PROJECT MANUAL

CAPITAL REGIONAL DEVELOPMENT AUTHORITY

100 COLUMBUS BOULEVARD
HARTFORD, CONNECTICUT 06103

CONCOURSE PARK
EAST HARTFORD, CONNECTICUT

CRDA PROJECT# 25-005

SOLLI PROJECT# 2010501

ISSUED FOR BID: OCTOBER 1, 2025

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SECTION 003132 – GEOTECHNICAL DATA

PART 1 – GENERAL

1.1 SUBSURFACE EXPLORATIONS

A. Subsurface conditions at the site have been evaluated by completion of test borings.

B. Boring logs have been included with the geotechnical engineering report referenced in this section and are available upon request. The logs describe subsurface conditions encountered at the boring locations at the time explorations were made.

C. No warranty is made of the continuity of strata or material between the exploration locations. The stratification lines on the logs represent approximate boundaries between strata.

D. Boring locations shown on the figure in the referenced geotechnical engineering report are approximate.

E. Bidders shall make their own deductions of subsurface conditions which may affect methods or cost of construction. Bidders may, at their own expense, and upon the owner's approval to enter the site, conduct additional subsurface testing.

1.2 GEOTECHNICAL ENGINEERING REPORT

A. A geotechnical report titled, "Geotechnical Engineering Report", dated May 29, 2024, has been prepared by Solli Engineering, LLC for use by Jasko Zelman 1, LLC and JZ Otto, LLC, and the project design team in the design for this project. The Geotechnical Engineering Report will be available at the Owner's office and is for informational purposes only.

B. Data contained in the Geotechnical Engineering Report concerning inferred subsurface conditions are not intended as representation or warranties of accuracy or continuity between test borings. Part of the information contained in this report is interpretive. It is expressly understood that neither the Owner, Architect, Engineer, nor Geotechnical Engineer shall be responsible for any interpretations or conclusions drawn therefrom by the Contractor. The Geotechnical Engineering Report, the data contained therein, and all attachments are not part of the contract documents.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION 003132

SECTION 003133 – ENVIRONMENTAL DATA

PART 1 – GENERAL

1.1 SOIL TESTING

A. Soil testing at the site has been evaluated by the collection of 23 soil samples from 16 soil borings and the collection of groundwater samples from three of the borings that were completed as monitoring wells.

B. Boring logs have been included with the Environmental Engineering Report referenced in this section and are available upon request. The logs describe subsurface conditions encountered at the boring locations at the time explorations were made.

C. No warranty is made of the continuity of strata or material between the exploration locations. The stratification lines on the logs represent approximate boundaries between strata.

D. Boring locations shown on the figure in the referenced Environmental Engineering Report are approximate.

E. Bidders shall make their own deductions of subsurface conditions which may affect methods or cost of construction. Bidders may, at their own expense, and upon the owner's approval to enter the site, conduct additional subsurface testing.

1.2 ENVIRONMENTAL ENGINEERING REPORT

A. An environmental report titled, "Soils and Materials Management Plan", dated June 2025, has been prepared by GZA GeoEnvironmental, Inc. for use by Jasko Zelman 1, LLC and JZ Otto, LLC, and the project design team in the design for this project. The Environmental Engineering Report will be available at the Owner's office and is for informational purposes only.

B. Data contained in the Environmental Engineering Report concerning inferred subsurface conditions are not intended as representation or warranties of accuracy or continuity between test borings. Part of the information contained in this report is interpretive. It is expressly understood that neither the Owner, Architect, Engineer, nor Environmental Engineer shall be responsible for any interpretations or conclusions drawn therefrom by the Contractor. The Environmental Engineering Report, the data contained therein, and all attachments are not part of the contract documents.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION 003133

SECTION 011000 - SUMMARY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Project information.
2. Contract description.
3. Work by Owner or others.
4. Contractor's use of Site.
5. Work sequence.
6. Work restrictions.
7. Permits.
8. Specification conventions.

B. Related Requirements:

1. Section 012000 - Price and Payment Procedures.
2. Section 013216 - Construction Progress Schedule: Digital project management procedures and web-based project management software package.
3. Section 015000 - Temporary Facilities and Controls: Limitations and procedures governing temporary use of Owner's facilities.
4. Section 017000 - Execution and Closeout Requirements:

1.2 PROJECT INFORMATION

A. Name: Concourse Park

1. Project Location:
   a. 936 Silver Lane, East Hartford, Connecticut, 06118 (Map 46, Lot 107-3)
   b. 960 Silver Lane, East Hartford, Connecticut, 06118 (Map 46, Lot 113-2)

B. Owner(s):

1. Jasko Zelman 1, LLC – 66 West Main Street, Suite 102, East Hartford, CT 06108

2. JZ Otto, LLC – 66 West Main Street, Suite 102, East Hartford, CT 06108

3. Owner's Representatives: Brian Zelman & Santiago Valencia

C. Project Engineer: Solli Engineering, LLC

1. Engineer's Representative: Paul Rodrigues, P.E.; Kevin Solli, P.E.
   a. Solli Engineering, LLC
   b. 501 Main Street, Suite 2a, Monroe, Connecticut 06468
   c. Office Phone: (203) 880-5455

D. Construction Manager: To be determined.

1. Construction Manager Representative: To be determined.

2. Construction Manager as contractor (CMc): Construction Manager is Project contractor for this Project. The terms "Construction Manager" and "Contractor" are synonymous.

E. Project Coordinator for Multiple Contracts: Owner shall serve as Project coordinator.

1.3 CONTRACT DESCRIPTION

A. The Project is for the Concourse Park site work and consists of the installation of erosion and sedimentation control, site demolition, earthwork, underground utilities, including storm drainage, sanitary sewer, water, gas, electric and telephone/cable, grading, curbing, paving, sidewalks, site lighting, signage and plantings.

Running parallel to the above-mentioned Concourse Park site work, Jasko Zelman 1, LLC (“Jasko”) will be overseeing the construction of the apartment community buildings, consisting of apartment buildings, garages, a clubhouse, a mail building and trash and maintenance buildings. The successful bidder for the Concourse Park site work will be required to maintain access for Jasko’s contractors to the building locations throughout the site and coordinate with Jasko’s contractors in the development of a logistics plan that will ensure both projects can proceed efficiently.

1.4 WORK BY OWNER OR OTHERS

A. Owner will award contracts for the Work per the timeline in the Invitation to Bid document.

B. If Owner-awarded contracts interfere with each other due to Work being performed at the same time or at the same Site, Owner will determine the sequence of Work under all contracts according to WORK SEQUENCE and CONTRACTOR'S USE OF SITE Articles in this Section.

C. Coordinate Work with utilities of Owner and public or private agencies.

D. Work under these Contracts will include:
1. Work as indicated on the Drawings.

1.5 CONTRACTOR'S USE OF SITE

A. Unrestricted Use of Site: Contractor shall have full use of Project Site for construction operations during construction period. Contractor's use of Project Site is limited only by Owner's right to perform work or to retain other contractors on portions of Project.

B. Restricted Use of Site: Contractor shall have limited use of Project Site for construction operations as indicated on Drawings by the Contract limits and as indicated by requirements of this Section.

C. Limits on Use of Site: Limit use of Project Site to work in areas indicated. Do not disturb portions of Project Site beyond areas in which the Work is indicated.

D. Construction Plan: Before start of construction, post electronic file to Project website of construction plan regarding access to Work, use of Site, and utility outages for acceptance by Owner. After acceptance of plan, construction operations shall comply with accepted plan unless deviations are accepted by Owner in writing.

E. The Contractor will be required to maintain access for Jasko's contractors to the building locations throughout the site and coordinate with Jasko's contractors in the development of a logistics plan that will ensure both projects can proceed efficiently.

1.6 WORK SEQUENCE

A. Construct Work in phases during construction period. Coordinate construction schedule and operations with Architect/Engineer and Owner:

1. Phase 1A: Demolition, soil erosion and sedimental control, grading and drainage, site utilities, and site logistics. Refer to Drawings for more information.
2. Phase 1B: Site features, soil erosion and sedimentation control, grading and drainage, and site utilities. Refer to Drawings for more information.
3. Phase 2: Site features, grading and drainage, soil erosion and sedimentation control, and site utilities. Refer to Drawings for more information.

B. Sequencing of Construction Plan: Before start of construction, post electronic file to Project website of construction plan regarding phasing of demolition, construction, and new Work for acceptance by Owner. After acceptance of plan, comply with accepted plan when coordinating construction sequencing unless deviations are accepted by Owner in writing.

1.7 WORK RESTRICTIONS

A. Comply with restrictions on construction operations.

1. Comply with limitations on use of public streets, work on public streets, rights of way, and other requirements of authorities having jurisdiction (AHJ).

B. On-Site Work Hours: Limit Work to between 7:00 a.m. to 5:00 p.m., Monday through Friday, unless otherwise indicated. Work hours may be modified to meet Project requirements if approved by Owner and Town of East Hartford.
1. Hours for Utility Shutdowns: Coordinate with Utility Providers.

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

1. Notify Owner not less than two days in advance of proposed utility interruptions.
2. Do not proceed with utility interruptions without Owner's written permission.
3. Contact utility-locator service for area where Project is located before excavating.

4. Demolish and completely remove from site existing underground utilities indicated to be removed. Coordinate with utility companies to shut off services if lines are active.

D. Noise, Vibration, Dust, and Odors: Coordinate with Owner operations that may result in high levels of noise and vibration, dust, odors, or other disruption to Owner occupancy.

1. Notify Construction Manager & Owner not less than two days in advance of proposed disruptive operations.
2. Obtain Construction Manager's and Owner's written permission before proceeding with disruptive operations.

E. Smoking and Controlled Substance Restrictions: Use of tobacco products, alcoholic beverages, marijuana and other controlled substances **o**n Project Site is not permitted.

F. Employee Screening: Comply with Owner's requirements for drug and background screening of Contractor personnel working on Project Site.

1. Maintain list of approved screened personnel with Owner's representative.

1.8 PERMITS

A. Furnish all necessary permits and bonds for construction of Work, such as but not limited to the following:

1. Building permit.
2. Stormwater permit.
3. Dewatering permit.
4. Soil Erosion and Sedimentation Control bond.

1.9 SPECIFICATION CONVENTIONS

A. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:

1. Imperative mood and streamlined language are generally used in the Specifications. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.
2. Text Color: Text used in the Specifications, including units of measure, manufacturer and product names, and other text may appear in multiple colors or underlined as part of a hyperlink; no emphasis is implied by text with these characteristics.
3. Hypertext: Text used in the Specifications may contain hyperlinks. Hyperlinks may allow for access to linked information that is not residing in the Specifications. Unless otherwise indicated, linked information is not part of the Contract Documents.

B. Drawing Coordination: Requirements for materials and products identified on the Drawings are described in detail in the Specifications. One or more of the following are used on the Drawings to identify materials and products:

1. Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.
2. Abbreviations: Materials and products are identified by abbreviations scheduled on Drawings
3. Keynoting: Materials and products are identified by reference keynotes referencing Specification Section numbers found in this Project Manual.

PART 2 - PRODUCTS - Not Used

PART 3 - EXECUTION - Not Used

END OF SECTION 011000

SECTION 012000 - PRICE AND PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Schedule of Values.

B. Application for Payment.

C. Change procedures.

D. Defect assessment.

E. Alternates.

1.2 SCHEDULE OF VALUES

A. Submit electronic file to Project website of schedule on **AIA G703 -Continuation Sheet for G702.** [Contractor's standard form or electronic media printout will be considered for this use]

B. Submit Schedule of Values as electronic file to Project website within 15 days after date established in Notice to Proceed.

C. Format: Use Table of Contents of this Project Manual. Identify each line item with number and title of major Specification Section. Also identify Site mobilization**,** bonds and insurance**.**

D. Include separately from each line item, direct proportional amount of Contractor's overhead and profit.

E. Revise schedule to list approved Change Orders with each Application for Payment.

1.3 APPLICATION FOR PAYMENT

A. Submit electronic file to Project website of each Application for Payment on AIA G702 - Application and Certificate for Payment and AIA G703 - Continuation Sheet for G702.

B. Content and Format: Use Schedule of Values for listing items in Application for Payment.

C. Submit updated construction schedule with each Application for Payment.

D. Payment Period: Submit at intervals stipulated in the Agreement

E. Submit submittals with transmittal letter as specified in Section 013300 - Submittal Procedures.

F. Substantiating Data: When Architect/Engineer requires substantiating information, submit data justifying dollar amounts in question. Include the following with Application for Payment:

1. Current construction photographs specified in Section 013300 - Submittal Procedures.
2. Partial release of liens from major Subcontractors and vendors.
3. Record Documents as specified in Section 017000 - Execution and Closeout Requirements, for review by Owner, which will be returned to Contractor.
4. Affidavits attesting to off-Site stored products.
5. Construction Progress Schedule, revised and current as specified in Section 013300 - Submittal Procedures.

1.4 CHANGE PROCEDURES

A. Submittals: Submit name of individual who is authorized to receive change documents and is responsible for informing others in Contractor's employ or Subcontractors of changes to the Work.

B. Carefully study and compare Contract Documents before proceeding with fabrication and installation of Work. Promptly advise Architect/Engineer of any error, inconsistency, omission, or apparent discrepancy.

C. Requests for Interpretation (RFI) and Clarifications: Allot time in construction scheduling for liaison with Architect/Engineer; establish procedures for handling queries and clarifications.

1. Use AIA G716 - Request for Information for requesting interpretations.
2. Architect/Engineer may respond with a direct answer on the Request for Interpretation form, AIA G710 - Architect's Supplemental Instruction or AIA G709 - Work Changes Proposal Request

D. Architect/Engineer will advise of minor changes in the Work not involving adjustment to Contract Sum/Price or Contract Time by issuing supplemental instructions on AIA G710.

E. Architect/Engineer may issue Notice of Change including a detailed description of proposed change with supplementary or revised Drawings and Specifications, a change in Contract Time for executing the change with stipulation of overtime work required and with the period of time during which the requested price will be considered valid. Contractor will prepare and submit estimate within 10 days.

F. Contractor may propose changes by submitting a request for change to Architect/Engineer, describing proposed change and its full effect on the Work. Include a statement describing reason for the change and the effect on Contract Sum/Price and Contract Time with full documentation and a statement describing effect on the Work by separate or other Contractors.

1.5 DEFECT ASSESSMENT

A. Replace the Work, or portions of the Work, not conforming to specified requirements.

B. If, in the opinion of Architect/Engineer, it is not practical to remove and replace the Work, Architect/Engineer will direct appropriate remedy or adjust payment.

C. The defective Work may remain, but unit sum/price will be adjusted to new sum/price at discretion of Owner.

D. Defective Work will be partially repaired according to instructions of Architect/Engineer, and unit sum/price will be adjusted to new sum/price at discretion of Owner.

E. Individual Specification Sections may modify these options or may identify specific formula or percentage sum/price reduction.

F. Authority of Owner to assess defects and identify payment adjustments is final.

G. Nonpayment for Rejected Products: Payment will not be made for rejected products for any of the following reasons:

1. Products wasted or disposed of in a manner that is not acceptable.
2. Products determined as unacceptable before or after placement.
3. Products not completely unloaded from transporting vehicle.
4. Products placed beyond lines and levels of the required Work.
5. Products remaining on hand after completion of the Work.
6. Loading, hauling, and disposing of rejected products.

1.6 ALTERNATES

A. Alternates quoted on Bid Forms will be reviewed and accepted or rejected at Owner's option. Accepted Alternates will be identified in Owner-Contractor Agreement. The Owner-Contractor Agreement may identify certain Alternates to remain an Owner option for a stipulated period of time.

B. Coordinate related Work and modify surrounding Work. Description for each Alternate is recognized to be abbreviated but requires that each change shall be complete for scope of Work affected.

1. Coordinate related requirements among Specification Sections as required.
2. Include as part of each Alternate: Miscellaneous devices, appurtenances, and similar items incidental to or necessary for complete installation.
3. Coordinate Alternate with adjacent Work and modify or adjust as necessary to ensure integration.

PART 2 - PRODUCTS - Not Used

PART 3 - EXECUTION - Not Used

END OF SECTION 012000

SECTION 012500 - SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Quality assurance.

B. Product options.

C. Product substitution procedures.

D. Installer Substitution Procedures

1.2 QUALITY ASSURANCE

A. Contracts are based on products and standards established in Contract Documents without consideration of proposed substitutions.

B. Products specified define standard of quality, type, function, dimension, appearance, and performance required.

C. Substitution Proposals: Permitted for specified products except where specified otherwise. Do not substitute products unless substitution has been accepted and approved in writing by Owner.

1.3 PRODUCT OPTIONS

A. See Section 016000 - Product Requirements.

1.4 PRODUCT SUBSTITUTION PROCEDURES

A. Architect/Engineer will consider requests for substitutions only within 30 days after date established in Notice to Proceed.

B. Substitutions may be considered when a product becomes unavailable through no fault of Contractor.

C. Document each request with complete data, substantiating compliance of proposed substitution with Contract Documents, including:

1. Manufacturer's name and address, product, trade name, model, or catalog number, performance and test data, and reference standards.
2. Itemized point-by-point comparison of proposed substitution with specified product, listing variations in quality, performance, and other pertinent characteristics.
3. Reference to Article and Paragraph numbers in Specification Section.

4. Cost data comparing proposed substitution with specified product and amount of net change to Contract Sum.
5. Changes required in other Work.
6. Availability of maintenance service and source of replacement parts as applicable.
7. Certified test data to show compliance with performance characteristics specified.
8. Samples when applicable or requested.
9. Other information as necessary to assist Architect/Engineer's evaluation.

D. A request constitutes a representation that Contractor:

1. Has investigated proposed product and determined that it meets or exceeds quality level of specified product.
2. Will provide same warranty for substitution as for specified product.
3. Will coordinate installation and make changes to other Work that may be required for the Work to be complete with no additional cost to Owner.
4. Waives claims for additional costs or time extension that may subsequently become apparent.
5. Will coordinate installation of the accepted substitute, making such changes as may be required for the Work to be complete in all respects.
6. Will reimburse Owner and Architect/Engineer for review or redesign services associated with reapproval by authorities having jurisdiction.

E. Substitutions will not be considered when they are indicated or implied on Shop Drawing or Product Data submittals without separate written request or when acceptance will require revision to Contract Documents.

F. Substitution Submittal Procedure:

1. Submit requests for substitutions on CSI Form 13.1A Substitution Request-After the Bidding/Negotiating Stage**.**
2. Submit electronic files to Project website of Request for Substitution for consideration. Limit each request to one proposed substitution.
3. Submit Shop Drawings, Product Data, and certified test results attesting to proposed product equivalence. Burden of proof is on proposer.
4. Architect/Engineer will notify Contractor in writing of decision to accept or reject request.

1.5 INSTALLER SUBSTITUTION PROCEDURES

A. Document Invitation to Bid - Instructions to Bidders specifies time restrictions for submitting requests for substitutions during Bidding period.

PART 2 - PRODUCTS - Not Used

PART 3 - EXECUTION - Not Used

END OF SECTION 012500

SECTION 013000 - ADMINISTRATIVE REQUIREMENTS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Coordination and Project conditions.

B. Preconstruction meeting.

C. Site mobilization meeting.

D. Progress meetings.

E. Preinstallation meetings.

F. Closeout meeting.

G. Alteration procedures.

1.2 COORDINATION AND PROJECT CONDITIONS

A. Coordinate scheduling, submittals, and Work of various Sections of Project Manual to ensure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later.

B. Verify that utility requirements and characteristics of operating equipment are compatible with building utilities. Coordinate Work of various Sections having interdependent responsibilities for installing, connecting to, and placing operating equipment in service.

C. Coordinate space requirements, supports, and installation of mechanical and electrical Work indicated diagrammatically on Drawings. Follow routing shown for pipes, ducts, and conduit as closely as practical; place runs parallel with lines of building. Use spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.

1. Coordination Drawings: Prepare as required to coordinate all portions of Work. Show relationship and integration of different construction elements that require coordination during fabrication or installation to fit in space provided or to function as intended. Indicate locations where space is limited for installation and access and where sequencing and coordination of installations are important.

D. Coordination Meetings: In addition to other meetings specified in this Section, hold coordination meetings with personnel and Subcontractors to ensure coordination of Work.

E. In finished areas except as otherwise indicated, conceal pipes, ducts, and wiring within construction. Coordinate locations of fixtures and outlets with finish elements.

F. Coordinate completion and clean-up of Work of separate Sections in preparation for Substantial Completion.

G. After Owner's occupancy of premises, coordinate access to Site for correction of defective Work and Work not complying with Contract Documents, to minimize disruption of Owner's activities.

1.3 PRECONSTRUCTION MEETING

A. Attendance Required: Architect/Engineer, Owner, Construction Manager, major Subcontractors, and Contractor.

B. Minimum Agenda:

1. Execution of Owner-Contractor Agreement.
2. Submission of executed bonds and insurance certificates.
3. Distribution of Contract Documents.
4. Submission of list of Subcontractors, list of products, schedule of values, and Progress Schedule.
5. Designation of personnel representing parties in Contract, and Architect/Engineer.
6. Communication procedures.
7. Procedures and processing of requests for interpretations, field decisions, field orders, submittals, substitutions, Applications for Payments, proposal request, Change Orders, and Contract closeout procedures.
8. Scheduling.
9. Critical Work sequencing.

C. Construction Manager: Record minutes and distribute copies to participants within two days after meeting, with two copies each to Architect/Engineer, Owner, and those affected by decisions made.

1.4 SITE MOBILIZATION MEETING

A. Owner will schedule and preside over meeting at Project Site prior to Contractor occupancy. Construction Manager presides over meeting.

B. Attendance Required: Architect/Engineer, Owner, Contractor, Contractor's superintendent, Construction Manager, and major Subcontractors.

C. Minimum Agenda:

1. Use of premises by Owner and Contractor.
2. Owner's requirements.
3. Construction facilities and controls.
4. Temporary utilities.
5. Survey and building layout.
6. Security and housekeeping procedures.
7. Schedules.
8. Procedures for testing.
9. Procedures for maintaining record documents.

10. Requirements for startup of equipment.
11. Inspection and acceptance of equipment put into service during construction period.

D. Construction Manager: Record minutes and distribute copies to participants within two days after meeting, with two copies each to Architect/Engineer, Owner, and those affected by decisions made.

1.5 PROGRESS MEETINGS

A. Schedule and administer meetings throughout progress of the Work at maximum monthly intervals.

B. Make arrangements for meetings, prepare agenda with copies for participants, and preside over meetings.

C. Attendance Required: Job superintendent, major Contractors and suppliers, and Architect/Engineer, Owner, as appropriate to agenda topics for each meeting.

D. Minimum Agenda:

1. Review minutes of previous meetings.
2. Review of Work progress.
3. Field observations, problems, and decisions.
4. Identification of problems impeding planned progress.
5. Review of submittal schedule and status of submittals.
6. Review of off-Site fabrication and delivery schedules.
7. Maintenance of Progress Schedule.
8. Corrective measures to regain projected schedules.
9. Planned progress during succeeding work period.
10. Coordination of projected progress.
11. Maintenance of quality and work standards.
12. Effect of proposed changes on Progress Schedule and coordination.
13. Other business relating to Work.

E. Construction Manager: Record minutes and distribute copies to participants within two days after meeting, with two copies each to Architect/Engineer, Owner, and those affected by decisions made.

1.6 PREINSTALLATION MEETINGS

A. When required in individual Specification Sections, convene preinstallation meetings at Project Site before starting Work of specific Section.

B. Require attendance of parties directly affecting, or affected by, Work of specific Section.

C. Notify Architect/Engineer four days in advance of meeting date.

D. Prepare agenda and preside over meeting:

1. Review conditions of installation, preparation, and installation procedures.

2. Review coordination with related Work.

E. Record minutes and distribute copies to participants within two days after meeting, with two copies each to Architect/Engineer, Owner, and those affected by decisions made.

1.7 CLOSEOUT MEETING

A. Schedule Project closeout meeting with sufficient time to prepare for requesting Substantial Completion. Preside over meeting and be responsible for minutes.

B. Attendance Required: Contractor, Construction Manager, major Subcontractors, Architect/Engineer, Owner, and others appropriate to agenda.

C. Notify Architect/Engineer four days in advance of meeting date.

D. Minimum Agenda:

1. Start-up of facilities and systems.
2. Operations and maintenance manuals.
3. Testing, adjusting, and balancing.
4. System demonstration and observation.
5. Operation and maintenance instructions for Owner's personnel.
6. Contractor's inspection of Work.
7. Contractor's preparation of an initial "punch list."
8. Procedure to request Architect/Engineer inspection to determine date of Substantial Completion.
9. Completion time for correcting deficiencies.
10. Inspections by authorities having jurisdiction.
11. Certificate of Occupancy and transfer of insurance responsibilities.
12. Partial release of retainage.
13. Final cleaning.
14. Preparation for final inspection.
15. Closeout Submittals:

    a. Project record documents.
    b. Operating and maintenance documents.
    c. Operating and maintenance materials.
    d. Affidavits.

16. Final Application for Payment.
17. Contractor's demobilization of Site.
18. Maintenance.

E. Record minutes and distribute copies to participants within two days after meeting, with two copies each to Architect/Engineer, Owner, and those affected by decisions made.

PART 2 - PRODUCTS - Not Used

PART 3 - EXECUTION

3.1 ALTERATION PROCEDURES

A. Designated areas of existing facilities will be occupied for normal operations during progress of construction. Cooperate with Owner in scheduling operations to minimize conflict and to permit continuous usage.

END OF SECTION 013000

SECTION 013216 - CONSTRUCTION PROGRESS SCHEDULE

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Web-based project management software package.

B. Digital Project data licensing.

C. Submittals.

D. Quality assurance.

E. Format for network analysis schedules.

F. Network analysis schedules.

G. Review and evaluation.

H. Updating schedules.

I. Distribution.

1.2 WEB-BASED PROJECT MANAGEMENT SOFTWARE PACKAGE

A. Web-Based Project Management Software Package: Provide, administer, and use web-based Project management software package for purposes of hosting and managing Project communication and documentation until final completion.

1. Web-based Project management software includes, at a minimum, the following features:

a. Compilation of Project data, including Contractor, Subcontractors, Architect/Engineer, Architect's/Engineer's consultants, Owner, and other entities involved in Project. Include names of individuals and contact information.
b. Access control for each entity for each workflow process, to determine entity's digital rights to create, modify, view, and print documents.
c. Document workflow planning, allowing customization of workflow among Project entities.
d. Create, log, track, and notify Project members of Project communications required in other Specification Sections, including, but not limited to, RFIs, submittals, minor changes in the Work, Construction Change Directives, and Change Orders.
e. Track status of each Project communication in real time, and log time and date when responses are provided.

f. Procedures for handling PDFs or similar file formats, allowing markups by each entity. Provide security features to lock markups against changes once submitted.
g. Process and track payment applications.
h. Process and track contract modifications.
i. Create and distribute meeting minutes.
j. Document management for Drawings, Specifications, and coordination drawings, including revision control.
k. Management of construction progress photographs.
l. Mobile device compatibility, including smartphones and tablets.

B. Provide up to seven (7) Project management software user licenses for use by Owner Construction Manager, Architect/Engineer, and Architect's/Engineer's consultants. Provide eight (8) hours of software training at Architect's/Engineer's office for web-based Project software users.

1. At completion of Project, provide digital archive in format that is readable by common desktop software applications and acceptable to Architect/Engineer. Provide data in locked format to prevent further changes.

2. Products: Provide Procore Technologies, Inc Project management software package under the current published licensing agreements.

1.3 DIGITAL PROJECT DATA LICENSING

A. Use of Architect's/Engineer's Digital Data Files: Digital data files of Architect's/Engineer's CAD drawings will be provided by Architect/Engineer for Contractor's use during construction, upon request.

B. Conditions for Use:

1. Digital data files may be used by Contractor in preparing coordination drawings, Shop Drawings, and Project Record Drawings.
2. Architect/Engineer makes no representations as to the accuracy or completeness of digital data files as they relate to Contract Drawings.
3. Digital Drawing Software Program: Contract Drawings are available in .dwg file.
4. Contractor shall execute a data licensing agreement in the form of Agreement form acceptable to Owner and Architect/Engineer.

a. Subcontractors and other parties granted access by Contractor to Architect’s/Engineer’s digital data files shall execute a data licensing agreement in the form of Agreement acceptable to Owner and Architect/Engineer.

1.4 SUBMITTALS

A. Within ten (10) days after date established in Notice to Proceed, submit proposed preliminary network diagram defining planned operations for first sixty (60) days of Work, with general outline for remainder of Work.

B. Participate in review of preliminary and complete network diagrams jointly with Architect/Engineer.

C. Within twenty (20) days after joint review of proposed preliminary network diagram, submit draft of proposed complete network diagram for review. Include written certification that major Subcontractors have reviewed and accepted proposed schedule.

D. Within ten (10) days after joint review, submit complete network analysis consisting of network diagrams and mathematical analyses.

E. Submit updated network schedules with each Application for Payment.

F. Post as electronic file to Project website.

1.5 QUALITY ASSURANCE

A. Construction Manager's personnel specializing in CPM scheduling with two years' minimum experience in scheduling construction work of complexity comparable to the Project, and having use of computer facilities capable of delivering detailed graphic printout within 48 hours of request**.**

B. Contractor's Administrative Personnel: 5 years' minimum experience in using and monitoring CPM schedules on comparable Projects.

1.6 NETWORK ANALYSIS SCHEDULES

A. Format For Network Analysis Schedule

1. Listings: Reading from left to right, in ascending order for each activity. Identify each activity with applicable Specification Section number.
2. Diagram Sheet Size: 30 inches high x 42 inches wide required.
3. Scale and Spacing: To allow for notations and revisions.

B. Prepare network analysis diagrams and supporting mathematical analyses using critical path method.

C. Illustrate order and interdependence of activities and sequence of Work; how start of given activity depends on completion of preceding activities, and how completion of activity may restrain start of subsequent activities.

D. Illustrate complete sequence of construction by activity, identifying Work of separate phases. Indicate dates for submittals and return of submittals; dates for procurement and delivery of critical products; and dates for installation and provision for testing. Include legend for symbols and abbreviations used.

E. Mathematical Analysis: Tabulate each activity of detailed network diagrams using calendar dates, and identify for each activity:

1. Preceding and following event numbers.
2. Activity description.

3. Estimated duration of activity, in maximum 15-day intervals. Status of critical activities.
4. Earliest start date.
5. Earliest finish date.
6. Actual start date.
7. Actual finish date.
8. Latest start date.
9. Latest finish date.
10. Total and free float; accrue float time to Owner and to Owner's benefit.
11. Monetary value of activity, keyed to Schedule of Values.
12. Percentage of activity completed.
13. Responsibility.

F. Analysis Program: Capable of compiling monetary value of completed and partially completed activities, of accepting revised completion dates, and of recomputing of scheduled dates and float.

G. Required Sorts: List activities in sorts or groups:

1. By preceding Work item or event number from lowest to highest.
2. By longest float, then in order of early start.
3. By responsibility in order of earliest possible start date.
4. In order of latest allowable start dates.
5. In order of latest allowable finish dates.
6. Contractor's periodic payment request sorted by Specification Sections.
7. List of basic input data-generating report.
8. List of activities on critical path.

H. Prepare subschedules for each stage of Work and Sequencing of Construction Plan identified in Section 011000 - Summary.

1.7 REVIEW AND EVALUATION

A. Participate in joint review and evaluation of schedules with Architect/Engineer at each submittal.

B. Evaluate Project status to determine Work behind schedule and Work ahead of schedule.

C. After review, revise schedules incorporating results of review, and resubmit within 10 days.

1.8 UPDATING SCHEDULES

A. Maintain schedules to record actual start and finish dates of completed activities.

B. Indicate progress of each activity to date of revision, with projected completion date of each activity. Update schedules to depict current status of Work.

C. Identify activities modified since previous submittal, major changes in Work, and other identifiable changes.

D. Upon approval of a Change Order, include the change in the next schedule submittal.

E. Indicate changes required to maintain Date of Total Completion.

F. Submit sorts as required to support recommended changes.

G. Prepare narrative report to define problem areas, anticipated delays, and impact on schedule. Report corrective action taken or proposed and its effect including effects of changes on schedules of separate Contractors.

1.9 DISTRIBUTION

A. Following joint review, distribute copies of updated schedules to Contractor's Project site file, Subcontractors, suppliers, Architect/Engineer, Owner, and other concerned parties.

B. Instruct recipients to promptly report, in writing, problems anticipated by projections shown in schedules.

PART 2 - PRODUCTS - Not Used

PART 3 - EXECUTION - Not Used

END OF SECTION 013216

SECTION 013300 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Definitions.

B. Submittal procedures.

C. Construction progress schedules.

D. Proposed product list.

E. Product data.

F. Use of electronic CAD files of Project Drawings.

G. Shop Drawings.

H. Samples.

I. Other submittals.

J. Test reports.

K. Certificates.

L. Manufacturer's instructions.

M. Manufacturer's field reports.

N. Erection Drawings.

O. Construction photographs.

P. Contractor review.

Q. Architect/Engineer review.

R. Construction Photographs.

1.2 DEFINITIONS

A. Action Submittals: Written and graphic information and physical samples that require Architect/Engineer's responsive action.

B. Informational Submittals: Written and graphic information and physical Samples that do not require Architect/Engineer's responsive action. Submittals may be rejected for not complying with requirements.

1.3 SUBMITTAL PROCEDURES

A. Transmit each submittal with Architect/Engineer-accepted form.

B. Sequentially number transmittal forms. Mark revised submittals with original number and sequential alphabetic suffix.

C. Identify: Project, Contractor, Subcontractor and supplier, pertinent Drawing and detail number, and Specification Section number appropriate to submittal.

D. Apply Contractor's stamp, signed or initialed, certifying that review, approval, verification of products required, field dimensions, adjacent construction Work, and coordination of information is according to requirements of the Work and Contract Documents.

E. Schedule submittals to expedite Project, and post electronic submittals as PDF electronic files to Project website. Coordinate submission of related items.

F. For each submittal for review, allow 15 days excluding delivery time to and from Contractor.

G. Identify variations in Contract Documents and product or system limitations that may be detrimental to successful performance of completed Work.

H. Allow space on submittals for Contractor and Architect/Engineer review stamps.

I. When revised for resubmission, identify changes made since previous submission.

J. Distribute copies of reviewed submittals as appropriate. Instruct parties to promptly report inability to comply with requirements.

K. Submittals not requested will not be recognized nor processed.

L. Incomplete Submittals: Architect/Engineer will not review. Complete submittals for each item are required. Delays resulting from incomplete submittals are not the responsibility of Architect/Engineer.

1.4 CONSTRUCTION PROGRESS SCHEDULES

A. Comply with Section 013216 - Construction Progress Schedule

1.5 PROPOSED PRODUCT LIST

A. Within 15 days after date of Notice to Proceed, submit list of major products proposed for use, with name of manufacturer, trade name, and model number of each product.

B. For products specified only by reference standards, indicate manufacturer, trade name, model or catalog designation, and reference standards.

1.6 PRODUCT DATA

A. Post electronic submittals as PDF electronic files to Project website.

1.7 ELECTRONIC CAD FILES OF PROJECT DRAWINGS

A. Electronic CAD Files of Project Drawings: May only be used to expedite production of Shop Drawings for the Project. Use for other Projects or purposes is not allowed.

B. Electronic CAD Files of Project Drawings: Distributed only under the following conditions:

1. Use of files is solely at receiver's risk. Architect/Engineer does not warrant accuracy of files. Receiving files in electronic form does not relieve receiver of responsibilities for measurements, dimensions, and quantities set forth in Contract Documents. In the event of ambiguity, discrepancy, or conflict between information on electronic media and that in Contract Documents, notify Architect/Engineer of discrepancy and use information in hard-copy Drawings and Specifications.
2. CAD files do not necessarily represent the latest Contract Documents, existing conditions, and as-built conditions. Receiver is responsible for determining and complying with these conditions and for incorporating addenda and modifications.
3. User is responsible for removing information not normally provided on Shop Drawings and removing references to Contract Documents. Shop Drawings submitted with information associated with other trades or with references to Contract Documents will not be reviewed and will be immediately returned.
4. Receiver shall not hold Architect/Engineer responsible for data or file clean-up required to make files usable, nor for error or malfunction in translation, interpretation, or use of this electronic information.
5. Receiver shall understand that even though Architect/Engineer has computer virus scanning software to detect presence of computer viruses, there is no guarantee that computer viruses are not present in files or in electronic media.
6. Receiver shall not hold Architect/Engineer responsible for such viruses or their consequences, and shall hold Architect/Engineer harmless against costs, losses, or damage caused by presence of computer virus in files or media.

1.8 SHOP DRAWINGS

A. Shop Drawings: Action Submittal: Submit to Architect/Engineer for assessing conformance with information given and design concept expressed in Contract Documents.

B. Indicate special utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.

C. When required by individual Specification Sections, provide Shop Drawings signed and sealed by a professional Engineer responsible for designing components shown on Shop Drawings.

1. Include signed and sealed calculations to support design.
2. Submit Shop Drawings and calculations in form suitable for submission to and approval by authorities having jurisdiction.
3. Make revisions and provide additional information when required by authorities having jurisdiction.

D. Post electronic submittals as PDF electronic files to Project website.

E. After review, produce copies and distribute according to "Submittal Procedures" Article and for record documents described in Section 017000 - Execution and Closeout Requirements.

1.9 SAMPLES

A. Samples: Action Submittal: Submit to Architect/Engineer for assessing conformance with information given and design concept expressed in Contract Documents.

B. Samples for Selection as Specified in Product Sections:

1. Submit to Architect/Engineer for aesthetic, color, and finish selection.
2. Submit Samples of finishes, textures, and patterns for Architect/Engineer selection.

C. Submit Samples to illustrate functional and aesthetic characteristics of products, with integral parts and attachment devices. Coordinate Sample submittals for interfacing work.

D. Include identification on each Sample, with full Project information.

E. Submit number of Samples specified in individual Specification Sections; Architect/Engineer will retain one Sample.

F. Reviewed Samples that may be used in the Work are indicated in individual Specification Sections.

G. Samples will not be used for testing purposes unless specifically stated in Specification Section.

H. After review, produce copies and distribute according to "Submittal Procedures" Article and for record documents described in Section 017000 - Execution and Closeout Requirements.

1.10 OTHER SUBMITTALS

A. Closeout Submittals: Comply with Section 017000 - Execution and Closeout Requirements.

B. Informational Submittal: Submit data for Architect/Engineer's knowledge as Contract administrator or for Owner.

C. Submit information for assessing conformance with information given and design concept expressed in Contract Documents.

1.11 TEST REPORTS

A. Informational Submittal: Submit reports for Architect/Engineer's knowledge as Contract administrator or for Owner.

B. Submit test reports for information for assessing conformance with information given and design concept expressed in Contract Documents.

1.12 CERTIFICATES

A. Informational Submittal: Submit certification by manufacturer, installation/application Subcontractor, or Contractor to Architect/Engineer, in quantities specified for Product Data.

B. Indicate material or product conforms to or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.

C. Certificates may be recent or previous test results on material or product but must be acceptable to Architect/Engineer.

1.13 MANUFACTURER'S INSTRUCTIONS

A. Informational Submittal: Submit manufacturer's installation instructions for Architect/Engineer's knowledge as Contract administrator or for Owner.

B. Submit printed instructions for delivery, storage, assembly, installation, startup, adjusting, and finishing, to Architect/Engineer in quantities specified for Product Data.

C. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.

1.14 MANUFACTURER'S FIELD REPORTS

A. Informational Submittal: Submit reports for Architect/Engineer's knowledge as Contract administrator or for Owner.

B. Submit report within 24 hours of observation to Architect/Engineer for information.

C. Submit reports for information for assessing conformance with information given and design concept expressed in Contract Documents.

1.15 ERECTION DRAWINGS

A. Informational Submittal: Submit Drawings for Architect/Engineer's knowledge as Contract administrator or for Owner.

B. Submit Drawings for information assessing conformance with information given and design concept expressed in Contract Documents.

C. Data indicating inappropriate or unacceptable Work may be subject to action by Architect/Engineer or Owner.

1.16 CONSTRUCTION PHOTOGRAPHS

A. Provide photographs of Site and construction throughout progress of Work produced by an experienced photographer acceptable to Architect/Engineer.

B. Each month submit photographs.

C. Digital Images: Provide images in JPG format, produces by a digital camera with minimum sensor size of eight (8) megapixels, and at an image resolution not less than 1600 by 1200 pixels and 400 dpi.

1.17 CONTRACTOR REVIEW

A. Review for compliance with Contract Documents and approve submittals before transmitting to Architect/Engineer.

B. Contractor: Responsible for:

1. Determination and verification of materials including manufacturer's catalog numbers.
2. Determination and verification of field measurements and field construction criteria.
3. Checking and coordinating information in submittal with requirements of Work and of Contract Documents.
4. Determination of accuracy and completeness of dimensions and quantities.
5. Confirmation and coordination of dimensions and field conditions at Site.
6. Construction means, techniques, sequences, and procedures.
7. Safety precautions.
8. Coordination and performance of Work of all trades.

C. Stamp, sign or initial, and date each submittal to certify compliance with requirements of Contract Documents.

D. Do not fabricate products or begin Work for which submittals are required until approved submittals have been received from Architect/Engineer.

1.18 ARCHITECT/ENGINEER REVIEW

A. Do not make "mass submittals" to Architect/Engineer. "Mass submittals" are defined as six or more submittals or items in one day or 15 or more submittals or items in one week. If "mass submittals" are received, Architect/Engineer's review time stated above will be extended as necessary to perform proper review. Architect/Engineer will review "mass submittals" based on priority determined by Architect/Engineer after consultation with Owner and Contractor.

B. Informational submittals and other similar data are for Architect/Engineer's information, do not require Architect/Engineer's responsive action, and will not be reviewed or returned with comment.

C. Submittals made by Contractor that are not required by Contract Documents may be returned without action.

D. Submittal approval does not authorize changes to Contract requirements unless accompanied by Change Order, , or Construction Change Directive.

E. Owner may withhold monies due to Contractor to cover additional costs beyond the second submittal review.

PART 2 - PRODUCTS - Not Used

PART 3 - EXECUTION –

3.1 CONSTRUCTION PHOTOGRAPHS

A. General: Take photographs using the maximum range of depth of field, and that are in focus, to clearly show the Work. Photographs with blurry or out-of-focus areas will not be accepted.

1. Maintain key plan with each set of construction photographs that identifies each photographic location.

B. Digital Images: Submit digital images exactly as originally recorded in the digital camera, without alteration, manipulation, editing, or modifications using image-editing software

1. Date and Time: Include date and time in file name for each image.

2. Field Office Images: Maintain one (1) set of images accessible in the field office at Project site, available at all times for reference. Identify images in the same manner as those submitted to Architect

C. Periodic Construction Photographs: Take eighteen to twenty (18-20) photographs weekly, with timing each month adjusted to coincide with the cutoff date associated with each Application for Payment. Select vantage points to show status of construction and progress since last photographs were taken.

D. Additional Photographs: Architect may request photographs in addition to periodic photographs specified.

1. In emergency situations, take additional photographs within twenty-four (24) hours of request.

2. Circumstances that could require additional photographs include, but are not limited to, the following:

a. Immediate follow-up when on-site events result in construction damage or losses.

b. Substantial Completion of a major phase or component of Work.

END OF SECTION 013300

SECTION 014000 - QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Quality control.

B. Tolerances.

C. References.

D. Labeling.

E. Mockup requirements.

F. Testing and inspection services.

G. Manufacturers' field services.

1.2 QUALITY CONTROL

A. Monitor quality control over suppliers, manufacturers, products, services, Site conditions, and workmanship, to produce Work of specified quality.

B. Comply with specified standards as the minimum quality for the Work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.

C. Perform Work using persons qualified to produce required and specified quality.

D. Products, materials, and equipment may be subject to inspection by Architect/Engineer and Owner at place of manufacture or fabrication. Such inspections shall not relieve Contractor of complying with requirements of Contract Documents.

E. Supervise performance of Work in such manner and by such means to ensure that Work, whether completed or in progress, will not be subjected to harmful, dangerous, damaging, or otherwise deleterious exposure during construction period.

1.3 TOLERANCES

A. Monitor fabrication and installation tolerance control of products to produce acceptable Work. Do not permit tolerances to accumulate.

B. Comply with manufacturers' recommended tolerances and tolerance requirements in reference standards. When such tolerances conflict with Contract Documents, request clarification from Architect/Engineer before proceeding.

C. Adjust products to appropriate dimensions; position before securing products in place.

1.4 REFERENCES

A. For products or workmanship specified by association, trade, or other consensus standards, comply with requirements of standard except when more rigid requirements are specified or are required by applicable codes.

B. Conform to reference standard by date of issue current as of date of Contract Documents except where specific date is established by code.

C. Obtain copies of standards and maintain on Site when required by product Specification Sections.

D. When requirements of indicated reference standards conflict with Contract Documents, request clarification from Architect/Engineer before proceeding.

E. Neither contractual relationships, duties, or responsibilities of parties in Contract nor those of Architect/Engineer shall be altered from Contract Documents by mention or inference in reference documents.

1.5 LABELING

A. Label Information: Include manufacturer's or fabricator's identification, approved agency identification, and the following information, as applicable, on each label:

1. Model number.
2. Serial number.
3. Performance characteristics.

B. Manufacturer's Nameplates, Trademarks, Logos, and Other Identifying Marks on Products: Not allowed on surfaces exposed to view in public areas, interior or exterior.

1.6 MOCK-UP REQUIREMENTS

A. Tests will be performed under provisions identified in this Section and identified in individual product Specification Sections.

B. Assemble and erect specified or indicated items with specified or indicated attachment and anchorage devices, flashings, seals, and finishes.

C. Accepted mockups shall be comparison standard for remaining Work.

D. Where mockup has been accepted by Architect/Engineer and is specified in product Specification Sections to be removed, remove mockup and clear area when directed to do so by Architect/Engineer.

1.7 TESTING AND INSPECTION SERVICES

A. Owner will employ and pay for specified services of an independent firm to perform testing and inspection.

B. Testing, inspections, and source quality control may occur on or off Project Site. Perform off-Site testing as required by Architect/Engineer or Owner.

C. Reports shall be submitted by independent firm to Architect/Engineer, Contractor, and authorities having jurisdiction, in duplicate, indicating observations and results of tests and compliance or noncompliance with Contract Documents.

1. Submit final report indicating correction of Work previously reported as noncompliant.

D. Cooperate with independent firm; furnish samples of materials, design mix, equipment, tools, storage, safe access, and assistance by incidental labor as requested.

1. Notify Architect/Engineer and independent firm 24hours before expected time for operations requiring services.
2. Make arrangements with independent firm and pay for additional Samples and tests required for Contractor's use.

E. Employment of testing agency or laboratory shall not relieve Contractor of obligation to perform Work according to requirements of Contract Documents.

F. Retesting or re-inspection required because of nonconformance with specified or indicated requirements shall be performed by same independent firm on instructions from Architect/Engineer. Payment for retesting or re-inspection will be charged to Contractor by deducting testing charges from Contract Sum/Price.

G. Agency Responsibilities:

1. Test Samples of mixes submitted by Contractor.
2. Provide qualified personnel at Site. Cooperate with Architect/Engineer and Contractor in performance of services.
3. Perform indicated sampling and testing of products according to specified standards.
4. Ascertain compliance of materials and mixes with requirements of Contract Documents.
5. Promptly notify Architect/Engineer and Contractor of observed irregularities or nonconformance of Work or products.
6. Perform additional tests required by Architect/Engineer.
7. Attend preconstruction meetings and progress meetings.

H. Agency Reports: After each test, promptly submit electronically, a copy of report to Architect/Engineer, Contractor, and authorities having jurisdiction. When requested by Architect/Engineer, provide interpretation of test results. Include the following:

1. Date issued.
2. Project title and number.
3. Name of inspector.

4. Date and time of sampling or inspection.
5. Identification of product and Specification Section.
6. Location in Project.
7. Type of inspection or test.
8. Date of test.
9. Results of tests.
10. Conformance with Contract Documents.

I. Limits on Testing Authority:

1. Agency or laboratory may not release, revoke, alter, or enlarge on requirements of Contract Documents.
2. Agency or laboratory may not approve or accept any portion of the Work.
3. Agency or laboratory may not assume duties of Contractor.
4. Agency or laboratory has no authority to stop the Work.

1.8 MANUFACTURERS' FIELD SERVICES

A. When specified in individual Specification Sections, require material or product suppliers or manufacturers to provide qualified staff personnel to observe Site conditions, conditions of surfaces and installation, quality of workmanship, startup of equipment, testing, adjusting, and balancing of equipment, and commissioning as applicable, and to initiate instructions when necessary.

B. Submit qualifications of observer to Architect/Engineer 30 days in advance of required observations. Observer is subject to approval of Architect/Engineer.

C. Report observations and Site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturer's written instructions.

D. Refer to Section 013300 - Submittal Procedures, "Manufacturer's Field Reports" Article.

PART 2 - PRODUCTS - Not Used

PART 3 - EXECUTION - Not Used

END OF SECTION 014000

SECTION 015000 - TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Temporary facilities under Construction Management Agreement.

B. Temporary Utilities:

1. Temporary electricity.
2. Temporary lighting for construction purposes.
3. Communication services.
4. Temporary water service.
5. Temporary sanitary facilities.

C. Construction Facilities:

1. Field offices and sheds.
2. Vehicular access.
3. Parking.
4. Progress cleaning and waste removal.
5. Project identification.
6. Traffic regulation.
7. Fire-prevention facilities.

D. Temporary Controls:

1. Barriers.
2. Enclosures and fencing.
3. Security.
4. Water control.
5. Dust control.
6. Erosion and sediment control.
7. Noise control.
8. Pest and rodent control.
9. Pollution control.

E. Removal of utilities, facilities, and controls.

1.2 REFERENCES

A. ASTM International:

1. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
2. ASTM E 90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.

3. ASTM E 119 - Standard Test Methods for Fire Tests of Building Construction and Materials.

1.3 TEMPORARY FACILITIES UNDER CONSTRUCTION MANAGEMENT AGREEMENT

A. Temporary Provisions Provided by Construction Manager:

1. Temporary barriers, barricades, covered walkways, fencing, exterior closures, and interior closures.
2. Temporary field offices.
3. Cleaning during construction.
4. Access roads and approaches.
5. Temporary sanitary facilities.
6. Temporary electrical service and distribution system for power and lighting.
7. Temporary telephone and internet service.

B. Each Contractor: Coordinate provisions with Construction Manager and provide the following items as necessary for execution of the Work including associated costs:

1. Construction aids.
2. Temporary fire protection, dust control, erosion and sediment control, water control, noise control, and other necessary temporary controls.
3. Temporary barriers, barricades, and similar devices as necessary for safety and protection of construction personnel and public.
4. On Construction Manager's approval, may provide temporary field office including electrical service and temporary telephone.
5. Temporary tree and plant protection.
6. Temporary heating before building enclosure.
7. Electrical service required in addition to temporary service and distribution provided by Construction Manager.
8. Temporary provisions for protection of installed Work.

1.4 TEMPORARY ELECTRICITY

A. Provide and pay for power service required from utility source as needed for construction operation. Contractor to coordinate with utility provider for temporary electricity.

1.5 TEMPORARY LIGHTING FOR CONSTRUCTION PURPOSES

A. Provide and maintain lighting for construction operations as needed.

1.6 COMMUNICATION SERVICES

A. Telephone Service: Provide, maintain, and pay for telephone service to field office and Owner’s field office at time of Project mobilization and until completion of Work.

B. Facsimile Service: Provide, maintain, and pay for facsimile service including dedicated telephone line to field office and Owner's field office at time of Project mobilization and until completion of Work.

C. Internet Service: Provide, maintain, and pay for broadband Internet service to field office and Owner's field office at time of Project mobilization. Provide desktop computer with Microsoft operating system and appropriate office function software, modem, and printer.

D. Contractor to coordinate with utility provider for communication services.

1.7 TEMPORARY WATER SERVICE

A. Provide and pay for suitable quality water service as needed to maintain specified conditions for construction operations. Connect to existing water source.

B. Contractor to coordinate with utility provider for temporary water services.

1.8 TEMPORARY SANITARY FACILITIES

A. Provide and maintain required facilities and enclosures. Existing facility use is not permitted. Provide facilities at time of Project mobilization.

1.9 FIELD OFFICES AND SHEDS

A. Owner's Field Office: Weathertight, with lighting, electrical outlets, heating, cooling, and ventilating equipment, and equipped with sturdy furniture including conference table, drawing rack, filing cabinets, and drawing display table. Provide space for Project meetings, with tables and chairs to accommodate 10 persons.

B. CRDA's Field Office: Weathertight, with lighting, electrical outlets, heating, cooling, and ventilation equipment, equipped with sturdy furniture including conference table, drawing rack, filing cabinet, and drawing display table. Provide space for Project meetings, with table and chairs to accommodate 5 persons.

C. Locate field offices and sheds as shown on the Logistics Plans.

D. When permanent facilities are enclosed with operable utilities, relocate field offices and storage into building, with written agreement of Owner, and remove temporary buildings.

E. Contractors shall provide separate field office per their own requirements.

F. Storage Areas and Sheds: Size to storage requirements for products of individual Sections, allowing for access and orderly provision for maintenance and inspection of products to suit requirements in Section 016000 - Product Requirements.

G. Preparation: Fill and grade Sites for temporary structures sloped for drainage away from buildings.

H. Installation:

1. Install field office spaces ready for occupancy 15 days after date established by Notice to Proceed.
2. Employee Residential Occupancy: Not allowed on Owner's property.

I. Maintenance and Cleaning:

1. Weekly janitorial services for field offices; periodic cleaning and maintenance for sheds and storage areas.
2. Maintain walks free of mud, water, snow, and the like.

J. Removal: At completion of Work remove buildings, foundations, utility services, and debris. Restore areas to same or better condition as original condition.

1.10 VEHICULAR ACCESS

A. Construct temporary all-weather access roads from public thoroughfares to serve construction area, of width and load-bearing capacity to accommodate unimpeded traffic for construction purposes.

B. Construct temporary bridges and culverts to span low areas and allow unimpeded drainage, as needed.

C. Extend and relocate vehicular access as Work progress requires and provide detours as necessary for unimpeded traffic flow.

D. Locate as indicated on Drawings.

E. Provide unimpeded access for emergency vehicles. Maintain 20 foot-wide driveways with turning space between and around combustible materials.

F. Provide and maintain access to fire hydrants free of obstructions.

G. Provide means of removing mud from vehicle wheels before entering streets.

H. Use existing on-Site roads for construction traffic.

1.11 PARKING

A. Provide contractor and other personnel parking on site as shown on the Logistics Plans.

B. Permanent Pavements and Parking Facilities:

1. Bases for permanent roads and parking areas may be used for construction traffic.
2. Avoid traffic loading beyond paving design capacity. Tracked vehicles are not allowed.

C. Maintenance:

1. Maintain traffic and parking areas in sound condition free of excavated material, construction equipment, products, mud, snow, ice, and the like.

2. Maintain existing and permanent paved areas used for construction; promptly repair breaks, potholes, low areas, standing water, and other deficiencies, to maintain paving and drainage in original condition.

D. Mud from Site vehicles: Provide means of removing mud from vehicle wheels before entering streets.

1.12 PROGRESS CLEANING AND WASTE REMOVAL

A. Maintain areas free of waste materials, debris, and rubbish. Maintain Site in clean and orderly condition.

B. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other closed or remote spaces, before enclosing spaces.

C. Broom and vacuum clean interior areas before starting surface finishing, and continue cleaning to eliminate dust.

D. Collect and remove waste materials, debris, and rubbish from Site weekly. and dispose of off-Site.

E. Open free-fall chutes are not permitted. Terminate closed chutes into appropriate containers with lids.

1.13 PROJECT IDENTIFICATION

A. Project Identification Sign:
   1. One painted sign per CRDA Project Sign requirements/template below.

PROJECT SIGN

SIGN PANEL: ¾" MDO-EXT-APA PLYWOOD SUPPORTED WITH (2) 4X4 TREATED WOOD COLUMNS AND SECURED 4' INTO GRADE. TOP OF SIGN AT 8'-0" ABOVE GRADE.

COLORS: ALL LETTERS AND SYMBOLS ARE TO BE ROYAL BLUE. THE BACKGROUND WILL BE WHITE ENAMEL. BACK OF PLYWOOD AND SUPPORT STRUCTURE SHALL BE PAINTED MATTE BLACK.

TYPEFACE: HELVETICA MEDIUM

LOCATION: SIGN MUST BE LOCATED TO BE CLEARLY VISIBLE TO THE PUBLIC.

TIMING: INSTALL AT THE START OF CONSTRUCTION AND REMOVE AT CONSTRUCTION COMPLETION.

STATE SEAL & DECD LOGO: ATTACHED

B. Submittal

   1. Contractor to provide sign shop drawings for Engineer review and approval prior to fabrication.

C. Installation

   1. Install Project identification sign within fifteen (15) days after date established by Owner-Contractor Agreement.
   2. Erect at designated location.

3. Erect supports and framing on secure foundation, rigidly braced and framed to resist wind loadings.
4. Install sign surface plumb and level, with butt joints. Anchor securely.
5. Paint exposed surfaces of sign, supports, and framing.

D. Maintenance: Maintain clean signs and supports; repair deterioration and damage.

E. Removal: Remove signs, framing, supports, and foundations at completion of Project and restore area.

1.14 TRAFFIC REGULATION

A. Signs, Signals, and Devices:

1. Post-Mounted and Wall-Mounted Traffic Control and Informational Signs: As approved by authorities having jurisdiction.
2. Traffic Cones, Drums, Flares, and Lights: As approved by authorities having jurisdiction.
3. Flag Person Equipment: As required by authorities having jurisdiction.

B. Flag Persons: Provide trained and equipped flag persons to regulate traffic when construction operations or traffic encroach on public traffic lanes.

C. Flares and Lights: Use flares and lights during hours of low visibility to delineate traffic lanes and to guide traffic.

D. Traffic Signs and Signals:

1. Provide signs at approaches to Site and on Site, at crossroads, detours, parking areas, and elsewhere as needed to direct construction and affected public traffic.
2. Provide, operate, and maintain traffic control signals to direct and maintain orderly flow of traffic in areas under Contractor's control and areas affected by Contractor's operations.
3. Relocate signs and signals as Work progresses, to maintain effective traffic control.

E. Removal:

1. Remove equipment and devices when no longer required**.**
2. Repair damage caused by installation.
3. Remove post settings to depth of 2feet.

1.15 FIRE-PREVENTION FACILITIES

A. Prohibit smoking within buildings under construction. Designate area on Site where smoking is permitted. Provide approved ashtrays in designated smoking areas.

B. Establish fire watch for cutting, welding, and other hazardous operations capable of starting fires. Maintain fire watch before, during, and after hazardous operations until threat of fire does not exist.

C. Standpipes: Install minimum of one standpipe for use during construction before building reaches 40 feet in height.

D. Portable Fire Extinguishers: NFPA 10; 10-pound capacity, 4A-60B: C UL rating.

1. Provide one fire extinguisher at each stairway on each floor of buildings under construction.
2. Provide minimum of one fire extinguisher in every construction trailer and storage shed.
3. Provide minimum of one fire extinguisher on roof during roofing operations using heat-producing equipment.

1.16 BARRIERS

A. Provide barriers to prevent unauthorized entry to construction areas and to protect existing facilities and adjacent properties from damage from construction operations and demolition.

B. Tree and Plant Protection: Preserve and protect existing trees and plants designated to remain.

1. Refer to Section 015639 – Temporary Tree and Plant Protection.

2. Protect areas within drip lines from traffic, parking, storage, dumping, chemically injurious materials and liquids, ponding, and continuous running water.
3. Replace trees and plants damaged by construction operations.

C. Protect non-owned vehicular traffic, stored materials, Site, and structures from damage.

1.17 ENCLOSURES AND FENCING

A. Construction: As specified on drawings.

1.18 SECURITY

A. Security Program:

1. Protect Work on existing premises from theft, vandalism, and unauthorized entry.
2. Initiate program at Project mobilization.
3. Maintain program throughout construction period until Owner's acceptance precludes need for Contractor's security.

B. Entry Control:

1. Restrict entrance of persons and vehicles to Project Site.
2. Allow entrance only to authorized persons with proper identification.
3. Maintain log of workers and visitors and make available to Owner on request.
4. Owner will control entrance of persons and vehicles related to Owner's operations.

1.19 WATER CONTROL

A. Grade Site to drain. Maintain excavations free of water. Provide, operate, and maintain necessary pumping equipment.

B. Protect Site from puddles or running water.

1.20 DUST CONTROL

A. Execute Work by methods that minimize raising dust from construction operations.

B. Provide positive means to prevent airborne dust from dispersing into atmosphere..

1.21 EROSION AND SEDIMENT CONTROL

A. Plan and execute construction by methods to control surface drainage from cuts and fills from borrow and waste disposal areas. Prevent erosion and sedimentation.

B. Minimize surface area of bare soil exposed at one time.

C. Provide temporary measures including berms, dikes, drains, and other devices to prevent water flow.

D. Construct fill and waste areas by selective placement to avoid erosive surface silts and clays.

E. Periodically inspect earthwork to detect evidence of erosion and sedimentation. Promptly apply corrective measures.

F. Comply with sediment and erosion control plan indicated on Drawings.

1.22 NOISE CONTROL

A. Provide methods, means, and facilities to minimize noise produced by construction operations.

1.23 PEST AND RODENT CONTROL

A. Provide methods, means, and facilities to prevent pests and insects from damaging the Work. Specify only Owner-instructed requirements.

B. Provide methods, means, and facilities to prevent rodents from accessing or invading premises.

1.24 POLLUTION CONTROL

A. Provide methods, means, and facilities to prevent contamination of soil, water, and atmosphere from discharge of noxious, toxic substances and pollutants produced by construction operations.

B. Comply with pollution and environmental control requirements of authorities having jurisdiction.

1.25 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

A. Remove temporary utilities, equipment, facilities, and materials before Final Application for Payment inspection.

B. Remove underground installations to minimum depth of 2 feet Site as indicated on Drawings.

C. Clean and repair damage caused by installation or use of temporary Work.

PART 2 - PRODUCTS - Not Used

PART 3 - EXECUTION - Not Used

END OF SECTION 015000

SECTION 015639 - TEMPORARY TREE AND PLANT PROTECTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes general protection and pruning of existing trees and plants that are affected by execution of the Work, whether temporary or permanent construction.

B. Related Requirements:
   1. Section 311000 – Clearing and Grubbing for removing existing trees and shrubs.

1.2 DEFINITIONS

A. Tree-Protection Zone: Area surrounding individual trees or groups of trees to be protected during construction and indicated on Drawings.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings:
   1. Detail fabrication and assembly of protection-zone fencing and signage.

C. Tree Pruning Schedule: Written schedule detailing scope and extent of pruning of trees to remain that interfere with or are affected by construction.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For arborist and tree service firm.

B. Certification: From arborist, certifying that trees indicated to remain have been protected during construction according to recognized standards and that trees were promptly and properly treated and repaired when damaged.

C. Maintenance Recommendations: From arborist, for care and protection of trees affected by construction during and after completing the Work.

D. Existing Conditions: Documentation of existing trees and plantings indicated to remain, which establishes preconstruction conditions that might be misconstrued as damage caused by construction activities.

1.5 QUALITY ASSURANCE

A. Arborist Qualifications: Certified Arborist as certified by ISA and licensed in the jurisdiction where Project is located.

1.6 FIELD CONDITIONS

A. The following practices are prohibited within protection zones:
   1. Storage of construction materials, debris, or excavated material.

2. Moving or parking vehicles or equipment.
3. Foot traffic.
4. Erection of sheds or structures.
5. Impoundment of water.
6. Excavation or other digging unless otherwise indicated.
7. Attachment of signs to or wrapping materials around trees or plants unless otherwise indicated.

B. Do not direct vehicle or equipment exhaust toward protection zones.

C. Prohibit heat sources, flames, ignition sources, and smoking within or near protection zones and organic mulch.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Protection-Zone Fencing: Fencing fixed in position and meeting the following requirements:
1. Plastic Protection-Zone Fencing: Plastic construction fencing constructed of high-density extruded and stretched polyethylene fabric with 2-inch maximum opening in pattern and weighing a minimum of 0.4 lb/ft.; remaining flexible from minus 60 to plus 200 deg F; inert to most chemicals and acids; minimum tensile yield strength of 2000 psi and ultimate tensile strength of 2680 psi; secured with plastic bands or galvanized-steel or stainless-steel wire ties; and supported by tubular or T-shape galvanized-steel posts spaced not more than 96 inches apart.
a. Height: 48 inches.
b. Color: High-visibility orange, nonfading.

B. Protection-Zone Signage: Shop-fabricated, rigid plastic or metal sheet with attachment holes pre-punched and reinforced; legibly printed with nonfading lettering and as follows:
1. Size and Text: “KEEP OUT / TREE PROTECTION ZONE”.
2. Lettering: 3-inch-high minimum, black characters on white background.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Erosion and Sedimentation Control: Examine the site to verify that temporary erosion and sedimentation control measures are in place. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross protection zones.

3.2 PREPARATION

A. Locate and clearly identify trees, shrubs, and other vegetation to remain. Tie a 1-inch blue vinyl tape around each tree trunk at 54 inches above the ground.

B. Protect tree root systems from damage caused by runoff or spillage of noxious materials while mixing, placing, or storing construction materials. Protect root systems from ponding, eroding, or excessive wetting caused by dewatering operations.

3.3 PROTECTION ZONES

A. Protection-Zone Fencing: Install protection-zone fencing where indicated on the Drawings along edges of protection zones before materials or equipment are brought on the site and construction operations begin in a manner that will prevent people from easily entering protected areas except by entrance gates. Construct fencing so as not to obstruct safe passage or visibility at vehicle intersections where fencing is located adjacent to pedestrian walkways or in close proximity to street intersections, drives, or other vehicular circulation.
   1. Posts: Set or drive posts into ground one-third the total height of the fence without concrete footings. Where a post is located on existing paving or concrete to remain, provide appropriate means of post support acceptable to Architect.

B. Protection-Zone Signage: Install protection-zone signage in visibly prominent locations in a manner approved by Architect. Install one sign spaced approximately every 50 feet on protection-zone fencing, but no fewer than four signs with each facing a different direction.

C. Maintain protection zones free of weeds and trash.

D. Maintain protection-zone fencing and signage in good condition as acceptable to Architect and remove when construction operations are complete and equipment has been removed from the site.
   1. Do not remove protection-zone fencing, even temporarily, to allow deliveries or equipment access through the protection zone.
   2. Temporary access is permitted subject to preapproval in writing by arborist if a root buffer effective against soil compaction is constructed as directed by arborist. Maintain root buffer so long as access is permitted.

3.4 EXCAVATION

A. Trenching within Protection Zones: Where utility trenches are required within protection zones, excavate under or around tree roots by hand or with air spade, or tunnel under the roots by drilling, auger boring, or pipe jacking. Do not cut main lateral tree roots or taproots; cut only smaller roots that interfere with installation of utilities. Cut roots as required for root pruning. If excavating by hand, use narrow-tine spading forks to comb soil and expose roots.

B. Do not allow exposed roots to dry out before placing permanent backfill. Provide temporary earth cover or pack with peat moss and wrap with burlap. Water and maintain in a moist condition. Temporarily support and protect roots from damage until they are permanently relocated and covered with soil.

3.5 ROOT PRUNING

A. Prune tree roots that are affected by temporary and permanent construction. Prune roots as follows:
   1. Cut roots manually by digging a trench and cutting exposed roots with sharp pruning instruments; do not break, tear, chop, or slant the cuts. Do not use a backhoe or other equipment that rips, tears, or pulls roots.
   2. Temporarily support and protect roots from damage until they are permanently redirected and covered with soil.
   3. Cover exposed roots with burlap and water regularly.

4. Backfill as soon as possible.

B. Root Pruning at Edge of Protection Zone: Prune tree roots flush with the edge of the protection zone by cleanly cutting all roots to the depth of the required excavation.

C. Root Pruning within Protection Zone: Clear and excavate by hand or with air spade to the depth of the required excavation to minimize damage to tree root systems. If excavating by hand, use narrow-tine spading forks to comb soil to expose roots. Cleanly cut roots as close to excavation as possible.

3.6 CROWN PRUNING

A. Prune branches that are affected by temporary and permanent construction. Prune branches as directed by arborist.
1. Prune to remove only injured, broken, dying, or dead branches unless otherwise indicated. Do not prune for shape unless otherwise indicated.
2. Do not remove or reduce living branches to compensate for root loss caused by damaging or cutting root system.
3. Pruning Standards: Prune trees according to ANSI A300 (Part 1).

B. Chip removed branches and dispose of off-site.

3.7 REGRADING

A. Lowering Grade: Where new finish grade is indicated below existing grade around trees, slope grade beyond the protection zone. Maintain existing grades within the protection zone.

B. Raising Grade: Where new finish grade is indicated above existing grade around trees, slope grade beyond the protection zone. Maintain existing grades within the protection zone.

3.8 FIELD QUALITY CONTROL

A. Inspections: Engage a qualified arborist to direct plant-protection measures in the vicinity of trees, shrubs, and other vegetation indicated to remain and to prepare inspection reports.

3.9 REPAIR AND REPLACEMENT

A. General: Repair or replace trees, shrubs, and other vegetation indicated to remain or to be relocated that are damaged by construction operations, in a manner approved by Architect.
1. Submit details of proposed pruning and repairs.
2. Perform repairs of damaged trunks, branches, and roots within 24 hours according to arborist's written instructions.
3. Replace trees and other plants that cannot be repaired and restored to full-growth status, as determined by Architect.

3.10 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Disposal: Remove excess excavated material, displaced trees, trash, and debris and legally dispose of them off Owner's property.

END OF SECTION 015639

SECTION 016000 - PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Products.

B. Product delivery requirements.

C. Product storage and handling requirements.

D. Product options.

1.2 PRODUCTS

A. At minimum, comply with specified requirements and reference standards.

B. Specified products define standard of quality, type, function, dimension, appearance, and performance required.

C. Furnish products of qualified manufacturers that are suitable for intended use. Furnish products of each type by single manufacturer unless specified otherwise. Confirm that manufacturer's production capacity can provide sufficient product, on time, to meet Project requirements.

D. Domestic Products: Except where specified otherwise, domestic products are required and interpreted to mean products mined, manufactured, fabricated, or produced in United States or its territories.

E. Do not use materials and equipment removed from existing premises except as specifically permitted by Contract Documents.

F. Furnish interchangeable components from same manufacturer for components being replaced.

1.3 PRODUCT DELIVERY REQUIREMENTS

A. Transport and handle products according to manufacturer's instructions.

B. Promptly inspect shipments to ensure products comply with requirements, quantities are correct, and products are undamaged.

C. Provide equipment and personnel to handle products; use methods to prevent soiling, disfigurement, or damage.

1.4 PRODUCT STORAGE AND HANDLING REQUIREMENTS

A. Store and protect products according to manufacturer's instructions.

B. Store products with seals and labels intact and legible.

C. Store sensitive products in weathertight, climate-controlled enclosures in an environment suitable to product.

D. For exterior storage of fabricated products, place products on sloped supports aboveground.

E. Provide off-Site storage and protection when Site does not permit on-Site storage or protection.

F. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.

G. Store loose granular materials on solid flat surfaces in well-drained area. Prevent mixing with foreign matter.

H. Provide equipment and personnel to store products; use methods to prevent soiling, disfigurement, or damage.

I. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

1.5 PRODUCT OPTIONS

A. Products Specified by Reference Standards or by Description Only: Products complying with specified reference standards or description.

B. Products Specified by Naming One or More Manufacturers: Products of one of manufacturers named and complying with Specifications; no options or substitutions allowed.

C. Products Specified by Naming One or More Manufacturers with Provision for Substitutions: Submit Request for Substitution for any manufacturer not named, according to Section 012500 - Substitution Procedures.

PART 2 - PRODUCTS – Not Used

PART 3 - EXECUTION - Not Used

END OF SECTION 016000

SECTION 017000 - EXECUTION AND CLOSEOUT REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Coordination.
2. Preinstallation meetings.
3. Scheduling.
4. Submittals.
5. Closeout submittals.
6. Maintenance material submittals.
7. Field engineering.
8. Closeout procedures.
9. Manual for materials and finishes.
10. Warranty.
11. Examination.
12. Preparation.
13. Installation.
14. Field quality control.
15. Site & Utility cleaning.
16. Demonstration.
17. Protection.

1.2 COORDINATION

A. Site Access: Provide access to Project Site for Owner and other outside contractors.

B. Coordinate construction and operations of the Work with Work performed by Owner's construction personnel and Owner's separate Contractors.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conferences: Include Owner's construction personnel and Owner's separate Contractors at preinstallation conferences covering portions of the Work that are to receive Owner's Work. Attend preinstallation conferences conducted by Owner's construction personnel if portions of the Work depend on Owner's construction.

1.4 SCHEDULING

A. Construction Schedule: Inform Owner of Contractor's preferred construction schedule for Owner's portion of the Work. Adjust construction schedule based on a mutually agreeable timetable. Notify Owner if changes to schedule are required due to differences in actual construction progress.

1.5 SUBMITTALS

A. Final punch list indicating all items have been completed or corrected.

B. Final payment request with final releases and supporting documentation not previously submitted and accepted. Include certificates of insurance for products and completed operations where required.

C. Specified warranties, workmanship/maintenance bonds, maintenance agreements, and other similar documents.

D. Accounting statement for final changes to Contract Sum.

E. Contractor's affidavit of payment of debts and claims on AIA G706 - Contractor's Affidavit of Payment of Debts and Claims.

F. Contractor affidavit of release of liens on AIA G706A - Contractor's Affidavit of Release of Liens.

G. Consent of surety to final payment on AIA G707 - Consent of Surety to Final Payment Form.

1.6 CLOSEOUT SUBMITTALS

A. Project Record Documents:

1. Maintain on Site one set of the following record documents; record actual revisions to the Work:

    a. Drawings.
    b. Specifications.
    c. Addenda.
    d. Change Orders and other modifications to the Contract.
    e. Reviewed Shop Drawings, product data, and Samples.
    f. Manufacturer's instruction for assembly, installation, and adjusting.

2. Ensure entries are complete and accurate, enabling future reference by Owner.
3. Store record documents separate from documents used for construction.
4. Record information concurrent with construction progress, not less than weekly.
5. Specifications: Legibly mark and record, at each product Section, description of actual products installed, including the following:

    a. Manufacturer's name and product model and number.
    b. Product substitutions or alternates used.
    c. Changes made by Addenda, bulletin, Change Order, and modifications.

6. Record Drawings and Shop Drawings: Legibly mark each item to record actual construction as follows:

    a. Include Contract modifications such as Addenda, supplementary instructions, change directives, field orders, minor changes in the Work, and change orders.
    b. Include locations of concealed elements of the Work.

c. Identify depth of buried utility lines and provide dimensions showing distances from permanent facility components that are parallel to utilities.
d. Dimension ends, corners, and junctions of buried utilities to permanent facility components using triangulation.
e. Identify and locate existing buried or concealed items encountered during Project.
f. Measured depths of foundations in relation to finish first floor datum.
g. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
h. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.
i. Field changes of dimension and detail.
j. Details not on original Drawings.

7. Submit marked-up paper copy documents to Architect/Engineer before Substantial Completion.
8. Submit PDF electronic files of marked-up documents to Architect/Engineer before Substantial Completion.

B. Operation and Maintenance Data:

1. Submit in PDF composite electronic indexed file.
2. Submit data bound in 8-1/2 x 11-inch text pages, three D side ring binders with durable plastic covers.
3. Prepare binder cover with printed title "OPERATION AND MAINTENANCE INSTRUCTIONS," title of Project, and subject matter of binder when multiple binders are required.
4. Internally subdivide binder contents with permanent page dividers, logically organized as described below; with tab titling clearly printed under reinforced laminated plastic tabs.
5. Drawings: Provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.
6. Contents: Prepare table of contents for each volume, with each product or system description identified, typed on white paper, in three parts as follows:

    a. Part 1: Directory, listing names, addresses, and telephone numbers of Architect/Engineer, Contractor, Subcontractors, and major equipment suppliers.
    b. Part 2: Operation and maintenance instructions, arranged by system and subdivided by Specification Section. For each category, identify names, addresses, and telephone numbers of Subcontractors and suppliers. Include the following:

        1) Significant design criteria.
        2) List of equipment.
        3) Parts list for each component.
        4) Operating instructions.
        5) Maintenance instructions for equipment and systems.
        6) Maintenance instructions for finishes, including recommended cleaning methods and materials, and special precautions identifying detrimental agents.

7) Safety precautions to be taken when operating and maintaining or working near equipment.

c. Part 3: Project documents and certificates, including the following:

1) Shop Drawings and product data.
2) Air and water balance reports.
3) Certificates.
4) Photocopies of warranties and bonds.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish spare parts, maintenance, and extra products in quantities specified in individual Specification Sections.

B. Deliver to Project Site; obtain receipt prior to final payment.

1.8 FIELD ENGINEERING

A. Employ land surveyor registered in State of Connecticut and acceptable to Architect/Engineer.

B. Contractor shall locate and protect survey controls and reference points. Promptly notify Architect/Engineer of discrepancies discovered.

C. Control datum for survey is indicated on Drawings.

D. Prior to beginning Work, verify and establish floor elevations of existing facilities to ensure that new Work will meet existing elevations in smooth and level alignment except where specifically detailed or indicated otherwise.

E. Verify setbacks and easements; confirm Drawing dimensions and elevations.

F. Provide field engineering services. Establish elevations, lines, and levels using recognized engineering survey practices. Contractor shall perform stakeouts, and maintain and protect survey control points and reference points.

G. Submit copy of Site drawing and certificate signed by land surveyor certifying elevations. Maintain complete and accurate log of control and survey Work as Work progresses.

H. On completion of foundation walls and major Site improvements, prepare certified survey illustrating dimensions, locations, angles, and elevations of construction and Site Work.

I. Protect survey control points prior to starting Site Work; preserve permanent reference points during construction.

J. Promptly report to Architect/Engineer loss or destruction of reference point or relocation required because of changes in grades or other reasons.

K. Replace dislocated survey control points based on original survey control. Make no changes without prior written notice to Architect/Engineer.

L. Final Property Survey: Prior to Substantial Completion, prepare final property survey illustrating locations, dimensions, angles, and elevations of buildings and Site Work that have resulted from construction indicating their relationship to permanent benchmarks and property lines.

1. Show significant features (real property) for Project.
2. Include certification on survey, signed by surveyor, that principal metes, bounds, lines, levels, and elevations of Project are accurately shown.

1.9 CLOSEOUT PROCEDURES

A. Prerequisites to Substantial Completion: Complete following items before requesting Certification of Substantial Completion, either for entire Work or for portions of Work:

1. Submit maintenance manuals, Project record documents, digital images of construction photographs, video recordings, and other similar final record data in compliance with this Section.
2. Complete facility startup, testing, adjusting, balancing of systems and equipment, demonstrations, and instructions to Owner's operating and maintenance personnel as specified in compliance with this Section.
3. Conduct inspection to establish basis for request that Work is substantially complete. Create comprehensive list (initial punch list) indicating items to be completed or corrected, value of incomplete or nonconforming Work, reason for being incomplete, and date of anticipated completion for each item. Include copy of list with request for Certificate of Substantial Completion.
4. Obtain and submit releases enabling Owner's full, unrestricted use of Project and access to services and utilities. Include certificate of occupancy, operating certificates, and similar releases from authorities having jurisdiction and utility companies.
5. Deliver tools, spare parts, extra stocks of material, and similar physical items to Owner.
6. Make final change-over of locks eliminating construction master-key system and transmit keys directly to Owner. Advise Owner's personnel of change-over in security provisions.
7. Discontinue or change over and remove temporary facilities and services from Project Site, along with construction tools, mockups, and similar elements.
8. Perform final cleaning according to this Section.

B. Substantial Completion Inspection:

1. When Contractor considers Work to be substantially complete, submit to Architect/Engineer:

a. Written certificate that Work, or designated portion, is substantially complete.
b. List of items to be completed or corrected (initial punch list).

2. Within seven days after receipt of request for Substantial Completion, Architect/Engineer will make inspection to determine whether Work or designated portion is substantially complete.
3. Should Architect/Engineer determine that Work is not substantially complete:

    a. Architect/Engineer will promptly notify Contractor in writing, stating reasons for its opinion.
    b. Contractor shall remedy deficiencies in Work and send second written request for Substantial Completion to Architect/Engineer/Owner.
    c. Architect/Engineer will reinspect Work.
    d. Redo and Inspection of Deficient Work: Repeated until Work passes Architect/Engineer's inspection.

4. When Architect/Engineer finds that Work is substantially complete, Architect/Engineer will:

    a. Prepare Certificate of Substantial Completion on AIA G704 - Certificate of Substantial Completion, accompanied by Contractor's list of items to be completed or corrected as verified and amended by Architect/Engineer and Owner (final punch list).
    b. Submit Certificate to Owner and Contractor for their written acceptance of responsibilities assigned to them in Certificate.

5. After Work is substantially complete, Contractor shall:

    a. Allow Owner occupancy of Project under provisions stated in Certificate of Substantial Completion.
    b. Complete Work listed for completion or correction within time period stipulated.

C. Prerequisites for Final Completion: Complete following items before requesting final acceptance and final payment.

1. When Contractor considers Work to be complete, submit written certification that:

    a. Contract Documents have been reviewed.
    b. Work has been examined for compliance with Contract Documents.
    c. Work has been completed according to Contract Documents.
    d. Work is completed and ready for final inspection.

2. Perform final cleaning for Contractor-soiled areas according to this Section.

D. Final Completion Inspection:

1. Within seven days after receipt of request for final inspection, Architect/Engineer will make inspection to determine whether Work or designated portion is complete.
2. Should Architect/Engineer consider Work to be incomplete or defective:

    a. Architect/Engineer will promptly notify Contractor in writing, listing incomplete or defective Work.
    b. Contractor shall remedy stated deficiencies and send second written request to Architect/Engineer that Work is complete.

c. Architect/Engineer will reinspect Work.
d. Redo and Inspection of Deficient Work: Repeated until Work passes Architect/Engineer's inspection.

1.10 MANUAL FOR MATERIALS AND FINISHES

A. Submit two copies of preliminary draft or proposed formats and outlines of contents before start of Work. Architect/Engineer will review draft and return one copy with comments.

B. For equipment or component parts of equipment put into service during construction and operated by Owner, submit documents within 10 days after acceptance.

C. Submit one copy of completed volumes before Substantial Completion. Completed volumes, with Architect/Engineer comments, will be returned after Substantial Completion. Revise content of document sets as required prior to final submission.

D. Submit two sets of revised final volumes within 10days after final inspection.

E. Submit in PDF composite electronic indexed file of final volumes within 10 days after final inspection.

F. Instructions for Care and Maintenance: Include manufacturer's recommendations for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.

G. Moisture Protection and Weather Exposed Products: Include product data listing applicable reference standards, chemical composition, and details of installation. Include recommendations for inspections, maintenance, and repair.

H. Additional Requirements: As specified in individual product Specification Sections.

I. Include listing in table of contents for design data, with tabbed fly sheet and space for insertion of data.

1.11 WARRANTY

A. Obtain warranties and bonds executed in duplicate by responsible Subcontractors, suppliers, and manufacturers within 10 days after completion of applicable item of Work.

B. Execute and assemble transferable warranty documents and bonds from Subcontractors, suppliers, and manufacturers.

C. Verify documents are in proper form, contain full information, and are notarized.

D. Co-execute submittals when required.

E. Include table of contents and assemble in three D side ring binder with durable plastic cover.

F. Submit prior to final Application for Payment.

G. Time of Submittals:

1. For equipment or component parts of equipment put into service during construction with Owner's permission, submit documents within 10 days after acceptance.
2. Make other submittals within 10 days after date of Substantial Completion, prior to final Application for Payment.
3. For items of Work for which acceptance is delayed beyond Substantial Completion, submit within 10 days after acceptance, listing date of acceptance as beginning of warranty or bond period.

PART 2 - PRODUCTS - Not Used

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that existing Site conditions and substrate surfaces are acceptable for subsequent Work. Beginning new Work means acceptance of existing conditions.

B. Verify that existing substrate is capable of structural support or attachment of new Work being applied or attached.

C. Examine and verify specific conditions described in individual Specification Sections.

D. Verify that utility services are available with correct characteristics and in correct locations.

3.2 PREPARATION

A. Clean substrate surfaces prior to applying next material or substance according to manufacturer's instructions.

B. Seal cracks or openings of substrate prior to applying next material or substance.

C. Apply manufacturer-required or -recommended substrate primer, sealer, or conditioner prior to applying new material or substance in contact or bond.

3.3 INSTALLATION

A. Comply with manufacturer's installation instructions, performing each step in sequence. Maintain one set of manufacturer's installation instructions at Project Site during installation and until completion of construction.

B. When manufacturer's installation instructions conflict with Contract Documents, request clarification from Architect/Engineer before proceeding.

C. Verify that field measurements are as indicated on approved Shop Drawings or as instructed by manufacturer.

D. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, or disfigurement.

1. Secure Work true to line and level and within specified tolerances, or if not specified, industry-recognized tolerances.
2. Physically separate products in place and provide electrical insulation or protective coatings to prevent galvanic action or corrosion between dissimilar metals.
3. Exposed Joints: Provide uniform joint width and arrange to obtain best visual effect. Refer questionable visual effect choices to Architect/Engineer for final decision.

E. Allow for expansion of materials and building movement.

F. Climatic Conditions and Project Status: Install each unit of Work under conditions to ensure best possible results in coordination with entire Project.

1. Isolate each unit of Work from incompatible Work as necessary to prevent deterioration.
2. Coordinate enclosure of Work with required inspections and tests to minimize necessity of uncovering Work for those purposes.

G. Mounting Heights: Where not indicated, mount individual units of Work at industry-recognized standard mounting heights for particular application indicated.

1. Refer questionable mounting height choices to Architect/Engineer for final decision.
2. Elements Identified as Handicap Accessible: Comply with applicable codes and regulations.

H. Adjust operating products and equipment to ensure smooth and unhindered operation.

I. Clean and perform maintenance on installed Work as frequently as necessary through remainder of construction period. Lubricate operable components as recommended by manufacturer.

3.4 FIELD QUALITY CONTROL

A. Owner will appoint, employ, and pay for services of independent firm to perform testing, adjusting, and balancing.

B. Reports will be submitted by independent firm to Architect/Engineer indicating observations, test results, and compliance or noncompliance with requirements of Contract Documents.

3.5 SITE & UTILITY CLEANING

A. Owner will provide final cleaning after final acceptance.

B. Execute final cleaning prior to final Project assessment.

1. Employ experienced personnel or professional cleaning firm.

C. Clean debris from drainage systems.

D. Clean Site; sweep paved areas, rake clean landscaped surfaces.

E. Remove waste and surplus materials, rubbish, and construction facilities from Site.

3.6 DEMONSTRATION

A. Demonstrate operation and maintenance of products to Owner's personnel two weeks prior to date of Substantial Completion.

B. Use operation and maintenance manuals as basis for instruction. Review contents of manual with Owner's personnel in detail to explain all aspects of operation and maintenance.

C. Prepare and insert additional data in operations and maintenance manuals when need for additional data becomes apparent during instruction.

D. Allot the required instruction time for each item of equipment and system as specified in individual Specification Sections.

3.7 PROTECTION

A. Protect installed Work and provide special protection where specified in individual Specification Sections.

B. Prohibit traffic from landscaped areas.

END OF SECTION 017000

SECTION 024100 – SITE DEMOLITION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 DESCRIPTION OF WORK

A. All labor, material and equipment necessary to complete all phases of demolition work as shown on the Drawings, as specified, and as can be reasonably implied from Drawings, Specifications, and field conditions.

B. Filling of depressions resulting from demolition activities with approved material as listed in Section 312300 - Earthwork and the geotechnical report.

C. Removal of pavement, sidewalks, curbing, site features, stairs, pads, conduits, utilities (water, gas, electric, telecommunications, sanitary, & storm), pipes, structures, etc.

D. Removal and disposal of all resulting demolition materials.

E. Leaving site clean and ready for clearing required to install new construction.

F. Maintaining driveways and walks during demolition and the cleaning of them of debris resulting from demolition.

G. Protecting site features that are to remain (including utilities, signs, and lighting).

H. Patching required because of demolition.

I. Securing and maintaining in force the required permits and the payment of associated fees.

J. Complying with all regulations for street and walk access and protection and fire access.

K. The Contractor shall follow all OSHA guidelines during site demolition.

1.3 RELATED WORK DESCRIBED ELSEWHERE

A. Section 312300 – Earthwork.

B. Section 312500 – Sedimentation and Erosion Controls.

1.4 QUALITY ASSSURANCE

A. Requirements of Regulatory Agencies:

1. State of Connecticut Basic Building Code
2. State of Connecticut Demolition Code
3. State of Connecticut Department of Health Services

4. State of Connecticut Department of Energy and Environmental Protection
5. Utility companies having jurisdiction
6. Town of East Hartford

1.5 JOB CONDITIONS

A. Traffic

1. State of Connecticut Basic Building Code
2. State of Connecticut Demolition Code
3. State of Connecticut Department of Health Services
4. State of Connecticut Department of Energy and Environmental Protection
5. Utility companies having jurisdiction
6. Town of East Hartford

B. If applicable, provide and maintain fire protection.

C. Promptly repair damages to adjacent facilities caused by demolition operations. Replace glass breakage immediately.

D. Maintain existing utilities not scheduled to be removed, keep in service, and protect against damage during demolition operations;

1. Repair and, if necessary, replace, services damaged as result of demolition.
2. Do not interrupt existing utilities if encountered serving occupied or used facilities, except when authorized in writing by authorities.
3. Provide temporary services during interruptions to existing utilities, as acceptable to the governing authorities.
4. The Contractor shall arrange for any utility shut-offs required and pay all fees. The Contractor shall disconnect and seal utilities before starting demolition operations. Construction related work required by the Utility Companies is included in this Contract. Do not start demolition work until utility disconnections have been completed and verified in writing.

E. Protection:

1. Erect barriers, fences, guard rails, enclosures, chutes, and shoring to protect personnel, structures, pavement, and utilities remaining intact.

PART 2 - PRODUCTS

2.1 NONE REQUIRED BY THIS SECTION.

PART 3 - EXECUTION

3.1 PREPARATION

A. Review all limits of fencing, sediment control and other construction barriers with Owner, and Engineer prior to installation.

B. Prior to demolition, removal, or abandonment of items within paved areas to remain, the Contractor shall saw cut the bituminous concrete pavement.

C. The Contractor shall obtain all necessary permits from agencies having jurisdiction.

3.2 DEMOLITION

A. Use water sprinkling, temporary enclosures, and other suitable methods to limit to the lowest practical level the amount of dust and dirt rising and scattering in the air;

1. Comply with governing regulations pertaining to environmental protection and pollution.
2. Do not use water when it may create hazardous or objectionable conditions, such as ice, flooding, and pollution.

B. Completely fill below-grade areas and voids resulting from demolition of structures and pavements.

1. Use satisfactory materials consisting of stone, gravel, and sand, free from debris, trash, materials, roots, and other organic matter outside of future structure footprints.
2. Use structural fill in areas within the footprint of a future structure.

C. Prior to placement of fill materials, ensure that areas to be filled are free of standing water, frost, frozen materials, roots and other organic matter.

D. Place fill materials in horizontal layers and compact each layer in conformance with Section 312300 – Earthwork.

1. After fill placement and compaction, grade surface to meet adjacent contours and to provide flow to surface drainage structures.
2. Where indicated on the Drawings demolish and remove foundation walls and retaining walls in its entirety which includes all footings.
3. Filling will be in conformance with Section 312300 - Earthwork and the geotechnical report requirements.

E. Saw cut bituminous pavement in the locations and depths indicated on the drawings.

3.3 DISPOSAL OF DEMOLISHED MATERIALS

A. Remove and dispose from the site all debris, rubbish, and other materials resulting from demolition operations;

1. Storing or burning of materials on the site will not be permitted.
2. Crushing existing asphalt, or concrete for reuse will be allowed and is subject to owner approval.

B. Transport materials of demolished structures and legally dispose of off-site in conformance with regulations of Department of Energy and Environmental Protection, and other regulating agencies as applicable.

C. Remove demolition debris daily.

D. Manner of disposal shall comply with all applicable local, state, and federal regulations.

END OF SECTION 024100

SECTION 033053 – SITE CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Form facing materials.
2. Steel reinforcement.
3. Reinforcement Accessories.
4. Concrete materials.
5. Admixtures.
6. Waterstops
7. Fabricating Reinforcement
8. Curing materials.
9. Related materials.
10. Concrete mixtures.
11. Concrete mixing.

B. Related Requirements:
1. Section 312300 - Earthwork: Drainage fill under slabs-on-grade.
2. Section 321313 – Concrete Paving: Concrete pavement and walks

1.2 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.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project Site

1.4 ACTION SUBMITTALS

A. Product Data:
1. Form facing materials.
2. Steel reinforcement.
3. Reinforcement Accessories
4. Concrete materials.
5. Admixtures.
6. Waterstops.
7. Fabricating reinforcement.
8. Curing materials.
9. Related materials.

10. Concrete mixtures.
11. Concrete mixing.

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.
3. Testing Agency: Include copies of applicable ACI certificates.

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 Architect/Engineer.

2. Reinforcing Steel Strip

    a. Include details of steel reinforcement placement including material, grade, bar schedules, stirrup spacing, bent bar diagrams, arrangement, and supports.

1.5 INFORMATIONAL SUBMITTALS

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

B. Field Quality-Control Reports: For Contractor-furnished tests and inspections.

1.6 CLOSEOUT SUBMITTALS

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

1.7 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing ready-mixed concrete specified in this Section that complies with ASTM C94/C94M requirements for production facilities and equipment.

1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."

B. Installer Qualifications: A qualified Installer employing Project personnel qualified as ACI-certified Flatwork Technician and Finisher and a supervisor certified as ACI Flatwork Concrete Finisher/Technician, or an ACI Concrete Flatwork Technician with experience installing and finishing concrete, and incorporating permeability-reducing admixtures.

1. Post-Installed Concrete Anchors Installers: ACI-certified Adhesive Anchor Installer.

C. Concrete Testing Service Qualifications: Employ and pay an independent testing laboratory, acceptable to the Owner, Architect/Engineer, and authorities having jurisdiction, to perform material evaluation tests and to review concrete mix designs proposed by Contractor to conform to this Specification.

D. Laboratory Testing Agency Qualifications: A testing agency qualified according to ASTM C1077 and ASTM E329 for testing indicated and employing an ACI-certified Concrete Quality Control Technical Manager.

1. Personnel performing laboratory tests are required to be ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician, Grade I. Testing agency laboratory supervisors are required to be ACI-certified Concrete Laboratory Testing Technician, Grade II.

E. Field Quality-Control Testing Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, qualified according to ASTM C1077 and ASTM E329 for testing indicated.

1. Personnel conducting field tests are required to be qualified as ACI Concrete Field-Testing Technician, Grade 1, according to ACI CPP 610.1 or an equivalent certification program.

F. Alkali-Silica Reactivity Testing: Aggregates used in the concrete shall be tested by an independent testing agency for alkali-silica reactivity according to ASTM C1260.

1.8 FIELD CONDITIONS

A. Cold-Weather Placement: Comply with ACI 301 (ACI 301M), ACI 306.1, and as follows:

1. Protect concrete Work from physical damage or reduced strength caused by frost, freezing actions, or low temperatures.
2. When average high and low temperature is expected to fall below 40 deg. F for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301 (ACI 301M).
3. Do not use frozen materials or materials containing ice or snow.
4. Do not place concrete in contact with surfaces less than 35 deg. F, other than reinforcing steel.
5. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.

B. Hot-Weather Placement: Comply with ACI 301 (ACI 301M) and ACI 305.1 (ACI 305.1M), and as follows:

1. Maintain concrete temperature at time of discharge not to exceed 95 deg. F
2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

1.9 DELIVERY, STORAGE AND HANDLING

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

B. Storage:

1. 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

2.1 PERFORMANCE REQUIREMENTS

A. Perform Work according to:

1. The State of Connecticut Department of Transportation standards.
2. The Town of East Hartford Department of Public Works standards.
3. The Metropolitan District (MDC) standards.

2.2 MANUFACTURERS

A. Acceptable Manufacturers as per approval of the Construction Manager.

B. Substitutions: Allowed only per Construction Manager.

C. Requests for substitutions will be considered in accordance with Division 01.

2.3 FORM-FACING MATERIALS

A. Smooth-Formed Finished Concrete; Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.
   1. Plywood, metal, or other approved panel materials.

B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two (2) edges and one (1) side for tight fit.

C. Forms for Cylindrical Columns, Pedestals, and Supports: Metal, glass-fiber-reinforced plastic, paper, or fiber tubes that will produce surfaces with gradual or abrupt irregularities not exceeding specified formwork surface class. Provide units with sufficient wall thickness to resist plastic concrete loads without detrimental deformation.

D. Pan-Type Forms: Glass-fiber-reinforced plastic or formed steel, stiffened to resist plastic concrete loads without detrimental deformation.

E. Void Forms: Biodegradable paper surface, treated for moisture resistance, structurally sufficient to support weight of plastic concrete and other superimposed loads.

F. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4-inch, minimum.

G. Rustication Strips: Wood, metal, PVC, or rubber strips, kerfed for ease of form removal.

H. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.
   1. Formulate form-release agent with rust inhibitor for steel form-facing materials.

I. Form Ties: Factory-fabricated, removable or snap-off metal or glass-fiber-reinforced plastic form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.
   1. Furnish units that will leave no corrodible metal closer than one (1) inch to the plane of exposed concrete surface.
   2. Furnish ties that, when removed, will leave holes no larger than one (1) inch in diameter in concrete surface.

2.4 STEEL REINFORCEMENT

A. Reinforcing Bars: ASTM A615, Grade 60, deformed.

B. Plain-Steel Wire: ASTM A82, as drawn.

C. Plain-Steel Welded Wire Fabric: ASTM A185, fabricated from as-drawn steel wire into flat sheets.

D. Deformed-Steel Welded Wire Fabric: ASTM A497, flat sheet.

2.5 REINFORCEMENT ACCESSORIES

A. Joint Dowel Bars: ASTM A615, Grade 60, plain-steel bars, cut true to length with ends square and free of burrs.

B. Bar Supports: Bolsters, chairs, spaces, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete in accordance with CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:
   1. For concrete surfaces exposed to view where legs of wire bar support contact forms, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless steel bar supports.

2.6 CONCRETE, GENERAL

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

2.7 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 I – Normal
      b. Type: Portland.
      c. Grey; with the following supplementary materials
         1) Fly Ash: ASTM C618, Class C.
         2) Ground Granulated Blast-Furnace Slag: ASTM C989, Grade 100 or 120.

   2. Normal Weight Aggregates:

a. Comply with ASTM C33/C33M coarse aggregate or better, uniformly graded, not exceeding 1-1/2-inch nominal size. Provide aggregates from a single source.

3. Lightweight Aggregate:

a. Comply with ASTM C330/C330M

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

2.8 ADMIXTURES

A. 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.

1. Air-Entraining Admixture: ASTM C260/C260M.
2. Water-Reducing Admixture: ASTM C494/C494M, Type A.
3. High-Range, Water-Reducing Admixture: ASTM C494/C494M, Type F.
4. High-Range, Water-Reducing and Retarding Admixture: ASTM C494/C494M, Type G.

B. Integral Color Pigment:

1. ASTM C979/C979M, synthetic mineral-oxide pigments, color stable, free of carbon black, nonfading, and resistant to lime and other alkalis.
2. Color: As selected by Architect/Engineer from manufacturer's full range.

2.9 WATERSTOPS

A. Flexible Rubber Waterstops: CE CRD-C 513, for embedding in concrete to prevent passage of fluids through joints. Factory fabricate corners, intersections, and direction changes.
1. Profile: Flat, dumbbell with center bulb.
2. Dimensions: 6-inches by 3/8-inch thick; non tapered.

2.10 FABRICATING REINFORCEMENT

A. Fabricate steel reinforcement in accordance with CRSI’s “Manual for Standard Practice.”

2.11 CURING MATERIALS

A. Film-Forming Evaporation Retarder:

1. Waterborne or VOC compliant, monomolecular film forming, manufactured for application to fresh concrete.

B. Moisture-Retaining Cover: ASTM C171, polyethylene film or white burlap-polyethylene sheet.

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

2.12 RELATED MATERIALS

A. Joint Devices and Filler:

1. Expansion and Isolation Joint-Filler Strips:

a. Comply with ASTM D1751.
b. Asphalt-saturated cellulosic fiber

B. Bonding Agent:

1. Comply with ASTM C1059.
2. Type II
3. Non-redispersible
4. Acrylic emulsion or styrene butadiene

C. Epoxy Bonding Agent:

1. Comply with ASTM C881
2. Two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade to suit requirements, and as follows:
   a. Types I and II, non-load bearing, for bonding hardened or freshly mixed concrete to hardened concrete

D. Reglets:
1. Fabricate reglets of not less than 0.0217-inch thick, galvanized steel sheet. Temporarily fill or cover face opening of reglet to prevent intrusion of concrete or debris.

E. Dovetail Anchor Slots
1. Hot-dip galvanized steel sheet, not less than 0.0336-inch thick, with bent tab anchors.
2. Temporarily fill or cover face opening of slots to prevent intrusion of concrete or debris.

2.13 CONCRETE MIXTURES

A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301 (ACI 301M).

1. Use a qualified testing agency for preparing and reporting proposed mixture designs, based on laboratory trial mixtures or field test data bases, as follows:
   a. Compressive Strength (28 Days): 4,400 psi min. unless otherwise noted.
   b. Slump: Five (5) inches.
      1) Slump Limit for Concrete Containing High-Range Water-Reducing Admixture: Not more than eight (8) inches after adding admixture to plant- or site-verified, 2- to 3-inch slump.

B. Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having an air content of 5.0 percent within a tolerance of plus 1.0 or minus 1.5 percent.

C. Synthetic Fiber: Uniformly disperse in concrete mix at manufacturer's recommended rate, but not less than 1.0 lb/cu yd.

2.14 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

3.1 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.

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

3.2 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 non shrink 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.

3.3 FORMWORK

A. Design, construct, erect, shore, brace, and maintain formwork according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.

B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.

C. Limit concrete surface irregularities, designated by ACI 347R as abrupt or gradual, as follows:
1. Class A, 1/8-inch for smooth-formed finished surfaces.
2. Class B, 1/4-inch for rough-formed finished surfaces.

D. Construct forms tight enough to prevent loss of concrete mortar.

E. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.

F. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.

G. Provide temporary openings for cleanouts and inspection ports where interior area or formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.

H. Chamfer exterior corners and edges of permanently exposed concrete.

I. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.

J. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.

K. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

L. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.4 EMBEDDED ITEMS

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

3.5 REMOVING AND REUSING FORMS

A. General: Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 degrees F for 24 hours after placing concrete, if concrete is hard enough to not be damaged by form-removal operations and curing and protection operations are maintained.

B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-release agent.

C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

3.6 SHORES AND RESHORES

A. Comply with ACI 318 and ACI 301 for design, installation, and removal of shoring and reshoring.

B. Plan sequence of removal of shores and reshore to avoid damage to concrete. Locate and provide adequate reshoring to support construction without excessive stress or deflection.

3.7 STEEL REINFORCEMENT

A. Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.
   1. Do not cut or puncture vapor barrier. Repair damage and reseal vapor barrier before placing concrete.

B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that would reduce bond to concrete.

C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.

D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

E. Install welded wire reinforcement in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.

3.8 JOINTS

A. Construct joints true to line with faces perpendicular to surface plane of concrete.

B. Construction Joints: Locate and install so as not to impair strength or appearance of concrete, at locations indicated or as approved by Architect.

C. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.
   1. Extend joint fillers full width and depth of joint, terminating flush with finished concrete surface, unless otherwise indicated.

D. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of the concrete thickness, as follows:

   1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint with groover tool to a radius of 1/8-inch. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover marks on concrete surfaces.

E. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt coat one-half of dowel length to prevent concrete bonding to one (1) side of joint.

3.9 WATERSTOPS

A. Flexible Waterstops: Install in construction joints and at other joints indicated to form a continuous diaphragm. Install in longest lengths practicable. Support and protect exposed waterstops during progress of the Work. Field fabricate joints in waterstops according to manufacturer's written instructions.

B. Self-Expanding Strip Waterstops: Install in construction joints and at other joints indicated, according to manufacturer's written instructions, adhesive bonding, mechanically fastening, and firmly pressing into place. Install in longest lengths practicable.

3.10 CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.

B. Comply with recommendations in ACI 304R for measuring, mixing, transporting, and placing concrete.

C. Do not add water to concrete during delivery, at project site, or during placement.

D. Consolidate concrete with mechanical vibrating equipment.

3.11 FINISHING FORMED SURFACES

A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defective areas repaired and patched, and fins and other projections exceeding 1/4-inch in height rubbed down or chipped off.
   1. Apply to concrete surfaces not exposed to public view.

B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defective areas. Completely remove fins and other projections.
   1. Apply to concrete surfaces exposed to public view or to be covered with a coating or covering material applied directly to concrete, such as waterproofing, dampproofing, veneer plaster, or painting.
   2. Apply smooth-rubbed finish, defined in ACI 301, to smooth-formed finished concrete.

C. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.

3.12 FINISHING UNFORMED SURFACES

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

B. Screed surfaces with a straightedge and strike off. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane before excess moisture or bleedwater appears on the surface.
   1. Do not further disturb surfaces before starting finishing operations.

C. Float Finish: Apply float finish to surfaces indicated, to surfaces to receive trowel finish, and to floor and slab surfaces to be covered with fluid-applied or sheet waterproofing, built-up or membrane roofing, or sand-bed terrazzo.

D. Trowel Finish: Apply a hard trowel finish to surfaces indicated and to floor and slab surfaces exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin film-finish coating system.

E. Non-slip Broom Finish: Apply a non-slip broom finish to surfaces indicated and to exterior concrete platforms, steps, and ramps. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route.

3.13 MISCELLANEOUS CONCRETE ITEMS

A. Fill in holes and openings left in concrete structures, unless otherwise indicated, after work of other trades is in place. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete the Work.

B. Equipment Bases and Foundations: Provide machine and equipment bases and foundations as indicated on Drawings. Set anchor bolts for machines and equipment at correct elevations, complying with diagrams or templates from manufacturer furnishing machines and equipment.

3.14 CONCRETE PROTECTION AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection, and follow recommendations in ACI 305R for hot-weather protection during curing.

B. Evaporation Retarder: Apply evaporation retarder to concrete surfaces if hot, dry, or windy conditions occur before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.

C. Begin curing after finishing concrete, but not before free water has disappeared from concrete surface.

D. Cure formed and unformed concrete for at least seven (7) days as follows:

1. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
2. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

3.15 JOINT FILLING

A. Prepare, clean, and install joint filler in accordance with manufacturer’s written instructions.

B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact surfaces of joint clean and dry.

C. Install semirigid joint filler full depth in saw-cut joints and at least two (2) inches deep in formed joints. Overfill joint and trim joint filler flush with top of joint after hardening.

3.16 CONCRETE SURFACE REPAIRS

A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect’s approval.

B. Patching Mortar: Mix dry-pack patching mortar, consisting of one (1) part Portland cement to 2-1/2 parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.

C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.

D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.

E. Perform structural repairs of concrete, subject to Architect’s approval, using epoxy adhesive and patching mortar.

F. Repair materials and installation not specified in this Article are subject to Architect’s approval.

3.17 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to sample materials, perform tests, and submit test reports during concrete placement. Tests will be performed according to ACI 301.

1. Testing Frequency: One composite sample for each day's pour of each concrete mix exceeding five (5) cu yd, but less than 25 cu yd, plus one set for each additional 50 cu yd or fraction thereof.

3.18 WASTE MANAGEMENT

A. Separate, reuse, and recycle waste materials in accordance with the Waste Management Plan and to the maximum extent economically feasible. Reuse form lumber on project for framing, blocking, etc.

B. Prior to concrete pours, designate locations or uses for excess concrete. Also designate a location for cleaning out concrete trucks.

C. Collect excess reinforcing steel and place in designated area for recycling.

END OF SECTION 033053

SECTION 101425 – TRAFFIC CONTROL SIGNAGE
PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

B. State of Connecticut Department of Transportation Standard Specifications for Roads, Bridges, Facilities and Incidental Construction Form 819.

1.2 SUMMARY

A. The work of this Section includes the following:

1. Traffic Control Signage.

1.3 REFERENCES

A. Form 819 - State of Connecticut Department of Transportation Standard Specification for Roads, Bridges, Facilities and Incidental Construction (2024).

B. D.O.T. Manual - U. S. Department of Transportation Manual on Uniform Traffic Control Devices for Streets and Highways, latest edition.

C. ASTM - American Society for Testing and Materials.

1.4 SUBMITTALS

A. Submit under provisions of Division 01 Section 'Submittal Procedures'.

1. Traffic Control Signage.

B. Product Data: For each product item indicated in this specification.

1.5 QUALITY ASSURANCE

A. Source of Materials:

1. Obtain materials of each type from same source for the entire project.
2. Manufacturer shall have minimum 5 years specializing in commercial quality products as Specified.

B. Product Installation: Work shall be carried out by a company with not less than 5 years of successful experience of similar application and installed at least 5 jobs of similar size and complexity.

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver products and materials in original unopened packages, containers, or bundles with manufacturer's label intact and legible.

B. Remove items delivered in broken, damaged, rusted, or unlabeled condition from project site immediately.

C. Handle and store so as to avoid damage.

PART 2 - PRODUCTS

2.1 SIGN PANELS

A. Sign Panel Material: Aluminum (thickness of 0.080 inches) with mounting holes and conforming to the Manual on Uniform Traffic Control Devices.

B. Traffic Control Sign Graphics: Sign lettering and graphics shall be provided in the sizes, colors, and letter styles as shown on the Drawings.

2.2 SIGN POSTS

A. U-Channel Sign Post

1. Galvanized hot-rolled, high-tensile-strength steel construction for strength

2. 3/8 in. diameter pre-drilled holes with 1 in. on center

B. Pipe Post

1. NPS 2″ Standard Weight Steel

PART 3 – EXECUTION

3.1 SIGNAGE

A. Set securely, plumb, and level at locations and elevations indicated on drawings.

B. Fasten securely with appropriate hardware.

C. Conform to state and local regulations.

D. The Contractor shall install a square tubular sleeve for all signs located in concrete or brick sidewalk. See attached detail sheet for dimensions. The contractor shall also place the sleeve to achieve the required angle

END OF SECTION 101425

SECTION 311000 – CLEARING AND GRUBBING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Removing surface debris.
2. Removing designated paving and curbs.
3. Removing designated trees, shrubs, and other plant life; removing stumps.
4. Removing abandoned utilities.
5. Excavating topsoil.
6. Disposal of materials.

B. Related Sections:
1. Section 312300 – Earthwork
2. Section 312500 – Sedimentation and Erosion Controls

PART 2 - PRODUCTS

2.1 NONE REQUIRED BY THIS SECTION

PART 3 - EXECUTION

3.1 EXAMINATION

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

B. Identify area for placing removed materials.

3.2 PREPARATION

A. Call Local Utility Line Information service, Call Before You Dig at 811 (800-922-4455) not less than three working days before performing Work.

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

3.3 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

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

3.4 CLEARING AND GRUBBING

A. Remove all rubbish and debris from within the Contract limits.

B. Remove trees, saplings, shrubs, bushes, vines, undergrowth, stumps, and roots from areas to be occupied by buildings, structures, roadways, parking lots, pipelines, and lawns.

C. The Owner's Representative will designate trees and other plants to remain. Protect those trees and plants from damage by erecting barricades, fences, or by other acceptable means. Prevent falling trees from damaging trees and plants designated to remain.

D. Protect areas outside the limits of clearing from damage by the clearing and grubbing operations.

3.5 STRIPPING AND STOCKPILING TOPSOIL

A. Strip topsoil from cleared areas. Do not mix topsoil with subsoil. Keep topsoil free of brush, trash, large stones, and other extraneous material.

B. Stockpile topsoil at areas on the site as directed by the Construction Manager. Protect the stockpiles of topsoil until used for lawns and other plantings under other Sections of these Specifications.

C. Any topsoil remaining after all work is in place shall become the property of the Contractor. The Contractor shall dispose of the topsoil off the site.

D. The Contractor shall supply additional topsoil at his expense if there is a shortage from stripping.

3.6 DISPOSAL OF MATERIAL

A. No burning will be allowed.

B. All rubbish, debris, logs, stumps, roots, cuttings, and other materials resulting from the clearing and grubbing operations shall become the property of the Contractor and shall be disposed of by him off the site. The manner of disposal shall comply with all applicable local, state, and federal regulations.

END OF SECTION 311000

SECTION 312300 – EARTHWORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

B. Wherever reference is made to the DOT Specifications, it shall mean the Connecticut Department of Transportation Standard Specifications for Roads, Bridges, Facilities and Incidental Construction Form 819, most recent edition, as modified by Supplemental Specifications issued by the Connecticut Department of Transportation.

1.2 SUMMARY

A. This section includes the following:

1. Backfilling excavations with specified materials in compacted lifts.
2. Preparing subgrades for slabs-on-grade, walks, pavements, lawns, and plantings.
3. Excavating and backfilling for buildings and structures.
4. Subbase and base course for concrete walks and pavements.
5. Excavating and backfilling trenches within building lines.
6. Excavating and backfilling trenches for buried mechanical and electrical utilities and pits for buried utility structures.

1.3 DEFINITIONS

A. Backfill: Suitable soil materials used to raise existing grades.

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

B. Base Course: Layer placed between the subbase course and asphalt paving or brick unit or bluestone paving.

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

D. Borrow: Suitable soil imported from off-site for use as fill or backfill as approved by geotechnical engineers.

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

1. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated dimensions without advice from Owner’s Geotechnical Engineer. Unauthorized excavation, as well as remedial work recommended by Owner’s Geotechnical Engineer, shall be without additional compensation.

F. Fill: Suitable soil materials, as determined by the Owner's Geotechnical Engineer, used to raise existing grades.

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

H. Subbase Course: Layer placed between the subgrade and base course for asphalt paving, or layer placed between the subgrade and a concrete pavement or walk.

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

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

1.4 SUBMITTALS

A. Product Data: For the following:

1. Each type of plastic warning tape.
2. Geotextiles.

B. Samples: For the following:

1. 30-lb samples, sealed in airtight containers, of each proposed soil material from on-site or borrow sources.

C. Material Test Reports: From a qualified testing agency indicating and interpreting test results for compliance of the following with requirements indicated:

1. Classification according to ASTM D2487 of each on-site or borrow soil material proposed for fill and backfill.
2. Laboratory compaction curve according to ASTM D1557 for each on-site or borrow soil material proposed for fill and backfill.

D. Temporary Excavation Support

1. Proposed method of temporary excavation support.
2. Design drawings showing the locations of excavation support and calculations. Excavation design shall be in accordance with all OSHA and other applicable regulatory agency requirements and sealed by a registered State of Connecticut Professional Engineer.
3. Certification of acceptable quality materials.

1.5 QUALITY ASSURANCE

A. Testing Agency: Independent testing agency qualified according to ASTM E329 to conduct soil materials and rock testing.

1.6 PROJECT CONDITIONS

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

1. Notify Owner not less than two days in advance of proposed utility interruptions.
2. Do not proceed with utility interruptions without Owner's written permission.
3. Contact utility-locator service for area where Project is located before excavating.
4. Demolish and completely remove from site existing underground utilities indicated to be removed. Coordinate with utility companies to shut off services if lines are active.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

A. General: Provide borrow soil materials consisting of suitable soil when sufficient suitable soils are not available from excavations.

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

C. Unsuitable Soils: ASTM D 2487 soil classification groups GC, SC, MH, CH, OL, OH, and PT, or a combination of these group symbols.

D. Unsuitable soils also include suitable soils not maintained by the General Contractor within 2 percent of optimum moisture content at time of compaction.

E. Backfill and Fill: Suitable soil that meets specification requirements.

F. Ordinary Fill: Suitable soil that can be placed and compacted.

G. Structural Fill: Suitable soil consisting of naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand, and free of all reclaimed aggregate; CTDOT Form 819, M.02.02, 1 – Bank or Crushed Gravel.

H. Reclaim Fill: Suitable soil consisting of artificially graded mixture of natural or crushed grave, crushed stone, and crushed reclaimed waste (i.e., asphalt, concrete); CTDOT Form 819, M.02.01, 3 – Reclaimed Miscellaneous Aggregate.

I. Crushed Stone: Suitable soil consisting of washed, narrowly graded mixture of crushed stone, or crushed gravel; CTDOT Form 819, M.01.02, Grading No 67.

J. Existing On-Site Soils: Considered suitable or unsuitable soils. Existing soils consist of the following:

1. Existing On-Site Fill – Suitable soil that can be reused as Ordinary Fill or Structural Fill depending on testing requirements and results.

2. Sand – Suitable soil that can be reused as Ordinary Fill or Structural Fill depending on testing requirements and results.
3. Clay – Unsuitable soil that can not be reused as Ordinary Fill or Structural Fill.

K. Separation Fabric: Non-woven geotextile, specifically manufactured for use as a separation geotextile; made from polyolefins, polyesters, or polyamides; and with the following minimum properties determined according to ASTM D4759 and referenced standard test methods:

1. Grab Tensile Strength: 120 lbf; ASTM D4632.
2. Tear Strength: 50 lbf; ASTM D4533.
3. Puncture Resistance: 310 lbf; ASTM D6241.
4. Water Flow Rate: 135 gpm per sq. ft.; ASTM D4491.
5. Apparent Opening Size: No. 70 U.S. standard sieve size; ASTM D4751.

L. ACCESSORIES

1. Detectable Warning Tape: Acid- and alkali-resistant polyethylene film warning tape manufactured for marking and identifying underground utilities, minimum 6 inches wide and 4 mils thick, continuously inscribed with a description of utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches deep; colored as follows:

a. Red: Electric.
b. Yellow: Gas, oil, steam, and dangerous materials.
c. Orange: Telephone and other communications.
d. Blue: Water systems.
e. Green: Sewer systems

PART 3 - EXECUTION

3.1 PREPARATION

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

B. Proofrolling subgrade areas shall not be conducted during wet weather to avoid the potential for creating more disturbance than improvement. If proofrolling must be conducted during wet weather, the specifications should require that materials disturbed by proofrolling be removed and replaced. Static proofrolling may be approved at the

C. discretion of the Engineer.

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

E. Protect subgrades and foundation soils against freezing temperatures or frost. Provide protective insulating materials as necessary. Remove and replace subgrade material and foundation soils that have frozen.

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

3.2 DEWATERING

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

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

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

3.3 EXCAVATION OF UNSUITABLE MATERIALS

A. Dispose of unsuitable soil, and rock, off site properly and replace with approved fill material as required to bring the site to final elevations. Contractor shall excavate all material deemed “unsuitable” by the Owner’s geotechnical engineer. In the case of any question or inconsistencies, the Owner’s geotechnical engineer’s determination of unsuitable soils shall be final.

B. All excavation is to be observed and monitored by the Owner’s Testing Agency. Any excavation performed by Contractor, which is not mon

C. itored by the Owner’s Testing Agency shall be at the Contractor’s expense.

3.4 EXCAVATION FOR STRUCTURES

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

3.5 EXCAVATION FOR WALKS AND PAVEMENTS

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

3.6 APPROVAL OF SUBGRADE

A. Notify Owner’s geotechnical engineer when excavations have reached required subgrade.

B. Soil subgrades are susceptible to disturbance and loss of strength due to construction equipment operating over the subgrade or other disturbance when the subgrade is wet or moist. All loose, saturated or disturbed materials that are unsuitable and shall be removed and replaced with compacted Structural Fill.

C. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Owner's geotechnical engineer.

3.7 UNAUTHORIZED EXCAVATION

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

1. Fill unauthorized excavations under other construction or utility pipe as directed by the Owner's geotechnical engineer.

3.8 STORAGE OF SOIL MATERIALS

A. Stockpile borrow materials and suitable excavated soil materials in areas approved by the Owner only. The site has limited areas for stockpiling. The Contractor shall be responsible for cost of any equipment and materials required for stockpiling efforts.

3.9 BACKFILL

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

1. Construction below finish grade including, where applicable, dampproofing, waterproofing, and perimeter insulation.
2. Surveying locations of underground utilities for record documents.
3. Inspecting and testing underground utilities.
4. Removing concrete formwork.
5. Removing trash and debris.
6. Removing temporary shoring and bracing, and sheeting.
7. Installing permanent or temporary horizontal bracing on horizontally supported walls.

3.10 FILL

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

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

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

1. Under grass and planted areas, use Ordinary Fill, or Reclaim.
2. Under walks and pavements, use Ordinary Fill or Reclaim, and base and subbase.
3. Under steps and ramps, use Ordinary Fill and Structural Fill.
4. Under building slabs, footings and foundations, use Crushed Stone and Separation Fabric, or Structural Fill.
5. Around perforated or slotted drainage pipe, use Crushed Stone around the drainage pipe and Drainage Fabric around the Crushed Stone.

D. Place fill and other materials as indicated on the drawings.

3.11 MOISTURE CONTROL

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

1. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice.
2. Remove and replace, or scarify and air-dry, otherwise suitable soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.

3.12 COMPACTION OF BACKFILLS AND FILLS

A. Place backfill and fill materials in layers not more than 12 inches in loose depth for material compacted by heavy compaction equipment, and not more than 6 inches in loose depth for material compacted by hand-operated tampers.

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

C. Compact soil to not less than the following percentages of maximum dry unit weight according to ASTM D1557.

1. Under structures, building slabs, steps and pavements, the compaction shall be a minimum of 95 percent of the maximum dry density.
2. Under walkways, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill material to a minimum of 90 percent of the maximum dry density.
3. Under lawn or unpaved areas, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill material to a minimum of 90 percent of the maximum dry density.
4. In sloped areas, step or bench the existing ground surface prior to placement of fill.

D. Existing on-site soils that are considered suitable soils have a low to high fines content and thus should be compacted according to the standard for Compaction of Backfills and Fills. Suitable soils with high fines content may be difficult to place and compact when wet and may need to be dried or amended with another material to achieve compaction. The Contractor is advised that achieving compaction can be difficult and time consuming, particularly during periods of cold or wet weather. The Contractor shall protect stockpiled materials from rain and shall protect placed and compacted fill from wet weather and disturbance from construction operations.

E. Fill placed at the edge of a slope shall be placed beyond the final slope limits and then cut back, to achieve the required compaction at the edge of the slope.

3.13 GRADING

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

1. Provide a smooth transition between adjacent existing grades and new grades.
2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.

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

1. Lawn or Unpaved Areas: Plus or minus 1 inch.
2. Walks: Plus or minus ½ inch.
3. Pavements: Plus or minus ½ inch.

C. Grading inside Building Lines: Finish subgrade to a tolerance of ½ inch when tested with a 10-foot straightedge.

3.14 SUBBASE AND BASE COURSES

A. Under pavements and walks, place subbase course on prepared subgrade and as follows:

1. Place base course material over subbase as specified.
2. Compact subbase and base courses at optimum moisture content to required grades, lines, cross sections, and thickness to not less than 95 percent of maximum dry unit weight according to ASTM D1557.
3. Shape subbase and base to required crown elevations and cross-slope grades.
4. When the thickness of compacted subbase or base course is 6 inches or less, place material in a single layer.
5. When the thickness of compacted subbase or base course exceeds 6 inches, place material in equal layers, with no layer more than 6 inches thick or less than 3 inches thick when compacted.

B. Pavement Shoulders: Place shoulders along edges of subbase and base course to prevent lateral movement. Construct shoulders, at least 60 inches wide, of Ordinary Fill and compact each layer of Ordinary Fill, subbase, and base layer to not less than 90 percent of maximum dry unit weight according to ASTM D1557.

3.15 FIELD QUALITY CONTROL

A. Owner’s Geotechnical Engineer or Testing Agency: Owner will engage a qualified Geotechnical Engineer or Testing Agency to perform laboratory and field quality control testing.

B. Allow Owner’s Geotechnical Engineer or Testing Agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earthwork only after test results for previously completed work comply with requirements.

C. Owner’s Geotechnical Engineer or Testing Agency will test in place dry density of soils according to ASTM D2922, as applicable. Tests will be performed at the following locations and frequencies:

1. Paved and Structure Areas: At subgrade and at each compacted fill and backfill layer, at least one test for every 2500 sq. ft. or less of paved area or building slab, but in no case fewer than three tests.

2. Trench Backfill: At each compacted initial and final backfill layer, at least one test for each 150 feet or less of trench length, but no fewer than two tests.

D. When Owner’s Geotechnical Engineer or Testing Agency reports that subgrades, fills, or backfills have not achieved the in place dry density specified, scarify and moisten or aerate, or remove and replace soil to depth required; recompact and retest until specified in place dry density is obtained.

3.16 PROTECTION

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

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

1. Scarify or remove and replace soil material to depth as directed by the Owner’s geotechnical engineer; reshape and recompact.

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

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

D. Protect areas with slopes exceeding 1 vertical: 2 horizontal with erosion-control fiber mesh and with erosion-control blankets installed and stapled according to manufacturer's written instructions.

E. Protect areas with slopes not exceeding 1 vertical: 2 horizontal by spreading straw mulch. Spread uniformly at a minimum rate of 2 tons/acre to form a continuous blanket 1-1/2 inches in loose depth over seeded areas. Spread by hand, blower, or other suitable equipment.

1. Anchor straw mulch by crimping into topsoil with suitable mechanical equipment.

3.17 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Disposal: Remove surplus suitable soil and waste material, including unsuitable soil, trash, and debris, and legally dispose of it off Owner's property.

1. Remove waste material including unsuitable soil, trash, and debris, and legally dispose of it off Owner’s property.

END OF SECTION 312300

SECTION 312319 - DEWATERING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

B. State of Connecticut Department of Transportation (CTDOT) Standard Specifications for Roads, Bridges, Facilities and Incidental Construction Form 819 (Form 819).

C. Metropolitan District Commission Project Manual, Section 02140, Dewatering and Drainage

1.2 SUMMARY

A. Section Includes:

1. Dewatering equipment.
2. Monitoring equipment.
3. Accessories.

B. Related Requirements:
1. Section 312300 - Earthwork for excavating, backfilling, site grading, and for site utilities.
2. Section 315000 - Excavation Support and Protection for shoring, bracing, and sheet piling of excavations.

1.3 DEFINITIONS

A. Dewatering:

1. The lowering of ground water table and intercepting horizontal water seepage to prevent ground water from entering excavations, trenches, tunnels, and shafts.
2. The reduction of piezometric pressure within strata to prevent failure or heaving of excavations, trenches, tunnels, and shafts.
3. The disposal of removed water.

B. Ground Water Observation Well: A screened or slotted pipe with solid riser pipe installed in a drilled hole with the annulus around the pipe backfilled with sand and bentonite fill. Near-surface ground water levels are measured in the well.

C. Piezometer: A tube inserted into a vessel or pipe to indicate the height (pressure) that a liquid can rise in the tube.

D. US EPA: United States Environmental Protection Agency.

1.4 COORDINATION

A. Coordinate Work of this Section to permit following construction operations to be completed on dry and stable substrate:

1. Earthwork operations as specified in Section 312300 - Earthwork
2. Trenching for utilities as specified in Section 312316- Trenching and Backfilling.

1.5 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project Site.

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

1. Verify availability of Installer's personnel, equipment, and facilities needed to perform dewatering Work.
2. Review Site to be dewatered, including coordination with temporary erosion-control measures and temporary controls and protections.
3. Review geotechnical report.
4. Review proposed Site clearing and excavations.
5. Review existing utility types, location, and subsurface conditions.
6. Review coordination for interruption, shutoff, capping, and continuation of utility services.
7. Review observation and monitoring of dewatering equipment.
8. Review sampling and testing requirements for discharge.
9. Review pretreatment requirements prior to discharge, discharge locations, and flow rate requirements.
10. Review construction schedule. Verify availability of Installer’s personnel, equipment, and facilities needed to make progress and avoid delays.

1.6 PERFORMANCE REQUIREMENTS

A. Dewatering Performance: Design, furnish, install, test, operate, monitor, and maintain dewatering system of sufficient scope, size, and capacity to control hydrostatic pressures and to lower, control, remove, and dispose of ground water and permit excavation and construction to proceed on dry, stable subgrades.

1. Delegated Design: Design dewatering system, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
2. Continuously monitor and maintain dewatering operations to ensure erosion control, stability of excavations and constructed slopes, that excavation does not flood, and that damage to subgrades and permanent structures is prevented.
3. Prevent surface water from entering excavations by grading, dikes, or other means.
4. Accomplish dewatering without damaging existing buildings, structures, and site improvements adjacent to excavation.
5. Remove dewatering system when no longer required for construction.

1.7 ACTION SUBMITTALS

A. Product Data:

1. Dewatering equipment.
2. Monitoring equipment.
3. Accessories.

B. Submit sizes, capacities, priming method, and engine motor characteristics for dewatering pumps.

C. Submit pumping equipment for control of surface water within excavation.

D. Ground water observation well construction details including casing type, filter gradation, screen interval, grout mix, drilling methods, and well depths.

E. Shop Drawings:

1. Indicate dewatering system layout, well depths, well screen lengths, dewatering pump locations, pipe sizes and capacities, grades, filter sand gradations, surface water control devices, valves, and water disposal method and location.
2. Indicate primary and standby power system location and capacity.
3. Indicate layout and depth of monitoring wells, piezometers, and flow measuring devices for system performance measurement.
4. Include detailed description of dewatering equipment and monitoring system installation procedures and maintenance of equipment.
5. Include description of emergency procedures to follow when problems arise.
6. Signed and sealed by the qualified professional engineer responsible for their preparation.

F. Delegated Design Submittals:

1. Submit signed and sealed Shop Drawings with design calculations, assumptions, and analysis data for dewatering equipment, monitoring equipment, and accessories.

1.8 INFORMATIONAL SUBMITTALS

A. Field Quality-Control Reports: For dewatering equipment, monitoring equipment, and accessories.

B. Reports:

1. Initial Installation Report:

a. Installation and development reports for well points and pumps.
b. Installation and baseline reports for monitoring of wells and piezometers.
c. Test reports of well water analysis.
d. Initial dewatering flow rates.

2. Weekly Monitoring Reports:

a. Dewatering flow rates.
b. Piezometer readings.
c. Test reports of discharge water analysis.
d. Maintenance records for dewatering equipment and surface water control system.
e. Measure depth to static water level in a well, piezometer, sounding tube, or any closed pipe.

C. Qualifications Statements: For Installer, land surveyor, and professional engineer.

1. Other Informational Submittals: Show existing conditions of adjoining construction and site improvements that might be misconstrued as damage caused by dewatering operations.

D. Photographs

1. Show existing conditions of adjoining construction and site improvements that might be misconstrued as damage caused by dewatering operations.

1.9 CLOSEOUT SUBMITTALS

A. Project Record Documents: Record actual locations of piping abandoned in place.

1.10 QUALITY ASSURANCE

A. Comply with authorities having jurisdiction for the following:

1. Drilling and abandoning of wells used for dewatering equipment.
2. Water discharge and disposal from pumping operations.

B. Manufacturer Qualifications: Company specializing in manufacturing products specified in this Section.

C. Installer Qualifications: Company specializing in performing Work of this Section.

1.11 PROJECT CONDITIONS

A. Interruption of Existing Utilities:

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

a. Notify Engineer no fewer than two days in advance of proposed interruption of utility.
b. Do not proceed with interruption of utility without Engineer's written permission.

B. Survey Work:

1. Engage a qualified land surveyor or professional engineer to survey adjacent existing buildings, structures, and site improvements, establishing exact elevations at fixed points to act as benchmarks. Clearly identify benchmarks and record existing elevations.

a. During dewatering, regularly resurvey benchmarks, maintaining an accurate log of surveyed elevations for comparison with original elevations. Promptly notify Architect if changes in elevations occur or if cracks, sags, or other damage is evident in adjacent construction.

1.12 FIELD CONDITIONS

A. Project-Site Information: A geotechnical report has been prepared for this Project and is available for information only. The opinions expressed in this report are those of a geotechnical engineer and represent interpretations of subsoil conditions, tests, and results of analyses conducted by a geotechnical engineer. Owner is not responsible for interpretations or conclusions drawn from this data.

B. Make additional test borings and conduct other exploratory operations necessary for dewatering according to the performance requirements.

C. The geotechnical report is referenced in Section 003132 – Geotechnical Data.

D. Survey Work: Engage a qualified land surveyor or professional engineer to survey adjacent existing buildings, structures, and site improvements; establish exact elevations at fixed points to act as benchmarks. Clearly identify benchmarks and record existing elevations.

PART 2 - PRODUCTS

2.1 NONE REQUIRED BY THIS SECTION.

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. Utility Service Locator:

1. Call Local Utility Line Information service, Call Before You Dig at 811 (800-922-4455) not less than three working days before performing Work.

a. Request that underground utilities be located and marked within and immediately surrounding construction areas.

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

3.2 PREPARATION

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

1. Prevent surface water and subsurface or ground water from entering excavations, from ponding on prepared subgrades, and from flooding Site or surrounding area.
2. Protect subgrades and foundation soils from softening and damage by rain or water accumulation.

B. Install dewatering equipment to ensure minimum interference with roads, streets, walks, and other adjacent occupied and used facilities.

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

C. Provide temporary grading to facilitate dewatering and control of surface water.

D. Protect and maintain temporary erosion and sedimentation controls, which are specified in Section 312500 - Sedimentation and Erosion Controls during dewatering operations.

3.3 INSTALLATION

A. Install dewatering system utilizing wells, well points, or similar methods complete with pump equipment, standby power and pumps, filter material gradation, valves, appurtenances, water disposal, and surface-water controls.

1. Space well points or wells at intervals required to provide sufficient dewatering.
2. Use filters or other means to prevent pumping of fine sands or silts from the subsurface.

B. Before excavating below ground-water level, place system into operation to lower water to specified levels. Operate system continuously until drains, sewers, and structures have been constructed and fill materials have been placed or until dewatering is no longer required.

C. Provide an adequate system to lower and control ground water to permit excavation, construction of structures, and placement of fill materials on dry subgrades. Install sufficient dewatering equipment to drain water-bearing strata above and below bottom of foundations, drains, sewers, and other excavations.

1. Do not permit open-sump pumping that leads to loss of fines, soil piping, subgrade softening, and slope instability.

D. Reduce hydrostatic head in water-bearing strata below subgrade elevations of foundations, drains, sewers, and other excavations.

1. Maintain piezometric water level a minimum of 24 inches below surface of excavation.

E. Dispose of water removed by dewatering in a manner that avoids endangering public health, property, and portions of work under construction or completed. Dispose of water and sediment in a manner that avoids inconvenience to others. Provide sumps, sedimentation tanks, and other flow-control devices as required by authorities having jurisdiction.

F. Provide standby equipment on site, installed and available for immediate operation, to maintain dewatering on a continuous basis if any part of system becomes inadequate or fails. If dewatering requirements are not satisfied due to inadequacy or failure of dewatering system, restore damaged structures and foundation soils at no additional expense to Owner.

1. Remove dewatering system from Project site on completion of dewatering. Plug or fill well holes with sand or cut off and cap wells a minimum of 36 inches below overlying construction.

G. Damages: Promptly repair damages to adjacent facilities caused by dewatering operations.

3.4 FIELD QUALITY CONTROL

A. Observation Wells: Provide, take measurements, and maintain at least the minimum number of observation wells or piezometers indicated; additional observation wells may be required by authorities having jurisdiction.

1. Observe and record daily elevation of ground water and piezometric water levels in observation wells.
2. Repair or replace, within 24 hours, observation wells that become inactive, damaged, or destroyed. In areas where observation wells are not functioning properly, suspend construction activities until reliable observations can be made. Add or remove water from observation-well risers to demonstrate that observation wells are functioning properly.
3. Fill observation wells, remove piezometers, and fill holes when dewatering is completed.

B. Provide continual observation to ensure that subsurface soils are not being removed by the dewatering operation.

3.5 PROTECTION

A. Protect monitoring well standpipes from damage by construction operations.

END OF SECTION 312319

SECTION 312333 – TRENCHING AND BACKFILLING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Excavating trenches for utilities from 5 feet outside building to utility service
2. Compacted fill from top of utility bedding to subgrade elevations.
3. Fill materials.
4. Trench shoring shields or boxes.
5. Temporary steel plates.
6. Geotextiles.
7. Backfilling and compaction.

B. Related Requirements:

1. Section 003132 – Geotechnical Data;
2. Section 312300 – Earthwork;
3. Section 312500 – Sedimentation and Erosion Controls;
4. Section 331000 – Water Utilities;
5. Section 333000 – Sanitary Sewerage Utilities;
6. Section 334000 – Storm Drainage Utilities;
7. Section 337000 – Electrical Utilities;
8. Section 338000 – Communication Utilities

1.3 DEFINITIONS

A. Excavator: Any entity including, but not limited to, a person, partnership, joint venture, trust, corporation, association, public utility, company, or state or local government body or public agency which performs excavation operations, including the excavation of trenches.

B. Trench: An excavation which is narrow in relation to its length and deeper than it is wide, made more than three feet below grade, with width no greater than 15 feet as measured from the bottom.

C. Trench Shoring: The methods and equipment, including shores and props, used to brace the walls of a trench during excavation work and to prevent the trench walls from collapsing into the trench. Also referred to as trench bracing or trench lining.

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

1.4 PREINSTALLATION MEETINGS

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

1.5 REFERENCES

A. American Society for Testing and Materials (ASTM):

1. ASTM C136 - Method for Sieve Analysis of Fine and Coarse Aggregates.

B. Wherever reference is made to the DOT Specifications, it shall mean the Connecticut Department of Transportation Standard Specifications for Roads, Bridges, Facilities and Incidental Construction, Form 819, as modified by Supplemental Specifications issued by the Connecticut Department of Transportation.

1.6 REGULATORY REQUIREMENTS

A. Call Local Utility Line Information service, Call Before You Dig at 811 (800-922-4455) not less than three working days before performing Work.

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

B. Comply with United States Department of Labor, Occupational Safety and Health Administration.

C. Construction Standards for Excavations, 29 CFR part 1926, subpart P.

D. Obtain required permits from authorities.

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

F. Comply with all applicable requirements of State and local authorities for trenching, backfilling and maintenance and protection of traffic within town streets.

1.7 SUBMITTALS

A. Product Data: Submit data for sheeting, shoring, trench shoring shields, and geotextile fabric indicating fabric and construction.

B. Samples:

1. Submit samples of filter cloth and warning tape for approval. Other samples and certificates of compliance may be requested.

C. Where sheeting and shoring is used, complete sheeting and shoring sketches and calculations shall be prepared by a Connecticut registered Professional Engineer and shall meet OSHA regulations.

1.8 QUALITY ASSURANCE

A. Manufacturers Qualifications: Company specializing in manufacturing products specified in this Section.

B. Installers Qualifications: Company specializing in performing Work of this Section.

1.9 PROTECTION OF UNDERGROUND FACILITIES

A. The Contractor will conduct an investigation to assure that no damage to existing structures, drainage lines, utilities, or conduits will occur.

B. The Contractor is required to use caution when encountering active or abandoned utility structures to avoid possibly disturbing or damaging asbestos-containing materials (ACM), which may be present. The Contractor will notify the Architect/Engineer of any suspected ACM encountered in Site utility structures and is responsible for arranging testing of the suspect material by polarized light microscopy (PLM) or other approved method before proceeding with any Work that would disturb the structures.

C. While the excavation is open, protect, support, or remove underground installations as necessary.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Perform Work according to:

1. The State of Connecticut Department of Transportation standards.
2. The Metropolitan District (MDC) Standards.
3. Town of East Hartford Public Works standards.
4. Eversource Energy standards.

2.2 CRUSHED STONE

A. Crushed stone of the size specified shall conform to the requirements of as specified in Section 312300 – Earthwork.

2.3 SAND

A. Conform to Section M.03.01-2 of the DOT Specifications.

2.4 GRANULAR FILL

A. Conform to Section M.02.01 of the DOT Specifications.

2.5 BACKFILL MATERIAL

A. Wherever reference is made on the Drawings or in the Specifications to suitable material, suitable backfill material, and suitable fill material, the material shall be mineral soil substantially free from organic materials, topsoil, wood, trash, and other objectionable materials which may be compressible or which cannot be properly compacted. It shall not contain rocks or lumps larger than six (6) inches in largest dimension, and not more than 15 percent of the rocks or lumps shall be larger than 2 1/2 inches in largest dimension. Further, it shall not contain granite blocks, broken concrete, masonry rubble, or other similar materials. It shall have physical properties such that it can be readily spread and compacted during filling. Snow, ice, and frozen soil will not be permitted. See Section 312300 – Earthwork.

2.6 GEOTEXTILE FILTER FABRIC

A. As specified in Section 312300 – Earthwork.

2.7 WARNING TAPE

A. As specified in Section 312300 – Earthwork.

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. Proceed with trench excavation only after unsatisfactory conditions have been corrected.

3.2 LINES AND GRADES

A. Lay pipes and conduit to lines and grades as 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.

C. Maintain grade alignment of pipe and conduit using string line parallel with grade line and vertically above centerline of pipe or conduit.

1. Establish string line on level batter boards at intervals of not more than 25 feet
2. Install batter boards spanning trench, rigidly anchored to posts driven into ground on both sides of trench.
3. Set three adjacent batter boards before laying pipe to verify grades and line.
4. Determine elevation and position of string line from elevation and position of offset points or stakes located along pipe or conduit route.

5. Do not locate pipe or conduit using side lines for line or grade.

3.3 PREPARATION

A. Call Local Utility Line Information service, Call Before You Dig at 811 (800-922-4455) not less than three working days before performing Work.

1. Request underground utilities to be located and marked within and surrounding construction areas.
2. If utilities are to remain in place, provide adequate means of protecting during trench excavation operations.
3. Should uncharted or incorrectly charted piping or other utilities be encountered during trench excavation, consult Architect/Engineer immediately for directions. Cooperate with Architect/Engineer and public utility service companies as required to keep their respective services and facilities in operation. Repair damaged utilities to the satisfaction of Architect/Engineer] and utility company.

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 benchmarks, 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.

3.4 TRENCHING

A. Excavate subsoil required for utility installation.

B. Excavate rock and unsuitable material as specified in Section 312300 – Earthwork.

C. Perform excavation within 24 inches of existing utility service according to utility's requirements.

D. Do not advance open trench more than 200 feet ahead of installed pipe or conduit.

E. Cut trenches sufficiently wide to enable installation and allow inspection. Remove water or materials that interfere with Work according to OSHA 29 CFR 1926.650.

F. Excavate bottom of trenches maximum 2 feet wider than outside diameter of pipe or conduit.

G. Excavate trenches to depth as indicated on Drawings. Provide uniform and continuous bearing and support for bedding material and pipe**,** conduit, and utilities.

H. Do not interfere with 45-degree bearing splay of trench or foundations.

I. When Project conditions permit, slope side walls of excavation starting 2 feet, top of pipe or conduit. When side walls cannot be sloped, provide sheeting and trench shoring shields to protect excavation as specified in this Section.

J. When subsurface materials at bottom of trench are loose or soft, notify Architect/Engineer and request instructions.

K. Cut out soft areas of subgrade not capable of compaction in place.

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

M. Correct areas over-excavated by error. Where trench excavation is inadvertently carried below proper elevations, fill with granular fill and compact to provide a firm and unyielding subgrade or foundation at no additional cost to the Owner.

N. Remove from Site excess subsoil not intended for reuse.

O. Remove subsoil from Site.

P. Stockpile excavated material in area designated on site and remove excess material not being used, from site.

Q. Keep excavations dry; Construction work to be installed "in the dry". Do not use pipe being constructed for trench drainage.

R. Grade top perimeter of excavation to prevent surface water from draining into trench. Do not obstruct surface drainage, but provide means whereby storm water is diverted into existing gutters, other surface drains, or temporary drains.

3.5 SHEETING, SHORING, AND TRENCH SHORING SHIELDS

A. Utilize sheeting, shoring, and trench shoring shields 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 5 feet deep excavated through unstable, loose, or soft material. Provide sheeting, shoring, bracing, trench shoring shields, or other protection to maintain stability of excavation.

C. When sheeting is used, drive it ahead of the excavation operations to avoid the loss of material from behind the sheeting. Fill voids that occur outside of the sheeting with gravel borrow, thoroughly compacted.

D. Assemble and place trench shoring shields according to manufacturer's written instructions.

E. Design sheeting and shoring to be left in place as part of the completed Work, cut off minimum 18 inches below finished grade.

F. Design sheeting and shoring to be removed at completion of excavation Work.

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

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

3.6 PIPE AND STRUCTURE BEDDING

A. Grade trench bottoms for pipes, manholes, catch basins, utility services, and other items to provide a smooth, firm, and stable foundation free from rock points.

B. Support pipe conduit during placement and compaction of bedding fill. Provide continuous bedding layer. Use of blocking not acceptable.

C. Pipes and structures shall be bedded and backfilled as detailed in the drawings.

3.7 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. Backfill in accordance with trench details.

D. Place and compact backfill materials in continuous layers not exceeding 8 inches compacted depth, compacted as shown on the drawings.

E. Employ placement and compaction methods that do not disturb or damage pipes, conduits or structures.

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

G. Do not leave more than 50 feet of trench open at end of working day.

H. Protect open trench to prevent danger to individuals.

3.8 TOLERANCES

A. Top Surface of Backfilling: Plus or minus one inch from required elevations.

END OF SECTION 312333

SECTION 312500 - SEDIMENTATION AND EROSION CONTROLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
   1. Stabilized construction entrances.
   2. Siltation control devices.
   3. Erosion control devices.

B. Related Requirements:
   1. Section 311000 – Clearing and Grubbing
   2. Section 312333 – Trenching and Backfilling

C. REFERENCES

   1. Wherever reference is made to the DOT Specifications, it shall mean the Connecticut Department of Transportation Standard Specifications for Roads, Bridges, Facilities, and Incidental Construction Form 819 as modified by Supplemental Specifications issued by the Connecticut Department of Transportation.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project Site.

1.4 ACTION SUBMITTALS

A. Product Data:
   1. Stabilized construction entrances.
   2. Siltation control devices.
   3. Erosion control devices.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Perform Work according to:

   1. The State of Connecticut Department of Transportation standards.

2. The Metropolitan District (MDC) Standards.
3. Town of East Hartford standards.

2.2 HAY BALES AND STAKES

A. Place hay bales at slopes, at catch basins, and at other locations as shown on the Drawings.

B. Embed hay bales to a depth of 6 inches.

C. Drive stakes through hay bales into ground to secure hay bales.

D. Place and stake hay bales at all locations as necessary to intercept and to filter overland stormwater flows before these flows enter streams or ponds.

E. Whenever pumping water from excavations, discharge the water such that it passes through hay bales before entering a storm drain or water body.

F. Remove accumulated sediment and replace bales when the sediment reaches 1/3 the height of the bale or directed by the Construction Manager.

G. Remove hay bales at completion of project unless the Construction Manager directs otherwise.

2.3 CONSTRUCTION AND MAINTENANCE OF SILT FENCES AND SILT SACKS

A. Construct silt fences as shown on the Drawings.

B. Construct silt fences in accordance with manufacturer's instructions as accepted by the Construction Manager.

C. Maintain or replace silt fences until they are no longer necessary or as ordered by the Construction Manager.

D. Remove silt fences at completion of project unless the Construction Manager directs otherwise.

E. Install catch basin silt sack protection as detailed on the drawings.

2.4 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 INSTALLATION OF STABILIZED CONSTRUCTION ENTRANCES

A. Construct entrance with minimum of 8 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 and 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.

3.3 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 Architect/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 Architect/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.

3.4 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 Architect/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 8 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.

3.5 INSTALLATION OF BALED HAY

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

3.6 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.

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

F. Installation of Sediment Trap:

1. Clear Site as specified in Section 311000 - Clearing and Grubbing.
2. Place coarse aggregate or rock at outlet as indicated on Drawings.

3.7 CONSTRUCTION OF EROSION CONTROL BLANKETS

A. Protect seeded areas with slopes exceeding 1V:3H or as indicated on the plans with erosion-control blankets installed and stapled according to manufacturer's written instructions.

3.8 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.

3.9 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 seven days minimum after finishing until 75 percent design strength of concrete has been achieved.

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

END OF SECTION 312500

SECTION 315000 - EXCAVATION SUPPORT AND PROTECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

B. State of Connecticut Department of Transportation (CTDOT) Standard Specifications for Roads, Bridges, Facilities and Incidental Construction Form 819 (Form 819).

1.2 SUMMARY

A. Section includes temporary excavation support and protection systems.

B. Related Sections:
   1. Section 31219 - Dewatering for dewatering system for excavations.

1.3 PERFORMANCE REQUIREMENTS

A. Design, furnish, install, monitor, and maintain excavation support and protection system capable of supporting excavation sidewalls and of resisting soil and hydrostatic pressure and superimposed and construction loads.

   1. Delegated Design: Design excavation support and protection system, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
   2. Prevent surface water from entering excavations by grading, dikes, or other means.
   3. Install excavation support and protection systems without damaging existing buildings, structures, and site improvements adjacent to excavation.
   4. Monitor vibrations, settlements, and movements.

1.4 SUBMITTALS

A. Shop Drawings: For excavation support and protection system.

B. Delegated-Design Submittal: For excavation support and protection system indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

C. Other Informational Submittals:

   1. Photographs: Show existing conditions of adjacent construction and site improvements that might be misconstrued as damage caused by the absence of, the installation of, or the performance of excavation support and protection systems. Submit before Work begins.

2. Record Drawings: Identifying and locating capped utilities and other subsurface structural, electrical, or mechanical conditions.

1.5 QUALITY ASSURANCE

A. Preinstallation Conference: Conduct conference at Project site.

1. Review methods and procedures related to excavation support and protection system including, but not limited to, the following:
   a. Existing utilities and subsurface conditions.
   b. Proposed excavations.
   c. Proposed equipment.
   d. Monitoring of excavation support and protection system.
   e. Working area location and stability.
   f. Coordination with waterproofing.
   g. Abandonment or removal of excavation support and protection system.

1.6 PROJECT CONDITIONS

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

1. Notify Owner no fewer than two days in advance of proposed interruption of utility.
2. Do not proceed with interruption of utility without Owner's written permission.

B. Survey Work: Engage a qualified land surveyor or professional engineer to survey adjacent existing buildings, structures, and site improvements; establish exact elevations at fixed points to act as benchmarks. Clearly identify benchmarks and record existing elevations.

1. During installation of excavation support and protection systems, regularly resurvey benchmarks, maintaining an accurate log of surveyed elevations and positions for comparison with original elevations and positions. Promptly notify Engineer if changes in elevations or positions occur or if cracks, sags, or other damage is evident in adjacent construction.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Provide materials that are either new or in serviceable condition.

B. Structural Steel: ASTM A 36/A 36M, ASTM A 690/A 690M, or ASTM A 992/A 992M.

C. Steel Sheet Piling: ASTM A 328/A 328M, ASTM A 572/A 572M, or ASTM A 690/A 690M; with continuous interlocks.

1. Corners: Site-fabricated mechanical interlock.

D. Wood Lagging: Lumber, mixed hardwood, nominal rough thickness of size and strength required for application.

E. Cast-in-Place Concrete: ACI 301, of compressive strength required for application.

F. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.

G. Tiebacks: Steel bars, ASTM A 722/A 722M.

H. Tiebacks: Steel strand, ASTM A 416/A 416M.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards that could develop during excavation support and protection system operations.

1. Shore, support, and protect utilities encountered.

B. Install excavation support and protection systems to ensure minimum interference with roads, streets, walks, and other adjacent occupied and used facilities.

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.
2. Vibratory driving hammers shall not be used unless specifically indicated on the plans, or authorized by the Engineer.

C. Locate excavation support and protection systems clear of permanent construction so that forming and finishing of concrete surfaces are not impeded.

D. Monitor excavation support and protection systems daily during excavation progress and for as long as excavation remains open. Promptly correct bulges, breakage, or other evidence of movement to ensure that excavation support and protection systems remain stable.

E. Promptly repair damages to adjacent facilities caused by installing excavation support and protection systems.

F. Backfilling of sheeted trenches/areas shall proceed by one of the following two methods:

1. Simultaneously with the withdrawal of sheeting and as each layer is compacted in accordance with other appropriate bid items.

2. The trench/area will be backfilled to the surface. If the sheeting is to be withdrawn, backfilling will proceed up to each set of rangers and braces; the rangers and braces will be removed; the backfilling will proceed up to the next set of rangers and braces, etc. up to the top of the excavation. The backfill material shall be compacted to 95% of the

maximum dry density as determined by AASHTO T-180-01, Method D. Alternate sections of sheeting from the left side and right side of the trench/area shall be removed and the cavity remaining therefrom shall be jetted thoroughly by high pressure water, starting at the top of the sheeting and being drawn to the surface. Sand shall be inserted with the jetting process. Where the bottom of the excavation is not free draining material (some areas of organic material or miscellaneous fill) or where granular backfill is not available or ordered by the Engineer, the jetting shall be very carefully done with a minimum amount of water being expended. In such locations, the contractor may request the approval of the Engineer for other compaction methods in the sheeting cavity. The Contractor shall remove the sheeting and/or stay bracing from the excavation except where it is specifically ordered by the Engineer or the Contractor may elect to leave in place the sheeting and/or stay bracing for his own convenience or to serve his own interest to protect existing facilities, the work built or to be built under this Contract, or for the safety of the public, etc., at no cost to the Owner, with the permission of the Engineer. No sheeting or bracing which is within two feet of the existing or proposed finished grade may be left-in-place without the prior permission of the Engineer. This may require that the Contractor cut off sheeting at this elevation and at no additional cost to the Owner. Where sheeting, regardless of the type of sheeting used, is left in place, as specified or ordered unless otherwise specifically permitted in writing by the Engineer, all elements such as rangers, braces, wales, etc. shall be left in place except as specified hereinbefore; and, except such temporary braces required to be removed to make way for the structure/utility. Where it is necessary to remove such temporary braces, the sheeting shall be re-braced but in no case shall the sheeting be braced against the sides of the structure/utility. Where lagging and “soldier” beams are used, the “soldier” beams and all the braces shall also be left in place. Where wood sheeting has been driven below the excavation bottom to provide for a “toe-in”, no wood sheeting below the top of pipe or structure shall be removed but cut off at this elevation and the remaining sheeting above this line removed as described herein. There will be no payment made for this work or for the wood sheeting left-in-place. Sheeting shall be cut away and removed from in front of capped outlets or other branches or inlets set in the pipe for future connections. All sheeting, shoring and bracing removed shall be carefully removed from the excavation in such a manner as not to endanger the completed work or any adjacent pavements, buildings, structures, utilities, property, etc. The sheeting shall be withdrawn to such an extent that it is just above the backfill material being compacted and all voids left or caused by the withdrawal of such sheeting, shall be immediately refilled with approved material and compacted at no additional cost. Where the excavation is to be left open during non-working hours, the sheeting shall extend a minimum 42 inches above existing grade to protect pedestrian and vehicular traffic from the open excavation. If ordered by the engineer, barricades and warning lights will be used to supplement protection.

3.2 SOLDIER PILES AND LAGGING

A. Install steel soldier piles before starting excavation. Extend soldier piles below excavation grade level to depths adequate to prevent lateral movement. Space soldier piles at regular intervals not to exceed allowable flexural strength of wood lagging. Accurately align exposed faces of flanges to vary not more than 2 inches from a horizontal line and not more than 1:120 out of vertical alignment.

B. Install wood lagging within flanges of soldier piles as excavation proceeds. Trim excavation as required to install lagging. Fill voids behind lagging with soil, and compact.

C. Install wales horizontally at locations indicated on Drawings and secure to soldier piles.

3.3 SHEET PILING

A. Before starting excavation, install one-piece sheet piling lengths and tightly interlock to form a continuous barrier. Accurately place the piling, using templates and guide frames unless otherwise recommended in writing by the sheet piling manufacturer. Limit vertical offset of adjacent sheet piling to 60 inches. Accurately align exposed faces of sheet piling to vary not more than 2 inches from a horizontal line and not more than 1:120 out of vertical alignment. Cut tops of sheet piling to uniform elevation at top of excavation.

3.4 TIEBACKS

A. Tiebacks: Drill, install, grout, and tension tiebacks. Test load-carrying capacity of each tieback and replace and retest deficient tiebacks.

1. Test loading shall be observed by a qualified professional engineer responsible for design of excavation support and protection system.
2. Maintain tiebacks in place until permanent construction is able to withstand lateral soil and hydrostatic pressures.

3.5 BRACING

A. Bracing: Locate bracing to clear columns, floor framing construction, and other permanent work. If necessary to move brace, install new bracing before removing original brace.

1. Do not place bracing where it will be cast into or included in permanent concrete work unless otherwise approved by Architect.
2. Install internal bracing, if required, to prevent spreading or distortion of braced frames.
3. Maintain bracing until structural elements are supported by other bracing or until permanent construction is able to withstand lateral earth and hydrostatic pressures.

3.6 REMOVAL AND REPAIRS

A. Remove excavation support and protection systems when construction has progressed sufficiently to support excavation and bear soil and hydrostatic pressures. Remove in stages to avoid disturbing underlying soils or damaging structures, pavements, facilities, and utilities.

1. Remove excavation support and protection systems to a minimum depth of 48 inches below overlaying construction and abandon remainder.
2. Fill voids immediately with approved backfill compacted to density specified in Section 312300 - Earthwork.
3. Repair or replace, as approved by Architect/Engineer, adjacent work damaged or displaced by removing excavation support and protection systems.

END OF SECTION 315000

SECTION 321216 - ASPHALT PAVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. 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 Sections:

1. Section 312300 – Earthwork;
2. Section 312500 – Sedimentation and Erosion Controls;
3. Section 334000 – Storm Drainage Utilities.

1.3 REFERENCE STANDARDS

A. American Association of State Highway and Transportation Officials:

1. AASHTO M17 - Standard Specification for Mineral Filler for Bituminous Paving Mixtures.
2. AASHTO M29 - Standard Specification for Fine Aggregate for Bituminous Paving Mixtures.
3. AASHTO M140 - Standard Specification for Emulsified Asphalt.
4. AASHTO M208 - Standard Specification for Cationic Emulsified Asphalt.
5. AASHTO M288 - Standard Specification for Geotextile Specification for Highway Applications.
6. AASHTO M320 - Standard Specification for Performance-Graded Asphalt Binder.
7. AASHTO M324 - Standard Specification for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements.
8. AASHTO MP1a - Standard Specification for Performance-Graded Asphalt Binder.

B. 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.
3. AI SP-2 - Superpave Mix Design.

C. ASTM International:

1. ASTM C1371[**-2004a**] - Standard Test Method for Determination of Emittance of Materials Near Room Temperature Using Portable Emissometers.
2. ASTM C1549[**-2004**] - Standard Test Method for Determination of Solar Reflectance Near Ambient Temperature Using a Portable Solar Reflectometer.
3. ASTM D242 - Standard Specification for Mineral Filler For Bituminous Paving Mixtures.
4. ASTM D692 - Standard Specification for Coarse Aggregate for Bituminous Paving Mixtures.
5. ASTM D946 - Standard Specification for Penetration-Graded Asphalt Cement for Use in Pavement Construction.
6. ASTM D977 - Standard Specification for Emulsified Asphalt.
7. ASTM D1073 - Standard Specification for Fine Aggregate for Bituminous Paving Mixtures.
8. ASTM D1188 - Standard Test Method for Bulk Specific Gravity and Density of Compacted Bituminous Mixtures Using Coated Samples
9. ASTM D2027 - Standard Specification for Cutback Asphalt (Medium-Curing Type).
10. ASTM D2397 - Standard Specification for Cationic Emulsified Asphalt.
11. ASTM D2726 - Standard Test Method for Bulk Specific Gravity and Density of Non-Absorptive Compacted Bituminous Mixtures.
12. ASTM D2950 - Standard Test Method for Density of Bituminous Concrete in Place by Nuclear Methods.
13. ASTM D3381 - Standard Specification for Viscosity-Graded Asphalt Cement for Use in Pavement Construction.
14. ASTM D3515 - Standard Specification for Hot-Mixed, Hot-Laid Bituminous Paving Mixtures.
15. ASTM D3549 - Standard Test Method for Thickness or Height of Compacted Bituminous Paving Mixture Specimens.
16. ASTM D3910 - Standard Practices for Design, Testing, and Construction of Slurry Seal.
17. ASTM D6690 - Standard Specification for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements.
18. ASTM E408[**-1971(1996)e1**] - Standard Test Methods for Total Normal Emittance of Surfaces Using Inspection-Meter Techniques.
19. ASTM E903[**-1996**] - Standard Test Method for Solar Absorptance, Reflectance, and Transmittance of Materials Using Integrating Spheres.
20. ASTM E1918[**-1997**] - Standard Test Method for Measuring Solar Reflectance of Horizontal and Low-Sloped Surfaces in the Field.
21. ASTM E1980[**-2001**] - Standard Practice for Calculating Solar Reflectance Index of Horizontal and Low-Sloped Opaque Surfaces.

D. Wherever reference is made to the DOT specifications, it shall mean the Connecticut Department of Transportation Standard Specifications for Roads, Bridges, Facilities and Incidental Construction Form 819 as modified by Supplemental Specifications issued by the Connecticut Department of Transportation.

1.4 SUBMITTALS

A. Section 013300 - 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.

1.5 QUALIFICATIONS

A. Qualifications of Workmen

1. Provide at least one person who shall be thoroughly trained and experienced in the skills required, who shall be completely familiar with the design and application of work described for this Section, and who shall be present at all times during progress of the work of this Section and shall direct all work performed under this Section.
2. For actual finishing of bituminous concrete surfaces and operation of the required equipment, use only personnel who are thoroughly trained and experienced in the skills required.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Subbase shall conform to the requirements of Article M.02.02, DOT Specifications.

B. Base: Processed aggregate for the base shall conform to the requirements of Article M.05.01, DOT Specifications. Coarse Aggregate shall be broken stone conforming to the requirements of Article M.05.01-2 (b).

C. Pavement Materials:

1. Bituminous concrete mixtures conforming to the requirements of Section M.04 of the DOT Specifications.
2. In Section M.04, reference is made to the Chief, Materials Testing Section, to the Materials Testing Section, and to the Laboratory; none will be involved in this work. Do the work of the Chief, the Section, and the Laboratory; or arrange for the producer of the bituminous concrete to do this work. Make the determinations, verifications, rejections, approvals, tests, and inspections as specified by Section M.04 and as necessary to produce satisfactory bituminous mixtures.

D. Tack Coat: Section M.04 of the DOT Specifications.

E. Joint Sealer: A rubber compound of the hot-poured type conforming to the requirements of Section M.04 of the DOT Specifications.

F. Paint: Shall conform to Section M.07.21 of the DOT Specifications for Hot Applied Waterborne Pavement Marking Paint.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Section 017000 - 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, granular, stabilized soil**,** 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 312300 - Earthwork.

D. Verify gradients and elevations of base are correct.

E. Verify gutter drainage grilles and frames, manhole frames and are installed in correct position and elevation.

F. Do not proceed until unsatisfactory conditions have been corrected.

3.2 FINAL PREPORATION OF SUBGRADE

A. After preparation of subgrade as specified in Section 312300 – Earthwork of these Specifications, thoroughly scarify and sprinkle the entire area to be paved, and then compact by rolling to a smooth, hard, even surface of 95 percent of modified optimum density to receive subbase. Finish to the required grades, with due allowance for the thickness of bituminous concrete courses to be placed thereon.

B. Equipment: Compact by rolling with a 15-Ton vibratory roller.

3.3 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.

3.4 CONSTRUCTION OF SUBBASE AND BASE COURSE

A. After subgrade has been completed and accepted by the Engineer, construct the subbase and base over all areas to be paved.

B. Construct subbase in accordance with the requirements of Article 2.12.03 of the DOT Specifications, however compact with four passes of a 15-Ton (static weight) roller.

C. Construct base in accordance with the applicable requirements of Article 3.04.03 of the DOT Specifications. Compact to at least 98 percent of modified optimum density.

3.5 CONSTRUCTION OF BITUMINOUS CONCRETE PAVEMENT

A. Construct pavement in courses as called for on the Drawings. Use a class of bituminous concrete for each course as indicated on the Drawings. Thickness of each course: As shown on the Drawings.

B. Construct the bituminous concrete pavement in accordance with Article 4.06.03 of the DOT Specifications, except as modified below:

1. Article 4.06.03-1 Samples: Samples will not be taken by Materials Testing Section. Arrange for the producing plant to take its own samples to ascertain that mixtures are proper. Provide certifications. The Contractor will have the ultimate responsibility.
2. Article 4.06.03-2 Mixing Plant Inspection:

    a. Inspections, verifications, determinations, and approvals at the mixing plants will not be made by the Chief, Materials Testing Section. The Contractor will be responsible for mixtures and shall take whatever steps are required to ensure production of satisfactory mixtures. He shall certify that mixtures do meet specifications.
    b. Weights of completed mixtures will not be required.

C. Certifications: Furnish certified test reports, material certificates, and certificates of compliance in accordance with the requirements of Article 1.06.07 of the DOT Specifications.

3.6 APPLICATION OF PAINTED PAVEMENT MARKINGS AND LEGENDS

A. The contractor shall furnish a technical advisor, who shall be fully knowledgeable of all equipment operations and application techniques, to oversee the project operation.

B. Pavement markings shall be applied in accordance with the details shown on the Drawings, in accordance with Section 12.09 of the DOT Specifications and as directed by the Engineer.

C. The road surface shall be cleaned to the satisfaction of the Engineer just prior to application. Pavement cleaning shall consist of at least brushing with a rotary broom (non-metallic), and additionally as recommended by the material manufacturer and acceptable to the Architect.

D. The painted pavement markings application shall immediately follow the pavement cleaning. Operations shall be conducted only when the pavement surface temperatures are 50°F or greater.

E. After application the paint shall be protected from crossing vehicles and pedestrians for a time at least equivalent to the drying time of the paint.

F. The contractor shall place necessary “spotting” at appropriate points to provide horizontal control for striping and to determine necessary starting and cutoff points. Longitudinal joints, pavement edge and existing markings shall serve as horizontal control when so directed.

3.7 PROTECTION

A. Protect from traffic during all operations.

3.8 FINISH TOLERANCES

A. Finish surfaces to the following tolerances.

1. Subbase and Base: Plus 0.10 feet to minus 0.10 feet from line and grade shown on the Drawings.
2. Bituminous Concrete Surface Course: Plus or minus 0.05 feet at any point from line and grade shown on the Drawings. No variations in surface more than 1/8 inch in a 10-foot plane.

END OF SECTION 321216

SECTION 321313 - CONCRETE PAVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
   1. Concrete paving for:
      a. Concrete sidewalks.
      b. Concrete utility pads.
      c. Concrete dumpster pads.
      d. Concrete bike rack pads.

B. Related Requirements:
   1. Section 312300 – Earthwork.
   2. Section 321216 – Asphalt Paving.

1.3 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 A184/A184M - Standard Specification for Fabricated Deformed Steel Bar Mats for Concrete Reinforcement.
   2. ASTM A185/A185M - Standard Specification for Steel Welded Wire Fabric, Plain, for Concrete Reinforcement.
   3. ASTM A497/A497M - Standard Specification for Steel Welded Wire Fabric, Deformed, for Concrete Reinforcement.
   4. ASTM A615/A615M - Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
   5. ASTM A706/A706M - Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement.

6. ASTM A767/A767M - Standard Specification for Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement.
7. ASTM A775/A775M - S Standard Specification for Epoxy-Coated Steel Reinforcing Bars.
8. ASTM A884/A884M - Standard Specification for Epoxy-Coated Steel Wire and Welded Wire Reinforcement.
9. ASTM A934/A934M - Standard Specification for Epoxy-Coated Prefabricated Steel Reinforcing Bars.
10. ASTM C31/C31M - Standard Practice for Making and Curing Concrete Test Specimens in the Field.
11. ASTM C33 - Standard Specification for Concrete Aggregates.
12. ASTM C39/C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
13. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete.
14. ASTM C143/C143M - Standard Test Method for Slump of Hydraulic Cement Concrete.
15. ASTM C150 - Standard Specification for Portland Cement.
16. ASTM C172 - 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 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.
19. ASTM C260 - 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 - Standard Specification for Blended Hydraulic Cements.
23. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete.
24. ASTM C979 - Standard Specification for Pigments for Integrally Colored Concrete.
25. ASTM C989 - Standard Specification for Ground Granulated Blast-Furnace Slag for Use in Concrete and Mortars.
26. ASTM C1017/C1017M - Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete.
27. ASTM C1064/C1064M - Standard Test Method for Temperature of Freshly Mixed Hydraulic-Cement Concrete.
28. ASTM C1116 - Standard Specification for Fiber-Reinforced Concrete and Shotcrete.
29. ASTM C1315 - Standard Specification for Liquid Membrane-Forming Compounds Having Special Properties for Curing and Sealing Concrete.
30. ASTM C1371[**-2004a**] - Standard Test Method for Determination of Emittance of Materials Near Room Temperature Using Portable Emissometers.
31. ASTM C1549[**-2004**] - Standard Test Method for Determination of Solar Reflectance Near Ambient Temperature Using a Portable Solar Reflectometer.
32. ASTM D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).
33. ASTM D1752 - Standard Specification for Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction.
34. ASTM D6690 - Standard Specification for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements.
35. ASTM E408[**-1971(1996)e1**] - Standard Test Methods for Total Normal Emittance of Surfaces Using Inspection-Meter Techniques.

36. ASTM E903[**-1996**] - Standard Test Method for Solar Absorptance, Reflectance, and Transmittance of Materials Using Integrating Spheres.
37. ASTM E1918[**-1997**] - Standard Test Method for Measuring Solar Reflectance of Horizontal and Low-Sloped Surfaces in the Field.
38. ASTM E1980[**-2001**] - Standard Practice for Calculating Solar Reflectance Index of Horizontal and Low-Sloped Opaque Surfaces.

1.4 PRE-INSTALLATION MEETINGS

A. Section 013000 - Administrative Requirements: Pre-installation meeting.

B. Preinstallation Conference: Conduct conference at Project Site**.**

1.5 SUBMITTALS

A. Section 013300 - Submittal Procedures: Requirements for submittals.

B. Product Data:

1. Submit data on concrete materials, including; joint filler, admixtures.

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.

D. Source Quality Control Submittals: Indicate results of, shop/factory tests and inspections.

1.6 QUALITY ASSURANCE

A. Perform Work according to ACI 301.

B. Obtain cementitious materials from same source throughout.

1.7 QUALITY ASSURANCE

A. Qualifications of Workmen

1. Provide at least one person who shall be thoroughly trained and experienced in the skills required, who shall be completely familiar with the design and application of work described for this Section, and who shall be present at all times during progress of the work of this Section and shall direct all work performed under this Section.

2. For actual finishing of concrete surfaces and operation of the required equipment, use only personnel who are thoroughly trained and experienced in the skills required.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Concrete: Article M.03.01, DOT Specifications. Class: As indicated on the Drawings.

B. Air Entraining Portland Cement and Air Entraining Admixture: Article M.03.01, DOT Specifications.

C. Reinforcement: Welded Steel Wire Fabric or Rebar: Article M. 06.01, DOT Specifications. Size: As indicated on the Drawings.

D. Granular for Base: DOT Specifications per size and type shown on the Drawings.

E. Expansion Joint Filler: For installation at expansion joints: Bituminous cellular type, AASHTO M213.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Section 017000 - Execution and Closeout Requirements: Requirements for installation examination.

B. Verify compacted subgrade**,** granular**,** stabilized soil, 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 312300 – Earthwork.

C. Verify gradients and elevations of base are correct.

3.2 PREPARATION

A. Section 017000 - 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.

3.3 CONSTRUCTION METHODS

A. Conform to the requirements of Article 9.21.03 of the DOT Specifications.

B. Install expansion joint filler at expansion joints located as shown on the Drawings.

END OF SECTION 321313

SECTION 32 13 73 - CONCRETE PAVING JOINT SEALANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

B. State of Connecticut Department of Transportation (CTDOT) Standard Specifications for Roads, Bridges, Facilities and Incidental Construction (Form 819).

1.2 SUMMARY

A. Section Includes:

1. Cold-applied joint sealants.
2. Hot-applied joint sealants.

B. Related Sections:

1. Section 321216 – Asphalt Paving
2. Section 321313 – Concrete Paving

1.3 PRECONSTRUCTION TESTING

A. Preconstruction Compatibility and Adhesion Testing: Submit to joint-sealant manufacturers, for testing indicated below, Samples of materials that will contact or affect joint sealants.

1. Use manufacturer's standard test method to determine whether priming and other specific joint-preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.
2. Submit no fewer than eight pieces of each type of material, including joint substrates, shims, joint-sealant backings, secondary seals, and miscellaneous materials.
3. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
4. For materials failing tests, obtain joint-sealant manufacturer's written instructions for corrective measures including use of specially formulated primers.
5. Testing will not be required if joint-sealant manufacturers submit joint-preparation data that are based on previous testing, not older than 24 months, of sealant products for compatibility with and adhesion to joint substrates and other materials matching those submitted.

1.4 SUBMITTALS

A. Product Data: For each joint-sealant product indicated.

B. Samples for Verification: For each kind and color of joint sealant required, provide Samples with joint sealants in 1/2-inch-wide joints formed between two 6-inch-long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.

C. Pavement-Joint-Sealant Schedule: Include the following information:

1. Joint-sealant application, joint location, and designation.
2. Joint-sealant manufacturer and product name.
3. Joint-sealant formulation.
4. Joint-sealant color.

D. Qualification Data: For qualified Installer.

E. Product Certificates: For each type of joint sealant and accessory, from manufacturer.

F. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for joint sealants.

G. Preconstruction Compatibility and Adhesion Test Reports: From joint-sealant manufacturer, indicating the following:

1. Materials forming joint substrates and joint-sealant backings have been tested for compatibility with and adhesion to joint sealants.
2. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.

1.5 QUALITY ASSURANCE

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

B. Source Limitations: Obtain each type of joint sealant from single source from single manufacturer.

C. Product Testing: Test joint sealants using a qualified testing agency.

1. Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated.

D. Preinstallation Conference: Conduct conference at Project site.

1.6 PROJECT CONDITIONS

A. Do not proceed with installation of joint sealants under the following conditions:

1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F.
2. When joint substrates are wet.
3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.

4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Compatibility: Provide joint sealants, backing materials, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer based on testing and field experience.

B. Colors of Exposed Joint Sealants: Match color of adjacent pavement.

2.2 COLD-APPLIED JOINT SEALANTS

A. Single-Component, Self-Leveling, Silicone Joint Sealant for Concrete: ASTM D 5893, Type SL.

2.3 HOT-APPLIED JOINT SEALANTS

A. Hot-Applied, Single-Component Joint Sealant for Concrete and Asphalt: ASTM D 6690, Types I, II, and III.

2.4 JOINT-SEALANT BACKER MATERIALS

A. General: Provide joint-sealant backer materials that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by joint-sealant manufacturer based on field experience and laboratory testing.

B. Round Backer Rods for Cold- and Hot-Applied Joint Sealants: ASTM D 5249, Type 1, of diameter and density required to control sealant depth and prevent bottom-side adhesion of sealant.

C. Round Backer Rods for Cold-Applied Joint Sealants: ASTM D 5249, Type 3, of diameter and density required to control joint-sealant depth and prevent bottom-side adhesion of sealant.

D. Backer Strips for Cold- and Hot-Applied Joint Sealants: ASTM D 5249; Type 2; of thickness and width required to control joint-sealant depth, prevent bottom-side adhesion of sealant, and fill remainder of joint opening under sealant.

2.5 PRIMERS

A. Primers: Product recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.

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

3.2 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions.

B. Joint Priming: Prime joint substrates where indicated or where recommended in writing by joint-sealant manufacturer, based on preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

3.3 INSTALLATION OF JOINT SEALANTS

A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated unless more stringent requirements apply.

B. Joint-Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

C. Install joint-sealant backings of kind indicated to support joint sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.

1. Do not leave gaps between ends of joint-sealant backings.
2. Do not stretch, twist, puncture, or tear joint-sealant backings.
3. Remove absorbent joint-sealant backings that have become wet before sealant application and replace them with dry materials.

D. Install joint sealants using proven techniques that comply with the following and at the same time backings are installed:

1. Place joint sealants so they directly contact and fully wet joint substrates.
2. Completely fill recesses in each joint configuration.
3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

E. Tooling of Nonsag Joint Sealants: Immediately after joint-sealant application and before skinning or curing begins, tool sealants according to the following requirements to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint:

1. Remove excess joint sealant from surfaces adjacent to joints.
2. Use tooling agents that are approved in writing by joint-sealant manufacturer and that do not discolor sealants or adjacent surfaces.

F. Provide joint configuration to comply with joint-sealant manufacturer's written instructions unless otherwise indicated.

3.4 CLEANING

A. Clean off excess joint sealant or sealant smears adjacent to joints as the Work progresses, by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.5 PROTECTION

A. Protect joint sealants, during and after curing period, from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately and replace with joint sealant so installations in repaired areas are indistinguishable from the original work.

3.6 PAVEMENT-JOINT-SEALANT SCHEDULE

A. Joint-Sealant Application: Joints within cement concrete pavement, pads, sidewalks and curbs.

1. Joint Location:

    a. Expansion and isolation joints in cast-in-place concrete pavement.
    b. Contraction joints in cast-in-place concrete slabs.
    c. Joints between curb and sidewalk if not monolithic.
    d. Joints between sections of curb if not contiguous.
    e. Other joints as indicated.

2. Silicone Joint Sealant for Concrete: Single component, self-leveling.
3. Joint-Sealant Color: Match color of adjacent pavement.

B. Joint-Sealant Application: Joints between cement concrete pads, sidewalks and curbs and asphalt pavement.

1. Joint Location:

    a. Joints between concrete and asphalt pavement.
    b. Joints between concrete curbs and asphalt pavement.
    c. Other joints as indicated.

2. Hot-Applied Joint Sealant for Concrete and Asphalt: Single component.
3. Joint-Sealant Color: Match color of adjacent pavement.

END OF SECTION 321373

SECTION 321613 - CONCRETE CURB AND GUTTERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 DESCRIPTION

A. Work Included: Precast and cast-in-place concrete curbing, complete in place, as shown on the Drawings and as specified.

B. Related Work Specified Elsewhere

1. Section 312300 – Earthwork;

2. Section 321216 – Asphalt Paving.

1.3 QUALITY ASSURANCE

A. Qualifications of Installers: Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

1.4 APPLICABLE SPECIFICATIONS

A. Wherever reference is made to the DOT Specifications, it shall mean the Connecticut Department of Transportation Standard Specifications for Roads, Bridges, Facilities and Incidental Construction Form 819 (2024) as modified by Supplemental Specifications issued by the Connecticut Department of Transportation.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Cast-in-Place Concrete: Article M.03.01, DOT Specifications. Class: As shown on the Drawings.

B. Precast Concrete

1. Materials: Article M.03.01, DOT Specifications, except that coarse aggregate gradation may be varied subject to acceptance by the Architect.

2. Minimum 28-day compressive strength: 4,400 psi

3. Entrained air: 5 to 7 percent

4. Cement: Type I or II

C. Joint Filler: Bituminous cellular type, AASHTO M213.

D. Mortar: Article M.11.04, DOT Specifications.

E. Granular Base: Article M.02.03, DOT Specifications.

PART 3 - EXECUTION

3.1 CONSTRUCTION METHODS

A. General: Construct concrete curbing on the prepared base to the lines and grades indicated on the Drawings. Use either cast-in-place or precast concrete curbing unless otherwise indicated on the Drawings. Cast-in-place and precast concrete curbing may be mixed. Make color of each type to match the other as closely as possible, subject to acceptance by the Engineer.

B. Excavation: Excavate the trench to the bottom of the 6-inch granular base below the curbing. Make trench to a width that will permit thorough tamping. Obtain Engineer's acceptance of conditions at bottom of trench.

C. Placing Base: Place and compact granular base to a firm, even surface. Obtain Architect's acceptance of the surface.

D. Installation of Cast-in-Place Concrete Curbing

1. Refer to DOT Specifications: Conform to the requirements of Article 6.01.03 for concrete for structures, as supplemented by Article 8.11.03.

E. Installation of Precast Concrete Curbing

1. Set curbing on prepared base and settle into place to the line and grade required, straight and true for the full depth of curbing. Use a heavy wood hand-rammer to settle curbing into place.

2. Place mortar and point joints for full depth of curbing. At approximately 10 foot intervals, leave a ½-inch wide joint free of mortar for expansion.

3. At driveways and intersections, form ends of the curbing so that they are beveled or rounded as directed by the Engineer.

4. Where indicated on the Drawings or as directed by the Engineer, make drainage openings through the curbing at the elevations and of the size required.

F. Backfilling: Backfill the trench with the specified granular base material. Make the first layer 4 inches in depth, thoroughly rammed. Make successive layers 6 inches in depth, thoroughly rammed. Fill the trench to elevations as indicated on the drawings.

END OF SECTION 321613

SECTION 321726 - TACTILE WARNING SURFACING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Tactile warning surfacing and accessories.

B. Related Requirements:

1. Section 321313 - Concrete Paving for curbs and walks

1.2 REFERENCE STANDARDS

A. American Association of State and Highway Transportation Officials:

1. AASHTO HB-17 - Standard Specifications for Highway Bridges.

B. ASTM International:

1. ASTM C1208 - Standard Specification for Vitrified Clay Pipe and Joints for Use in Microtunneling, Sliplining, Pipe Bursting, and Tunnels.
2. ASTM C1208M - Standard Specification for Vitrified Clay Pipe and Joints for Use in Microtunneling, Sliplining, Pipe Bursting, and Tunnels.
3. ASTM C1371 - Standard Test Method for Determination of Emittance of Materials Near Room Temperature Using Portable Emissometers.
4. ASTM C1549 - Standard Test Method for Determination of Solar Reflectance Near Ambient Temperature Using a Portable Solar Reflectometer.
5. ASTM D570 - Standard Test Method for Water Absorption of Plastics.
6. ASTM D638 - Standard Test Method for Tensile Properties of Plastics.
7. ASTM D790 - Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.
8. ASTM D1044 - Standard Test Method for Resistance of Transparent Plastics to Surface Abrasion.
9. ASTM D2240 - Standard Test Method for Rubber Property - Durometer Hardness.
10. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
11. ASTM E303 - Standard Test Method for Measuring Surface Frictional Properties Using the British Pendulum Tester.
12. ASTM E408 - Standard Test Methods for Total Normal Emittance of Surfaces Using Inspection-Meter Techniques.
13. ASTM E903 - Standard Test Method for Solar Absorptance, Reflectance, and Transmittance of Materials Using Integrating Spheres.
14. ASTM E1918 - Standard Test Method for Measuring Solar Reflectance of Horizontal and Low-Sloped Surfaces in the Field.
15. ASTM E1980 - Standard Practice for Calculating Solar Reflectance Index of Horizontal and Low-Sloped Opaque Surfaces.

C. U.S. Architectural and Transportation Barriers Compliance Board (Access Board):

1. Americans with Disabilities Act (ADA) - Accessibility Guidelines for Buildings and Facilities.

1.3 PREINSTALLATION MEETINGS

A. Section 013000 - Administrative Requirements specifies requirements for preinstallation meeting.

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

C. Preinstallation Conference: Conduct conference at Project Site.

1.4 SUBMITTALS

A. Section 013300 - Submittal Procedures specifies requirements for submittals.

B. Product Data: Submit manufacturer's information including characteristics, dimensions, domes, and special shapes.

C. Manufacturer's Instructions: Submit detailed instructions on installation requirements, including storage and handling procedures.

D. Source Quality-Control Submittals: Indicate results of shop/ factory tests and inspections.

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

F. Manufacturer Reports:

1. Certify that equipment has been installed according to manufacturer's instructions.
2. Indicate activities on Site, adverse findings, and recommendations.

G. Qualifications Statements:

1. Submit qualifications for manufacturer and installer.
2. Submit manufacturer's approval of installer.

H. Samples for Verification Purposes: Submit two (2) Tactile Warning Surface samples minimum 8″ x 8″ of the kind and color proposed for use.

1. Samples shall be properly labeled and shall contain the following information:

a. Name of Project
b. Submitted by
c. Date of Submittal
d. Manufacturer’s Name
e. Catalog Number.

I. Drawings: Submit Standard Manufacturer Shop Drawings showing all pertinent characteristics of the composite Cast In Place Replaceable Tactile Warning Surface Tile (REP), including profile, sound on cane contact amplification feature and installation methods.

J. Material Test Reports: Submit current test reports from qualified, accredited independent testing laboratory in accordance with ASTM guidelines and indicating that materials proposed for use are in compliance with specification requirements and meet the properties indicated. All test reports submitted shall be representative of the Cast-in-Place Replaceable Tactile Warning Surface Tile (REP) delivered to the Project.

K. Maintenance Instructions: Submit copies of manufacturer's specified maintenance practices for each type of Tactile Warning Surface Tile and accessory.

1.5 QUALITY ASSURANCE

A. Provide composite Cast In Place Replaceable Tactile Warning Surface Tiles (REP) as produced by a single manufacturer with a minimum of five years' experience in manufacturing Cast In Place Replaceable Tactile Warning Surface Tiles (REP).

B. Installer's Qualifications: Engage an experienced installer certified in writing by the Tactile Warning Surface manufacturer, who has successfully completed Tactile Warning Surface installations similar in material, design, and extent to that indicated for the Contract.

C. Cast In Place Replaceable Tactile Warning Surface Tiles (REP) must be compliant with ADAAG, PROWAG, and CATitle 24 requirements. Division of the State Engineer IR 11B-3 (1/26/05) and IR 11B-4 (1/01/11). IR 11B-4 (1/01/11) removed the requirement for a "staggered" pattern and now calls for the "square grid" (in-line) pattern.

D. Cast In Place Replaceable Tactile Warning Surface Tiles (REP) shall meet or exceed the following test criteria using the most current test methods:

1. Water Absorption: Not to exceed 0.20%, when tested in accordance with ASTM-D570.
2. Slip Resistance: 0.80 minimum combined wet/dry static coefficient of friction when tested in accordance with ASTM C1028.
3. Compressive Strength: 25,000 psi minimum, when tested in accordance with ASTM D695.
4. Tensile Strength: 10,000 psi minimum, when tested in accordance with ASTM D638.
5. Flexural Strength: 25,000 psi minimum, when tested in accordance with ASTM D790.
6. Chemical Stain Resistance: No reaction to 1% hydrochloric acid, motor oil, calcium chloride, gum, soap solution, bleach, and antifreeze, when tested in accordance with ASTM D543.
7. Abrasion Resistance: 300 minimum, when tested in accordance with ASTM C501.
8. Flame Spread: 25 maximum, when tested in accordance with ASTM E84.
9. Accelerated Weathering of Tactile Warning Surface when tested by ASTM-G155 or ASTM G151 shall exhibit the following result: $\Delta E<5.0$ at 2,000 hours minimum exposure.
10. AASHTO-H20 Load Bearing Test: No Damage at 16,000# loading.

11. Salt and Spray Performance of Tactile Warning Surface: No deterioration or other defects after 200 hours of exposure, when tested in accordance with ASTM-B117.

1.6 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this Section.

B. Installer: Company specializing in performing Work of this Section.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Section 016000 - 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 and protect materials according to manufacturer's instructions.

1.8 WARRANTY

A. Section 017000 - Execution and Closeout Requirements: Requirements for warranties.

B. Cast In Place Replaceable Tactile Warning Surface Tiles (REP) shall be guaranteed in writing for a period of five (5) years from date of Contract’s final completion. The guarantee includes manufacturing defects, breakage, and deformation.

PART 2 - PRODUCTS

2.1 TACTILE WARNING SURFACING

1. Furnish materials according to State of Connecticut Department of Transportation standards.

B. Description:

1. ADA-compliant tactile warning surfaces for visually impaired pedestrians.
2. Suitable for installation on both asphalt and concrete.

C. Design and Performance Criteria:

1. Loading: Single-wheel HS20-44, according to AASHTO HB-17.
2. Resistant to impacts, wear, freeze-thaw, UV exposure, and stains.
3. Fire Spread: Less than 15 when tested according to ASTM E84.
4. Slip Resistance: 0.90, according to ASTM E303.
5. Taber Abrasion: 150 mgs, according to ASTM D1044.
6. Durometer Hardness: 90, according to ASTM D2240, Type A.
7. Water Absorption:

a. Comply with ASTM D570.
b. Maximum: 0.05 percent.

D. Composition: Cast In Place Replaceable Tactile Warning Surface Tiles (REP) shall be manufactured using a matte finish exterior grade homogeneous (uniform color throughout thickness of product) glass and carbon reinforced polyester based Sheet Molding Compound (SMC) composite material.

1. Truncated domes must contain fiberglass reinforcement within the truncated dome for superior structural integrity and impact resistance. A matte finish will be required on the Tactile Warning Surface for superior slip resistance performance superior to that offered by a gloss finish. Use of Tactile Warning Surface Products employing coatings or featuring layers of material with differing composition, performance, or color properties is expressly prohibited under this Section.

E. Color: Color shall be homogeneous throughout Cast In Place Replaceable Tactile Warning Surface Tiles (REP).

1. Color: Brick Red.

F. Domes: Square grid pattern of raised truncated domes of 0.2″ nominal height, base diameter of 0.9″ and top diameter of 0.45″. The Federal Code of Regulations permits a truncated dome spacing range of 1.6″- 2.4.″ For superior wheelchair, walker and shopping cart mobility, the preferred truncated dome spacing shall have a center-to-center (horizontally and vertically) spacing of 2.35″, measured between the most adjacent domes on square grid.

G. Configuration: Cast In Place Replaceable Tactile Warning Surface Tiles (REP) sizes shall be as indicated on the Contract Drawings. The Cast In Place Replaceable Tactile Warning Surface Tiles (REP) shall feature a minimum of eight (8) embedded corrosion resistant 1.50″ zinc inserts with 1/2″ diameter Bolts. Bolts must be covered with a structural watertight cap. Bolts must be located BETWEEN the truncated domes (in the field) for maximum protection of the Bolt integrity. Bolts are NOT to be located in the truncated dome.

1. The field area shall consist of a non-slip textured surface with a minimum static coefficient of friction of 0.80, wet and dry.

2. At a minimum, Cast In Place Replaceable Tactile Warning Surface Tiles (REP) thickness shall measure 1/4″ nominal exclusive of the perimeter minimum 3/4″ thick (nominal) by 1″ wide flange structure. The body of the Tactile Warning Surface Tile must consist of a SOLID body for maximum strength and to eliminate the possibility of air entrapment and cracking. “Hollow back,” “honeycomb,” or “waffle tiles” are not acceptable for use on this Project.

H. Truncated Dome Surface of Cast In Place Replaceable Tactile Warning Surface Tiles (REP) shall be protected with factory installed plastic sheeting for cleanliness during the installation process. Basic Installation Guidelines shall be printed on the plastic sheeting in both English and Spanish for customer convenience.

I. Dimensions: Cast In Place Replaceable Tactile Warning Surface Tiles (REP) shall be held within the following dimensions and tolerances:

1. Length and Width: As required by Contract Documents.
2. Dome Spacing: 2.35″ o.c.

J. Cleaning materials used on site shall have code acceptable low VOC solvent content and low flammability.

K. The Specifications of the concrete, sealants and related materials shall be in accordance with the Contract Documents and the guidelines set by their respective manufacturers.

2.3 EQUIPMENT

A. Contractor shall provide all tools, equipment and services required for satisfactory installation per manufacturer's instruction as Incidental Work.

1. Equipment, which may be required include typical mason's tools, a 4-foot long level with electronic slope readout, 25-pound weights, vibrator and rubber mallet with 2″ x 4″ x 10″ wood tamping plate, and a device for cutting the Tactile Warning Surface Product.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Section 017000 - Execution and Closeout Requirements: Requirements for installation examination.

B. Verify that substrate is level or to correct grade, is smooth, is capable of supporting tactile warning surface units and imposed loads, and is otherwise ready to receive Work of this Section.

3.2 PREPARATION

A. Section 017000 - Execution and Closeout Requirements: Requirements for installation preparation.

B. Maintenance and Protection of Traffic:

1. Provide short-term traffic control as specified in Section 015000 - Temporary Facilities and Controls.
2. Prevent interference with operations.
3. Maintain travel lanes between 7:00 AM to 9:00 AM and between 4:00 PM and 6:00 PM.
4. Maintain access to existing businesses and other properties requiring access.

C. Surface Preparation:

1. Clean and dry paved surface prior to installing tactile warning surface modules.

2. Blow or sweep surface free of dirt, debris, oil, grease, or gasoline.

D. Existing Work:

1. Remove existing tactile warning surface modules by methods that will cause least damage to pavement surface.
2. Repair pavement or surface damage caused by removal operations.

E. During all concrete pouring and Cast In Place Replaceable Tactile Warning Surface Tiles (REP) Installation procedures, ensure adequate safety guidelines are in place and that they are in accordance with the applicable industry and government standards.

F. The physical characteristics of the concrete shall be consistent with the Contract Specifications while maintaining a slump range of 4 - 7 to permit solid placement of the Cast In Place Replaceable Tactile Warning Surface Tiles (REP). An overly wet mix will cause the Cast In Place Replaceable Tactile Warning Surface Tiles (REP) to float. Under these conditions suitable weights such as 2 concrete blocks or sandbags (25 pounds) shall be placed on each Cast In Place Replaceable Tactile Warning Surface Tiles (REP).

G. The concrete shall be poured and finished, true and smooth to the required dimensions and slope prior to Cast In Place Replaceable Tactile Warning Surface Tiles (REP) placement.

3.3 INSTALLATION

A. Do not be allowed to install Tactile Warning Surface Tiles until all submittals have been reviewed and approved by the Engineer.

B. Install per manufacturer's instructions.

C. To the maximum extent possible, the Cast In Place Replaceable Tactile Warning Surface Tiles (REP) shall be oriented such that the rows of in-line truncated domes are parallel with the direction of the ramp. When multiple Cast In Place Replaceable Tactile Warning Surface Tiles (REP) regardless of size are used, the truncated domes shall be aligned between the tactile warning surface tiles and throughout the entire tactile warning surface installation.

D. In accordance with the Proposed Accessibility Guidelines for Pedestrian Facilities in the Public Rights of Way (08/08/23, Access Board): Sections 304 + 305), Tactile Warning Surface Tile shall be located relative to the curb line as shown within Sections 304 and 305 of the Guidelines.

E. The Cast In Place Replaceable Tactile Warning Surface Tiles (REP) shall be tamped or vibrated into the fresh concrete to ensure that there are no voids or air pockets, and the field level of the Tactile Warning Surface Tile is flush to the adjacent concrete surface or as the Drawings indicate to permit proper water drainage and eliminate tripping hazards between adjacent finishes.

F. On Continuous Runs: The Installer shall leave a 3/16″ nominal gap between successive Tactile Warning Surface Tiles. As part of the concrete finishing operation, the Installer shall apply 1/8″ – 1/4″ edge treatment around the perimeter of the Tactile Warning Surface Tiles to facilitate future replacement of the Tactile Warning Surface Tile. A Urethane Sealant

such as Sikaflex 1a or BASF NP1 shall be applied to the edge treatment for a watertight Tactile Warning Surface Tile installation.

3.4 CLEANING AND PROTECTING

A. Protect Cast In Place Replaceable Tactile Warning Surface Tiles (REP) against damage during construction period to comply with REP Tiles manufacturer's Specifications.

B. During and after the Cast In Place Replaceable Tactile Warning Surface Tiles (REP) installation and the concrete curing stage, it is imperative that there are no walking, leaning or external forces placed on the REP Tile to rock the REP Tile, causing a void between the underside of the REP Tile and the concrete substrate.

C. Remove Protective Plastic Sheeting from Cast In Place Replaceable Tactile Warning Surface Tiles (REP) within 24 hours of installation of the Cast In Place Replaceable Tactile Warning Surface Tiles (REP). Particularly under hot weather conditions (80 degrees or higher), plastic sheeting will adhere strongly (resulting in difficult removal of same) to Tactile Warning Surface Tile when not removed quickly.

D. Clean Cast In Place Replaceable Tactile Warning Surface Tiles (REP) not more than four (4) days prior to date scheduled for inspection intended to establish date of substantial completion in each area of project. Clean Cast In Place Replaceable Tactile Warning Surface Tiles (REP) by method specified by Tactile Warning Surface Products manufacturer.

END OF SECTION 321726

SECTION 323113 - CHAIN LINK FENCES AND GATES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Galvanized steel chain-link fabric.
2. PVC-coated chain-link fabric.
3. Galvanized steel framework.

B. Related Sections:

1. Section 312300 - Earthwork

1.2 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.

1.3 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.

1.4 SUBMITTALS

A. Section 013300 - 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 posts, accessories, fittings and hardware.

1.5 CLOSEOUT SUBMITTALS

A. Section 017000 - 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.

1.6 QUALITY ASSURANCE

A. Supply material according to CLFMI - Product Manual.

B. Perform installation according to ASTM F567.

C. Perform Work according to State of Connecticut Department of Transportation.

1.7 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this section.

B. Installer: Company specializing in performing work of this section.

1.8 DELIVERY, STORAGE AND HANDLING

A. Section 016000 - 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

2.1 FENCE FRAMING

A. Round Steel Pipe: Standard weight, Schedule 40, galvanized steel pipe complying with ASTM F1083. ASTM F1043, Material Design Group IA, external and internal coating Type A, consisting of not less than 1.8-oz/sq ft zinc; and line, end, corner, and pull posts and top rail as required for Heavy Industrial Fence.

B. Round Aluminum Pipe: ASTM F1043, Material Design Group IB, and line, end, corner, and pull posts and top rail as required for Heavy Industrial Fence.

C. Round Steel Pipe: Cold-formed, electric-resistance-welded steel pipe. ASTM F1043, Material Design Group IC, with external and internal coatings; and line, end, corner, and pull posts and top rail as required for Heavy Industrial Fence.

D. Post Brace Rails: Match top rail for coating and strength and stiffness requirements. Provide brace rail with truss rod assembly for each gate, end, and pull post. Provide two brace rails extending in opposing directions, each with truss rod assembly, for each corner post and for pull posts. Provide rail ends and clamps for attaching rails to posts.

E. Top Rails: With swedged-end or fabricated for expansion-type coupling.

F. Intermediate Rails: Match top rail for coating and strength and stiffness requirements.

G. Bottom Rails: Match top rail for coating and strength and stiffness requirements.

2.2 GATES

A. General:

1. Gate Types, Opening Widths and Directions of Operation: As indicated on Drawings.
2. Factory assemble gates.
3. 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.

C. Gate Posts

1. Gate Posts: Fabricate members from round galvanized steel pipe for gate fabric heights (7′ max. gate height at 10′ ht. fence) by leaf widths indicated.

D. Tension Wire and Fittings

1. Metallic-Coated Steel Tension Wire: 0.177-inch diameter, marcelled tension wire complying with ASTM A824 at locations indicated.
2. Fittings: Provide fittings for a complete fence installation, including special fittings for corners. Comply with ASTM F626.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Install chain-link fencing to comply with ASTM F567 and more stringent requirements indicated. Do not begin installation before final grading is completed, unless otherwise permitted by Architect/Engineer.

B. Post Excavation: Drill or hand-excavate holes for posts to diameters and spacings indicated, in firm, undisturbed or compacted soil.

C. Post Setting: Hand-excavate holes for post foundations in firm, undisturbed or compacted soil.

1. Concrete Footings: Place concrete around posts and vibrate or tamp for consolidation. Verify that posts are set plumb, aligned, and at correct height and spacing, and hold in position during placement and finishing operations until concrete is sufficiently cured. Set the following post types in concrete footings and protect portion of posts aboveground from concrete splatter:

    a. Terminal.
    b. Line; Using mechanical devices to set line posts per ASTM F567 is not permitted.
    c. Gate.

D. Terminal Posts: Locate terminal end, corner, and gate posts per ASTM F567 and terminal pull posts at changes in horizontal or vertical alignment of 6 inches.

E. Line Posts: Space line posts uniformly at 10 feet oc.

F. Intermediate Rails: Install in one piece at as indicated, spanning between posts, using fittings, special offset fittings, and accessories.

G. Bottom Rails: Install, spanning between posts, using fittings and accessories. Bottom of fence shall be raised 3″ +/- above finished grade to allow for trimming-lines to pass through.

H. Chain-Link Fabric: Apply fabric to outside of enclosing framework.

I. Tie Wires: Attach wire to chain-link fabric per ASTM F626. Tie fabric to line posts at maximum interval of 12 inches oc and to braces at maximum interval of 24 inches oc.

J. Gate Installation: Install gates level, plumb, and secure for full opening without interference. Attach hardware using tamper-resistant or concealed means. Install ground-set items in concrete for anchorage. Adjust gate to operate smoothly, easily, and quietly throughout entire operational range. Confirm that latches and locks engage accurately and securely without forcing or binding.

K. Gate Operator Installation: Install gate operators aligned and true to fence line and grade. Hand-excavate holes for bases/pads, in firm, undisturbed or compacted soil. Provide cast-in-place or precast concrete bases/pads, made of not less than 3000-psi compressive strength (28 days). Comply with NFPA 70 for grounding. Adjust operators, controls, safety devices, alarms, and limit switches.

END OF SECTION 323113

SECTION 329116 - TOPSOIL AND PLANTING MIX

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes:

1. Planting soils specified by composition of the mixes.
2. Testing and amending of existing topsoil.
3. Spreading of topsoil.

B. Related Requirements:

1. Section 311000 - Clearing and Grubbing for topsoil stripping and stockpiling.
2. Section 329200 - Turf and Grasses for turf and grasses.
3. Section 329300 - Plants for plantings.

1.3 DEFINITIONS

A. AAPFCO: Association of American Plant Food Control Officials.

B. Backfill: The earth used to replace or the act of replacing earth in an excavation. This can be amended or unamended soil as indicated.

C. CEC: Cation exchange capacity.

D. Compost: The product resulting from the controlled biological decomposition of organic material that has been sanitized through the generation of heat and stabilized to the point that it is beneficial to plant growth.

E. Duff Layer: A surface layer of soil, typical of forested areas, that is composed of mostly decayed leaves, twigs, and detritus.

F. Imported Soil: Soil that is transported to Project site for use.

G. NAPT: North American Proficiency Testing Program. An SSSA program to assist soil-, plant-, and water-testing laboratories through interlaboratory sample exchanges and statistical evaluation of analytical data.

H. Organic Matter: The total of organic materials in soil exclusive of undecayed plant and animal tissues, their partial decomposition products, and the soil biomass; also called "humus" or "soil organic matter."

I. Planting Soil: Existing, on-site soil; imported soil; or manufactured soil that has been modified as specified with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth.

J. RCRA Metals: Hazardous metals identified by the EPA under the Resource Conservation and Recovery Act.

K. SSSA: Soil Science Society of America.

L. Subgrade: Surface or elevation of subsoil remaining after excavation is complete, or the top surface of a fill or backfill before planting soil is placed.

M. Subsoil: Soil beneath the level of subgrade; soil beneath the topsoil layers of a naturally occurring soil profile, typified by less than 1 percent organic matter and few soil organisms.

N. Surface Soil: Soil that is present at the top layer of the existing soil profile. In undisturbed areas, surface soil is typically called "topsoil"; but in disturbed areas such as urban environments, the surface soil can be subsoil.

O. USCC: U.S. Composting Council.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include recommendations for application and use.
2. Include test data substantiating that products comply with requirements.
3. Include sieve analyses for aggregate materials.
4. Material Certificates: For each type of soil amendment and fertilizer before delivery to the site, according to the following:

    a. Manufacturer's qualified testing agency's certified analysis of standard products.
    b. Analysis of fertilizers, by a qualified testing agency, made according to

AAPFCO methods for testing and labeling and according to AAPFCO's SUIP #25.

c. Analysis of nonstandard materials, by a qualified testing agency, made according to SSSA methods, where applicable.

B. Samples: For each bulk-supplied material, 1-quart (1-L) volume of each in sealed containers labeled with content, source, and date obtained. Each Sample shall be typical of the lot of material to be furnished; provide an accurate representation of composition, color, and texture.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For each testing agency.

B. Field quality-control reports.

1.7 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent, state-operated, or university-operated laboratory; experienced in soil science, soil testing, and plant nutrition; with the experience and capability to conduct the testing indicated; and that specializes in types of tests to be performed.

1. Laboratories: Subject to compliance with requirements, provide testing by one of the following:

a. Soil and Plant Tissue Laboratory, West Experiment Station, 682 North Pleasant Street, Amherst, MA 01003, (413) 545-2311, website: www.umass.edu/plsoils/soiltest.
b. University of Connecticut, Department of Plant Science, Soil Nutrient Analysis Laboratory, 6 Sherman Place, U-5102, CT 06269-5102, (860) 486-4274, http://www.soiltest.uconn.edu/

2. Multiple Laboratories: At Contractor's option, work may be divided among qualified testing laboratories specializing in physical testing, chemical testing, and fertility testing.

1.8 SOIL-SAMPLING REQUIREMENTS

A. General: Extract soil samples according to requirements in this article.

B. Sample Collection and Labeling: Have samples taken and labeled by soil scientist (CPSS) certified by SSSA, soil classifier (CPSC) certified by SSSA, soil scientist (RPSS) registered by the National Society of Consulting Soil Scientists or state-certified, -licensed, or -registered soil scientist under the direction of the testing agency.

1. Number and Location of Samples: Minimum of six representative soil samples from varied locations for each soil to be used or amended for landscaping purposes.
2. Procedures and Depth of Samples: According to USDA-NRCS's "Field Book for

Describing and Sampling Soils."

3. Division of Samples: Split each sample into two equal parts. Send half to the testing agency and half to Owner for its records.
4. Labeling: Label each sample with the date, location keyed to a site plan or other location system, visible soil condition, and sampling depth.

1.9 TESTING REQUIREMENTS

A. General: Perform tests on soil samples according to requirements in this article.

B. Physical Testing:

1. Soil Texture: Soil-particle, size-distribution analysis by [one of] the following methods according to SSSA's "Methods of Soil Analysis - Part 1-Physical and Mineralogical Methods":

    a. Sieving Method: Report sand-gradation percentages for very coarse, coarse, medium, fine, and very fine sand; and fragment-gradation (gravel) percentages for fine, medium, and coarse fragments; according to USDA sand and fragment sizes.
    b. Hydrometer Method: Report percentages of sand, silt, and clay.

2. Total Porosity: Calculate using particle density and bulk density according to SSSA's "Methods of Soil Analysis - Part 1-Physical and Mineralogical Methods."
3. Water Retention: According to SSSA's "Methods of Soil Analysis - Part 1-Physical and Mineralogical Methods."
4. Saturated Hydraulic Conductivity: According to SSSA's "Methods of Soil Analysis - Part 1-Physical and Mineralogical Methods"; at 85% compaction according to ASTM D 698 (Standard Proctor).

C. Chemical Testing:

1. CEC: Analysis by sodium saturation at pH 7 according to SSSA's "Methods of Soil Analysis - Part 3- Chemical Methods."
2. Clay Mineralogy: Analysis and estimated percentage of expandable clay minerals using CEC by ammonium saturation at pH 7 according to SSSA's "Methods of Soil Analysis - Part 1- Physical and Mineralogical Methods."
3. Metals Hazardous to Human Health: Test for presence and quantities of RCRA metals including aluminum, arsenic, barium, copper, cadmium, chromium, cobalt, lead, lithium, and vanadium. If RCRA metals are present, include recommendations for corrective action.
4. Phytotoxicity: Test for plant-available concentrations of phytotoxic minerals including aluminum, arsenic, barium, cadmium, chlorides, chromium, cobalt, copper, lead, lithium, mercury, nickel, selenium, silver, sodium, strontium, tin, titanium, vanadium, and zinc.

D. Fertility Testing: Soil-fertility analysis according to standard laboratory protocol of SSSA NAPT NEC-67, including the following:

1. Percentage of organic matter.
2. CEC, calcium percent of CEC, and magnesium percent of CEC.

3. Soil reaction (acidity/alkalinity pH value).
4. Buffered acidity or alkalinity.
5. Nitrogen ppm.
6. Phosphorous ppm.
7. Potassium ppm.
8. Manganese ppm.
9. Manganese-availability ppm.
10. Zinc ppm.
11. Zinc availability ppm.
12. Copper ppm.
13. Sodium ppm and sodium absorption ratio.
14. Soluble-salts ppm.
15. Presence and quantities of problem materials including salts and metals cited in the Standard protocol. If such problem materials are present, provide additional recommendations for corrective action.
16. Other deleterious materials, including their characteristics and content of each.

E. Organic-Matter Content: Analysis using loss-by-ignition method according to SSSA's "Methods of Soil Analysis - Part 3- Chemical Methods."

F. Recommendations: Based on the test results, state recommendations for soil treatments and soil amendments to be incorporated to produce satisfactory planting soil suitable for healthy, viable plants indicated. Include, at a minimum, recommendations for nitrogen, phosphorous, and potassium fertilization, and for micronutrients.

1. Fertilizers and Soil Amendment Rates: State recommendations in weight per 1000 sq. ft. (100 sq. m) for 6-inch (150-mm) depth of soil.
2. Soil Reaction: State the recommended liming rates for raising pH or sulfur for lowering pH according to the buffered acidity or buffered alkalinity in weight per 1000 sq. ft. (100 sq. m) for 6-inch (150-mm) depth of soil.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and compliance with state and Federal laws if applicable.

B. Bulk Materials:

1. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing turf areas or plants.
2. Provide erosion-control measures to prevent erosion or displacement of bulk materials, discharge of soil-bearing water runoff, and airborne dust reaching adjacent properties, water conveyance systems, or walkways.
3. Do not move or handle materials when they are wet or frozen.
4. Accompany each delivery of bulk fertilizers and soil amendments with appropriate certificates.

PART 2 - PRODUCTS

2.1 PLANTING SOILS SPECIFIED BY COMPOSITION

A. General: Soil amendments, fertilizers, and rates of application specified in this article are guidelines that may need revision based on testing laboratory's recommendations after preconstruction soil analyses are performed.

B. Planting-Soil Type: Existing, on-site surface soil, with the duff layer, if any, retained; and stockpiled on-site; modified to produce viable planting soil. Blend existing, on-site surface soil with the following soil amendments and fertilizers in the following quantities to produce planting soil:

1. Ratio of Loose Compost to Soil: 1:3 by volume.
2. Additional Properties of Soil before Amending: Soil reaction of pH 6 to 7 and minimum of 6 percent organic-matter content, friable, and with sufficient structure to give good tilth and aeration.
3. Unacceptable Properties: Clean soil of the following:

    a. Unacceptable Materials: Concrete slurry, concrete layers or chunks, cement, plaster, building debris, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, acid, and other extraneous materials that are harmful to plant growth.
    b. Unsuitable Materials: Stones, roots, plants, sod, clay lumps, and pockets of coarse sand that exceed a combined maximum of 8 percent by dry weight of the imported soil.
    c. Large Materials: Stones, clods, roots, clay lumps, and pockets of coarse sand exceeding 2 inches (50 mm) in any dimension.

2.2 INORGANIC SOIL AMENDMENTS

A. Lime: ASTM C602, agricultural liming material containing a minimum of 80 percent calcium carbonate equivalent and as follows:

1. Class: T, with a minimum of 99 percent passing through a No. 8 (2.36-mm) sieve and a minimum of 75 percent passing through a No. 60 (0.25-mm) sieve.
2. Form: Provide lime in form of ground dolomitic limestone.

B. Sulfur: Granular, biodegradable, and containing a minimum of 90 percent elemental sulfur, with a minimum of 99 percent passing through a No. 6 (3.35-mm) sieve and a maximum of 10 percent passing through a No. 40 (0.425-mm) sieve.

C. Iron Sulfate: Granulated ferrous sulfate containing a minimum of 20 percent iron and 10 percent sulfur.

D. Agricultural Gypsum: Minimum 90 percent calcium sulfate, finely ground with 90 percent passing through a No. 50 (0.30-mm) sieve.

E. Recycled Gypsum: Ground-up, recycled gypsum board debris with a minimum 90 percent calcium sulfate, finely ground with 90 percent passing through a No. 50 (0.30-mm) sieve

F. Sand: Clean, washed, natural or manufactured, free of toxic materials, and according to ASTM C 33/C 33M.

2.3 ORGANIC SOIL AMENDMENTS

A. The following organic soil amendments may be added to planting soil as recommended by topsoil analysis:
   1. Compost: Well-composted, stable, and weed-free organic matter produced by composting feedstock, and bearing USCC's "Seal of Testing Assurance," and as follows:

      a. Feedstock: May include sewage sludge or animal waste.
      b. Reaction: pH of 5.5 to 8.
      c. Soluble-Salt Concentration: Less than 4 dS/m.
      d. Moisture Content: 35 to 55 percent by weight.
      e. Organic-Matter Content: 50 to 60 percent of dry weight.
      f. Particle Size: Minimum of 98 percent passing through a 1/2-inch (13-mm) sieve.

   2. Sphagnum Peat: Partially decomposed sphagnum peat moss, finely divided or of granular texture with 100 percent passing through a 1/2-inch (13-mm) sieve, a pH of 3.4 to 4.8, and a soluble-salt content measured by electrical conductivity of maximum 5 dS/m.
   3. Muck Peat: Partially decomposed moss peat, native peat, or reed-sedge peat finely divided or of granular texture with 100 percent passing through a 1/2-inch (13-mm) sieve, a pH of 6 to 7.5, a soluble-salt content measured by electrical conductivity of maximum 5 dS/m, having a water-absorbing capacity of 1100 to 2000 percent, and containing no sand.
   4. Wood Derivatives: Shredded and composted, nitrogen-treated sawdust, ground bark, or wood waste; of uniform texture and free of chips, stones, sticks, soil, or toxic materials.
   5. Manure: Well-rotted, unleached, stable or cattle manure containing not more than 25 percent by volume of straw, sawdust, or other bedding materials; free of toxic substances, stones, sticks, soil, weed seed, debris, and material harmful to plant growth.

2.4 FERTILIZERS

A. The following fertilizers may be added to planting soil as recommended by topsoil analysis and if allowed by authorities having jurisdiction:

   1. Superphosphate: Commercial, phosphate mixture, soluble; a minimum of 20 percent available phosphoric acid.
   2. Commercial Fertilizer: Commercial-grade complete fertilizer of neutral character, consisting of fast- and slow-release nitrogen, 50 percent derived from natural organic sources of urea formaldehyde, phosphorous, and potassium in the following composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified testing agency.

3. Slow-Release Fertilizer: Granular or pelleted fertilizer consisting of 50 percent water- insoluble nitrogen, phosphorus, and potassium in the following composition:

    a. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified testing agency.

4. Chelated Iron: Commercial-grade FeEDDHA for dicots and woody plants, and commercial-grade FeDTPA for ornamental grasses and monocots.

2.5 MULCHES

A. Organic Mulch: Free from deleterious materials and suitable as a top dressing of trees and shrubs, consisting of one of the following:

1. Type: Shredded Pine bark.

2. Size Range: 3 inches (76 mm) maximum, 1/2-inch (13 mm) minimum.

3. Color: Natural.

Compost is a widely used bulk organic mulch and a recycled product. Because it is applied at much greater rates than fertilizer, compost has a significant cumulative effect on nutrient availability and may reduce or eliminate top-dressed fertilizing. Consider each plant's pH and soluble-salt requirements and how those relate to the compost being used.

PART 3 - EXECUTION

3.1 GENERAL

A. General: Apply and mix unamended soil with amendments on-site to produce required planting soil according to Division 32 Sections “Turf and Grasses” and “Plants”. Do not apply materials or till if existing soil or subgrade is frozen, muddy, or excessively wet.

B. Place planting soil and fertilizers according to requirements in Division 32 Sections “Turf and Grasses” and “Plants”.

C. Topsoil will not be permitted to be spread until topsoil test reports and amendments have been submitted and approved.

D. Amend topsoil per the direction of the test report.

3.2 PREPARATION OF UNAMENDED, ON-SITE SOIL BEFORE AMENDING

A. Unacceptable Materials: Clean soil of concrete slurry, concrete layers or chunks, cement, plaster, building debris, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, acid, and other extraneous materials that are harmful to plant growth.

B. Unsuitable Materials: Clean soil to contain a maximum of 8 percent by dry weight of stones, roots, plants, sod, clay lumps, and pockets of coarse sand.

C. Screening: Pass unamended soil through a 3-inch (75-mm) sieve to remove large materials.

3.3 PLACING AND MIXING PLANTING SOIL OVER EXPOSED SUBGRADE

A. General: Apply and mix unamended soil with amendments on-site to produce required planting soil. Do not apply materials or till if existing soil or subgrade is frozen, muddy, or excessively wet.

B. Subgrade Preparation: Till subgrade to a minimum depth of 4 inches (100 mm). Remove stones larger than 2 inches (50 mm) in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Owner's property.

1. Apply, add soil amendments, and mix approximately half the thickness of unamended soil over prepared, loosened subgrade according to "Mixing" Paragraph below. Mix thoroughly into top 4 inches (100 mm) of subgrade. Spread remainder of planting soil.

C. Mixing: Spread unamended soil to total depth of 6 inches (150 mm), but not less than required to meet finish grades after mixing with amendments and natural settlement. Do not spread if soil or subgrade is frozen, muddy, or excessively wet.

1. Amendments: Apply soil amendments and fertilizer, if required, evenly on surface, and thoroughly blend them with unamended soil to produce planting soil.
    a. Mix lime and sulfur with dry soil before mixing fertilizer as required by the soil test results.
    b. Mix fertilizer with planting soil no more than seven days before planting.

2. Lifts: Apply and mix unamended soil and amendments in lifts not exceeding 8 inches (200 mm) in loose depth for material compacted by compaction equipment, and not more than 4 inches (100 mm) in loose depth for material compacted by hand-operated tampers.

D. Compaction: Compact each blended lift of planting soil to 75 to 82 percent of maximum Standard Proctor density according to ASTM D 698 and tested in-place except where a different compaction value is indicated on Drawings.

E. Finish Grading: Grade planting soil to a smooth, uniform surface plane with loose, uniformly fine texture. Roll and rake, remove ridges, and fill depressions to meet finish grades.

3.4 PLACING PREBLENDED PLANTING SOIL OVER EXPOSED SUBGRADE

A. General: Apply amended soil on-site in its final, blended condition. Do not apply materials or till if existing soil or subgrade is frozen, muddy, or excessively wet.

B. Subgrade Preparation: Till subgrade to a minimum depth of 6 inches (150 mm). Remove stones larger than 3 inches (75 mm) in any dimension and sticks, roots,

rubbish, and other extraneous matter and legally dispose of them off Owner's property.

1. Apply approximately half the thickness of amended planting soil over prepared, loosened subgrade. Mix thoroughly into top 4 inches (100 mm) of subgrade. Spread remainder of planting soil.

C. Application: Spread planting soil to total minimum depth of 18 inches (450 mm) according to the planting details as indicated on the Drawings, but not less than required to meet finish grades after natural settlement. Do not spread if soil or subgrade is frozen, muddy, or excessively wet.

1. Lifts: Apply planting soil in lifts not exceeding 12 inches (300 mm) in loose depth for material compacted by compaction equipment, and not more than 6 inches (150 mm) in loose depth for material compacted by hand-operated tampers.

D. Compaction: Compact each lift of planting soil to 75 to 82 percent of maximum Standard Proctor density according to ASTM D.

E. Finish Grading: Grade planting soil to a smooth, uniform surface plane with loose, uniformly fine texture. Roll and rake, remove ridges, and fill depressions to meet finish grades.

3.5 FIELD QUALITY CONTROL

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

1. Compaction: Test planting-soil compaction after placing each lift and at completion using a densitometer or soil-compaction meter calibrated to a reference test value based on laboratory testing according to ASTM D 698. Space tests at no less than one for each 1000 sq. ft. (100 sq. m) of in-place soil or part thereof.

B. Soil will be considered defective if it does not pass tests and inspections.

C. Prepare test reports.

D. Label each sample and test report with the date, location keyed to a site plan or other location system, visible conditions when and where sample was taken, and sampling depth.

3.6 PROTECTION

A. Protection Zone: Identify protection zones according to Division 1 Section "Temporary Tree and Plant Protection."

B. Protect areas of in-place soil from additional compaction, disturbance, and contamination. Prohibit the following practices within these areas except as required to perform planting operations:
1. Storage of construction materials, debris, or excavated material.
2. Parking vehicles or equipment.
3. Vehicle traffic.

4. Foot traffic.
5. Erection of sheds or structures.
6. Impoundment of water.
7. Excavation or other digging unless otherwise indicated.

C. If planting soil or subgrade is over compacted, disturbed, or contaminated by foreign or deleterious materials or liquids, remove the planting soil and contamination; restore the subgrade as directed by Architect and replace contaminated planting soil with new planting soil.

3.7 CLEANING

A. Protect areas adjacent to planting-soil preparation and placement areas from contamination. Keep adjacent paving and construction clean and work area in an orderly condition.

3.8 Remove surplus soil and waste material including excess subsoil, unsuitable materials, trash, and debris and legally dispose of them off Owner's property unless otherwise indicated.

3.9 EXCESS STOCKPILED TOPSOIL

A. Remains property of Owner and is to be deposited or spread by the Contractor in an approved location unless approved otherwise.

END OF SECTION 329116

SECTION 329200 - TURF AND GRASSES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
   1. Lawn Mix Seeding.
   2. Hydroseeding.

B. Related Requirements:
   1. Section 312300 - Earthwork for planting soil requirements.
   2. Section 329300 - Plants for trees, shrubs, ground covers, and other plants as well as border edgings and mow strips.

1.3 DEFINITIONS

A. Finish Grade: Elevation of finished surface of planting soil.

B. Pesticide: A substance or mixture intended for preventing, destroying, repelling, or mitigating a pest. Pesticides include insecticides, miticides, herbicides, fungicides, rodenticides, and molluscicides. They also include substances or mixtures intended for use as a plant regulator, defoliant, or desiccant.

C. Pests: Living organisms that occur where they are not desired or that cause damage to plants, animals, or people. Pests include insects, mites, grubs, mollusks (snails and slugs), rodents (gophers, moles, and mice), unwanted plants (weeds), fungi, bacteria, and viruses.

D. Planting Soil: Existing, on-site soil; imported soil; or manufactured soil that has been modified with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth. See Section 329116 "Topsoil and Planting Mix" and drawing designations for planting soils.

E. Subgrade: The surface or elevation of subsoil remaining after excavation is complete, or the top surface of a fill or backfill before planting soil is placed.

1.1 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.2 INFORMATIONAL SUBMITTALS

A. Qualification Data: For landscape Installer.

B. Certification of Grass Seed: From seed vendor for each grass-seed monostand or mixture, stating the botanical and common name, percentage by weight of each species and variety, and percentage of purity, germination, and weed seed. Include the year of production and date of packaging.

C. Product Certificates: For fertilizers, from manufacturer.

D. Pesticides and Herbicides: Product label and manufacturer's application instructions specific to Project.

1.3 QUALITY ASSURANCE

A. Installer Qualifications: A qualified landscape installer whose work has resulted in successful turf establishment.
   1. Professional Membership: Installer shall be a member in good standing of either the National Association of Landscape Professionals or AmericanHort.
   2. Experience: Three years' experience in turf installation.
   3. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when work is in progress.
   4. Pesticide Applicator: State licensed, commercial.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Seed and Other Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of compliance with state and Federal laws, as applicable.

B. Bulk Materials:
   1. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing turf areas or plants.
   2. Provide erosion-control measures to prevent erosion or displacement of bulk materials; discharge of soil-bearing water runoff; and airborne dust reaching adjacent properties, water conveyance systems, or walkways.
   3. Accompany each delivery of bulk materials with appropriate certificates.

1.5 FIELD CONDITIONS

Planting Restrictions: Plant during one of the following periods. Coordinate planting periods with initial maintenance periods to provide required maintenance from date of planting completion.
   1. Spring Planting: April 1 to June 15.
   2. Fall Planting: September 1 to October 1.

B. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit planting to be performed when beneficial and optimum results may be

obtained. Apply products during favorable weather conditions according to manufacturer's written instructions.

C. Watering: The Contractor shall bear sole responsibility for the furnishing and application of all irrigation water, irrespective of whether or not an irrigation system is installed or operable. The Contractor shall ensure that all irrigation water is applied at the proper frequency, coverage and in the proper amounts to fulfill the plant establishment and maintenance requirements of the Contract. The Contractor's responsibility for all watering shall begin upon delivery of plants to the site, and shall continue through the end of the Warranty period.
   1. If no irrigation system is available, or if an available irrigation system is unsatisfactory to the Contractor's needs, then the Contractor shall furnish and apply all irrigation water.
   2. If an existing irrigation system is made available for the Contractor's use, and if the Contractor elects to utilize this irrigation system; then the Contractor shall accept total responsibility for ensuring that the system is satisfactorily adjusted and operated while utilized by the Contractor.
   3. If an irrigation system is to be provided or design/built under this Contract, and if the Contractor elects to utilize this irrigation system; then the Contractor shall coordinate with the irrigation designer, installer and operator, and shall accept total responsibility for ensuring that the system is satisfactorily adjusted and operated while utilized by the Contractor.

PART 2 - PRODUCTS

2.1 LAWN SEED

A. Grass Seed: Fresh, clean, dry, new-crop seed complying with AOSA's "Rules for Testing Seeds" for purity and germination tolerances.

B. Seed Species:
   1. Quality: Seed of grass species as listed below, with not less than 80 percent germination, not less than 97 percent pure seed, and not more than 0.5 percent weed seed:
   2. Lawn Seed: Proportioned by weight as follows:
      a. 40 percent: equal proportions of 2 or more improved Kentucky bluegrass (Poa pratensis) varieties.
      b. 40 percent: equal proportions of 2 or more improved creeping red fescue (Festuca rubra) varieties.
      c. 20 percent: 1 or more improved variety of perennial ryegrass (Lolium perenne).

2.2 INORGANIC SOIL AMENDMENTS

A. Lime: Agricultural liming material containing a minimum of 90 percent calcium carbonate equivalent and as follows:
   1. 100 percent passing through No. 10 sieve, a minimum of 90 percent passing through No. 20 sieve, and a minimum of 40 percent passing through No. 100 sieve.
   2. Provide lime in form of ground dolomitic limestone.

2.3 FERTILIZERS

A. Commercial Fertilizer: Commercial-grade complete fertilizer of neutral character, consisting of fast- and slow-release nitrogen, 50 percent derived from natural organic sources of urea formaldehyde, phosphorous, and potassium in the following composition:
   1. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing laboratory.

2.4 MULCHES

A. Straw Mulch: Provide air-dry, clean, mildew- and seed-free, salt hay or threshed straw of wheat, rye, oats, or barley.

B. Fiber Mulch: Biodegradable, dyed-wood, cellulose-fiber mulch; nontoxic and free of plant-growth or germination inhibitors; with a maximum moisture content of 15 percent and a pH range of 4.5 to 6.5.

C. Nonasphaltic Tackifier: Colloidal tackifier recommended by fiber-mulch manufacturer for slurry application; nontoxic and free of plant-growth or germination inhibitors.

D. Straw Blankets: Ultra short-term double-net erosion control blanket consisting of 100 percent straw matrix with lightweight accelerated photodegradable polypropylene netting, conforming to Federal Highway Administration Standard Specification FP-03, Article 713.17(d), Type 1.D. Include staples as required.
   1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      a. North American Green DS150 Double Net Erosion Control Blanket.

2.5 PESTICIDES

A. General: Pesticide, registered and approved by the EPA, acceptable to authorities having jurisdiction, and of type recommended by manufacturer for each specific problem and as required for Project conditions and application. Do not use restricted pesticides unless authorized in writing by authorities having jurisdiction.

B. Pre-Emergent Herbicide (Selective and Nonselective): Effective for controlling the germination or growth of weeds within planted areas at the soil level directly below the mulch layer.

C. Post-Emergent Herbicide (Selective and Nonselective): Effective for controlling weed growth that has already germinated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas to be planted for compliance with requirements and other conditions affecting installation and performance of the Work.

1. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in soil within a planting area.
2. Verify that seedbed is clean and weed-free.
3. Suspend planting operations during periods of excessive soil moisture until the moisture content reaches acceptable levels to attain the required results.
4. Uniformly moisten excessively dry soil that is not workable or which is dusty.

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

C. If contamination by foreign or deleterious material or liquid is present in soil within a planting area, remove the soil and contamination as directed by Landscape Architect and replace with new planting soil.

3.2 PREPARATION

A. Protect structures; utilities; sidewalks; pavements; and other facilities, trees, shrubs, and plantings from damage caused by planting operations.
1. Protect adjacent and adjoining areas from hydroseeding and hydromulching overspray.
2. Protect grade stakes set by others until directed to remove them.

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

3.3 TURF AND LAWN AREA PREPARATION

A. General: Prepare planting area for soil placement, and mix and place planting soil according to Section 329116 - Topsoil and Planting Mix.

B. Placing Planting Soil: Place planting soil in place over exposed subgrade.

C. Moisten prepared area before planting if soil is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.

D. Before planting, obtain Landscape Architect's acceptance of finish grading; restore planting areas if eroded or otherwise disturbed after finish grading.

3.4 SEEDING

A. Sow seed with spreader or seeding machine. Do not broadcast or drop seed when wind velocity exceeds 5 mph.
1. Evenly distribute seed by sowing equal quantities in two directions at right angles to each other.
2. Do not use wet seed or seed that is moldy or otherwise damaged.
3. Do not seed against existing trees. Limit extent of seed to outside edge of planting saucer.

B. Sow seed at a total rate of 5 to 8 lb/1000 sq. ft..

C. Rake seed lightly into top 1/8 inch of soil, roll lightly, and water with fine spray.

D. Protect seeded areas with slopes exceeding 1:6, and other seeded areas subject to concentrated water runoff, with straw blankets installed and stapled according to manufacturer's written instructions.

E. Protect seeded areas with slopes not exceeding 1:6 by spreading straw mulch. Spread uniformly at a minimum rate of 2 tons/acre to form a continuous blanket 1-1/2 inches in loose thickness over seeded areas. Spread by hand, blower, or other suitable equipment.
   1. Anchor straw mulch by crimping into soil with suitable mechanical equipment.

3.5 HYDROSEEDING

A. Hydroseeding: Mix specified seed, commercial fertilizer, and fiber mulch in water, using equipment specifically designed for hydroseed application. Continue mixing until uniformly blended into homogeneous slurry suitable for hydraulic application.
   1. Mix slurry with nonasphaltic tackifier.
   2. Spray-apply slurry uniformly to all areas to be seeded in a two-step process. Apply first slurry coat at a rate so that mulch component is deposited at not less than 500-lb/acre dry weight, and seed component is deposited at not less than the specified seed-sowing rate. Apply slurry cover coat of fiber mulch (hydromulching) at a rate of 1000 lb/acre.

3.6 TURF RENOVATION

A. Renovate existing turf where indicated.
   1. Turf renovation work within or near Tree Protection Areas shall be performed in a manner to minimize damage to trees, shrubs, ground cover, soil, and root systems.

B. Renovate turf damaged by Contractor's operations, such as storage of materials or equipment and movement of vehicles.
   1. Reestablish turf where settlement or washouts occur or where minor regrading is required.
   2. Install new planting soil as required.

C. Remove sod and vegetation from diseased or unsatisfactory turf areas; do not bury in soil.

D. Remove topsoil containing foreign materials, such as oil drippings, fuel spills, stones, gravel, and other construction materials resulting from Contractor's operations, and replace with new planting soil.

E. Mow, dethatch, core aerate, and rake existing turf.

F. Remove weeds before seeding.

G. Remove waste and foreign materials, including weeds, soil cores, grass, vegetation, and turf, and legally dispose of them off Owner's property.

H. Till stripped, bare, and compacted areas thoroughly to a soil depth of 6 inches.

I. Apply soil amendments and initial fertilizer required for establishing new turf and mix thoroughly into top 4 inches of existing soil. Install new planting soil to fill low spots and meet finish grades.
   1. Soil Amendments: Lime and compost according to requirements of Section 329116 - Topsoil and Planting Mix.
   2. Initial Fertilizer: Commercial fertilizer applied according to manufacturer's recommendations.

J. Apply seed and protect with straw mulch as required for new turf.
   1. Use seed drill when overseeding existing turf.

K. Water newly planted areas and keep moist until new turf is established.

3.7 TURF MAINTENANCE

A. General: Maintain and establish turf by watering, fertilizing, weeding, mowing, trimming, replanting, and performing other operations as required to establish healthy, viable turf. Roll, regrade, and replant bare or eroded areas and remulch to produce a uniformly smooth turf. Provide materials and installation the same as those used in the original installation.
   1. Fill in as necessary soil subsidence that may occur because of settling or other processes. Replace materials and turf damaged or lost in areas of subsidence.
   2. In areas where mulch has been disturbed by wind or maintenance operations, add new mulch and anchor as required to prevent displacement.
   3. Apply treatments as required to keep turf and soil free of pests and pathogens or disease. Use integrated pest management practices whenever possible to minimize the use of pesticides and reduce hazards.

B. Watering: Install and maintain temporary piping, hoses, and turf-watering equipment to convey water from sources and to keep turf uniformly moist to a depth of 4 inches.
   1. Schedule watering to prevent wilting, puddling, erosion, and displacement of seed or mulch. Lay out temporary watering system to avoid walking over muddy or newly planted areas.
   2. Minimum watering requirement: Water for 15 to 30 minutes every other morning for a period of at least 2 weeks during cool weather, or for up to 6 weeks during hot dry weather. Continue watering not less than twice per week for at least 2 months following the date of seeding. Provide additional watering as needed, especially during hot dry weather.

C. Mow turf as soon as top growth is tall enough to cut. Repeat mowing to maintain specified height without cutting more than one-third of grass height. Remove no more than one-third of grass-leaf growth in initial or subsequent mowings. Do not delay mowing until grass blades bend over and become matted. Do not mow when grass is wet. Schedule initial and subsequent mowings to maintain the following grass height:
   1. Mow Lawns to a height of 1-1/2 to 2 inches.
   2. Mow Fescue Mix Seeding to a height of 4-inches to control weeds.

D. Turf Postfertilization: Apply commercial fertilizer after initial mowing and when grass is dry.
   1. Lawns: Use fertilizer that provides actual nitrogen of at least 1 lb/1000 sq. ft. to turf area.

2. Fescue Mix Seeding: Do not fertilize.

3.8 SATISFACTORY TURF

A. Turf installations shall meet the following criteria as determined by Landscape Architect:
   1. Satisfactory Seeded Turf and Lawn Mix: At end of maintenance period, a healthy, uniform, close stand of grass has been established, free of weeds and surface irregularities, with coverage exceeding 90 percent over any 10 sq. ft. and bare spots not exceeding 5 by 5 inches.

B. Use specified materials to reestablish turf that does not comply with requirements, and continue maintenance until turf is satisfactory.

3.9 PESTICIDE APPLICATION

A. Apply pesticides and other chemical products and biological control agents according to requirements of authorities having jurisdiction and manufacturer's written recommendations. Coordinate applications with Owner's operations and others in proximity to the Work. Notify Owner before each application is performed.

B. Post-Emergent Herbicides (Selective and Nonselective): Apply only as necessary to treat already-germinated weeds and according to manufacturer's written recommendations.

3.10 CLEANUP AND PROTECTION

A. Promptly remove soil and debris created by turf work from paved areas. Clean wheels of vehicles before leaving site to avoid tracking soil onto roads, walks, or other paved areas.

B. Remove surplus soil and waste material, including excess subsoil, unsuitable soil, trash, and debris, and legally dispose of them off Owner's property.

C. Erect temporary fencing or barricades and warning signs as required to protect newly planted areas from traffic. Maintain fencing and barricades throughout initial maintenance period and remove after plantings are established.

D. Remove nondegradable erosion-control measures after grass establishment period.

3.11 MAINTENANCE SERVICE

A. Turf Maintenance Service: Provide full maintenance by skilled employees of landscape Installer. Begin maintenance immediately after each area is planted and continue until acceptable turf is established, but for not less than the following periods:
   1. Seeded Turf and Lawn Mix: 60 days from date of planting acceptance or upon Substantial Completion of the Contract, whichever occurs later. Maintenance service for turf areas shall include not less than 5 mowings or 4 weeks following the removal of all construction evidence, whichever is longer.
   2. Provide maintenance service until acceptable turf is established throughout all turf areas. Turf areas will not be accepted in individual pieces.

3. When initial maintenance period has not elapsed before end of planting season, or if turf is not fully established, continue maintenance during next planting season.

END OF SECTION 322920

SECTION 329300 - PLANTS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
   1. Plants.
   2. Tree stabilization.
   3. Tree-watering devices.
   4. Maintenance, protection, and guarantee.

B. Related Requirements:
   1. Section 312300 - Earthwork for planting soil requirements.
   2. Section 329200 - Turf and Grasses for turf (lawn) planting, and hydroseeding.

1.3 DEFINITIONS

A. Backfill: The earth used to replace or the act of replacing earth in an excavation.

B. Balled and Burlapped Stock: Plants dug with firm, natural balls of earth in which they were grown, with a ball size not less than diameter and depth recommended by ANSI Z60.1 for type and size of plant required; wrapped with burlap, tied, rigidly supported, and drum laced with twine with the root flare visible at the surface of the ball as recommended by ANSI Z60.1.

C. Central Leader: A continuation of the main trunk located more or less in the center of the crown, beginning at the lowest main branch (scaffold) and extending to the top of the tree. Also referred to as the Dominant Leader.

D. Codominant: Two or more vigorous, upright branches or stems of relatively equal size that originate from a common point, usually where the leader was lost or removed.

E. Container-Grown Stock: Healthy, vigorous, well-rooted plants grown in a container, with a well-established root system reaching sides of container and maintaining a firm ball when removed from container. Container shall be rigid enough to hold ball shape and protect root mass during shipping and be sized according to ANSI Z60.1 for type and size of plant required.

F. Crown: The portion of a tree beginning at the lowest main (scaffold) branch extending to the top of the tree.

G. Finish Grade: Elevation of finished surface of planting soil.

H. Included Bark: Bark embedded in the union between a branch and the trunk or between two or more stems that prevents the formation of a normal branch bark ridge.

I. Nursery: A place where young trees and plants are grown commercially for sale. Not included in this definition are horticultural distribution centers and plant re-wholesalers.

J. Pesticide: A substance or mixture intended for preventing, destroying, repelling, or mitigating a pest. Pesticides include insecticides, miticides, herbicides, fungicides, rodenticides, and molluscicides. They also include substances or mixtures intended for use as a plant regulator, defoliant, or desiccant. Some sources classify herbicides separately from pesticides.

K. Pests: Living organisms that occur where they are not desired or that cause damage to plants, animals, or people. Pests include insects, mites, grubs, mollusks (snails and slugs), rodents (gophers, moles, and mice), unwanted plants (weeds), fungi, bacteria, and viruses.

L. Planting Area: Areas to be planted.

M. Planting Soil: Existing, on-site soil; imported soil; or manufactured soil that has been modified with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth.

N. Plant; Plants; Plant Material: These terms refer to vegetation in general, including trees, shrubs, vines, ground covers, ornamental grasses, bulbs, corms, tubers, or herbaceous vegetation.

O. Root Flare: Also called "trunk flare." The area at the base of the plant's stem or trunk where the stem or trunk broadens to form roots; the area of transition between the root system and the stem or trunk.

P. Scaffold Branches: Large main branches that form the main structure of the crown.

Q. Stem Girdling Roots: Roots that encircle the stems (trunks) of trees below the soil surface.

R. Subgrade: The surface or elevation of subsoil remaining after excavation is complete, or the top surface of a fill or backfill before planting soil is placed.

S. Trunk: The main stem of a tree, beginning at the root collar and ending at the lowest main scaffold branch.

1.4 REFERENCE STANDARDS

A. American National Standards Institute:

1. ANSI A300 - Tree Care Operations - Tree, Shrub and Other Woody Plant Maintenance - Standard Practices.
2. ANSI Z60.1 - Nursery Stock.

B. Forest Stewardship Council:

1. FSC Guidelines - Forest Stewardship Council Guidelines.

C. American Horticulture Industry Association d/b/a AmericanHort. Ph. (614) 487-1117. www.AmericanHort.org.
   1. ANSI Z60.1: American Standard for Nursery Stock (2014).

1.5 COORDINATION

A. Coordination with Landscape Architect's Site Visits: The Landscape Architect may elect to be present to observe the execution of the following work. Provide not less than 2 full working days advance notice prior to performing these activities. It will be assumed that any work performed without notifying the Landscape Architect of the date and time in advance was performed incompletely or incorrectly.
   1. Deliveries of plant materials.
   2. Layout of plant locations.
   3. Preparation of planting area subgrades and placement of planting soil.
   4. Installation of plants.

B. Coordination with Turf Areas (Lawns): Plant trees, shrubs, and other plants after finish grades are established and before planting turf areas unless otherwise indicated.
   1. When planting trees, shrubs, and other plants after planting turf areas, protect turf areas, and promptly repair damage caused by planting operations.

1.6 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.
   1. Participants: including but not limited to Landscape Architect and Installer.

1.7 ACTION SUBMITTALS

A. Nursery Source Tagging Submittals
   1. Nursery Sources: Within 30-days of the Contract start, submit a list of all proposed nursery sources for approval, confirming the availability of plant varieties, sizes, forms, and quantities indicated in the Contract Documents. For field-grown trees and plants, specified as "balled and burlapped", include photographs of the available plant blocks to confirm that the nurseries have a sufficient selection of satisfactory plants available for tagging. Provide the names and telephone numbers for the nurseries' representatives.
      a. Substitutions: Substitutions of plant material will not be permitted unless approved in writing by the Landscape Architect. If any specified plants are not available at the time when needed to meet the project schedule, submit a statement documenting the nursery sources investigated and providing proposals for equivalent plants of the nearest available size or similar variety. Substitutions will not be allowed if the Landscape Architect identifies alternate nursery sources within a 500-mile radius of the project site.
      b. Container grown plants shall not be substituted for plants designated "B&B" on the Plant Schedule, unless approved in writing by the Landscape Architect.
      c. Quantities: Quantities shown on the Plant Schedule are for information only. Provide every plant shown on the Drawings. In the event of a discrepancy between the Planting Plans and the written quantities in the Plant Schedule, the Planting Plan shall govern.

2. Planting Schedule: Submit the projected planting schedule, including nursery visits, digging, delivery, storage and installation dates for review and approval. Schedule the dates for each type of landscape work during normal seasons for such work in each area of the site. Correlate with specified maintenance periods to provide maintenance until conclusion of the planting establishment and maintenance period. Revise schedule to keep current, subject to the Landscape Architect's approval.
3. Nursery Visit Schedule: Coordinate with the Landscape Architect and the proposed nurseries to arrange nursery visits. The final schedule for nursery visits shall be submitted not later than the November 30 preceding the scheduled installation of the plants.

B. Product Data: For each type of product.
1. Plant Materials: Include quantities, sizes, quality, and sources for plant materials.
2. Plant Photographs: Include color photographs in digital format of each required species and size of plant material as it will be furnished to Project. Take photographs from multiple angles depicting true size and condition of the typical plant to be furnished. Include a scale rod or other measuring device in each photograph. For species where more than 10 plants are required, include a minimum of three photographs showing the average plant, the best quality plant, and the worst quality plant to be furnished. Identify each photograph with the full scientific name and horticultural variety of the plant, plant size, and name of the growing nursery.
    a. Field-grown trees and shrubs:
        1) Specimen trees: Three photographs of every individual specimen tree, taken from multiple angles.
        2) Trees and shrubs to be furnished in quantities of 10 or less: At least three photographs of a typical plant taken from multiple angles, plus photographs showing overall views of the blocks from which the plants are to be obtained.
        3) Trees and shrubs to be furnished in quantities greater than 10: Photographs of the average plant, the best quality plant, and the worst quality plant; plus photographs showing overall views of the blocks from which the trees are to be obtained.
    b. Container-grown trees: Three photographs of each individual tree.
    c. Container-grown shrubs and vines: One photograph of one typical plant.
    d. Perennials and grasses: Photographs are not required.

C. Qualification data for the proposed provider of Deer Repellant and Deterrent Program services.

D. Samples for Verification: For each of the following:
1. Organic Mulch: 1-quart volume of each organic mulch required; in sealed plastic bags labeled with composition of materials by percentage of weight and source of mulch. Each Sample shall be typical of the lot of material to be furnished; provide an accurate representation of color, texture, and organic makeup.

1.8 INFORMATIONAL SUBMITTALS

A. Qualification Data: For landscape Installer. Include list of similar projects completed by Installer demonstrating Installer's capabilities and experience. Include project names, addresses, and year completed, and include names and addresses of owners' contact persons.

B. Product Certificates: For each type of manufactured product, from manufacturer, and complying with the following:
   1. Manufacturer's certified analysis of standard products.
   2. Analysis of other materials by a recognized laboratory made according to methods established by the Association of Official Analytical Chemists, where applicable.

C. Pesticides and Herbicides: Product label and manufacturer's application instructions specific to Project.

D. Sample Warranty: For special warranty.

1.9 CLOSEOUT SUBMITTALS

A. The provider of the deer repellant and deterrent program shall submit a proposal directly to the Owner for the continuation of their services following the conclusion of the one-year maintenance and guaranty period.

1.10 QUALITY ASSURANCE

A. Installer Qualifications: A qualified landscape installer whose work has resulted in successful establishment of plants.
   1. Experience: Five years' experience in landscape installation in addition to requirements in Section 014000 - Quality Requirements.
   2. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when work is in progress.
   3. Pesticide Applicator: State licensed, commercial.

B. Provide quality, size, genus, species, and variety of plants indicated, complying with applicable requirements in ANSI Z60.1.

C. Measurements: Measure according to ANSI Z60.1. Do not prune to obtain required sizes.
   1. Trees and Shrubs: Measure with branches and trunks or canes in their normal position. Take height measurements from or near the top of the root flare for field-grown stock and container-grown stock. Measure main body of tree or shrub for height and spread; do not measure branches or roots tip to tip. Take caliper measurements 6 inches above the root flare for trees up to 4-inch caliper size, and 12 inches above the root flare for larger sizes.
   2. Other Plants: Measure with stems, petioles, and foliage in their normal position.

D. Plant Material Inspection and Tagging: It is the prerogative of the Landscape Architect to inspect and select all plant material at the grower’s nursery prior to digging and upon delivery to the project site, for compliance with requirements for genus, species, variety, cultivar, size, and quality. Landscape Architect may also observe trees and shrubs further for size and condition of balls and root systems, pests, disease symptoms, injuries, and latent defects and may reject unsatisfactory or defective material at any time during progress of work. Remove rejected trees or shrubs immediately from Project site.
   1. Plants are subject to inspection and selection for overall form, vigor, and condition by the Landscape Architect with the Installer at the nursery source or place of growth. Plants designated as “balled and burlapped” shall be field-grown, and shall not be dug until inspected, approved and sealed by the Landscape Architect.

2. The Installer shall accompany the Landscape Architect on all source inspections, and shall make all necessary arrangements, provide transportation, and pay all expenses including travel, food, and lodging.
3. Coordinate with approved nurseries and with the Landscape Architect's nursery visits, to secure approved plants, and to confirm digging and shipping dates in conformance with the approved planting schedule. Arrange nursery visits as far in advance of the scheduled installation as possible, which will typically occur during the period running from September through February preceding the installation. In northern and snow-belt nurseries that are expected to become inaccessible during the winter, tagging shall be scheduled for completion prior to the onset of winter conditions. All tagging shall be completed by February 28. Summer and fall digging of deciduous plants will not be permitted without the Landscape Architect's approval.
4. All plants shall be delivered to the site with the Landscape Architect's permanent seals intact.

1.11 DELIVERY, STORAGE, AND HANDLING

A. Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of compliance with state and Federal laws if applicable.

B. Bulk Materials:
1. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing turf areas or plants.
2. Provide erosion-control measures to prevent erosion or displacement of bulk materials; discharge of soil-bearing water runoff; and airborne dust reaching adjacent properties, water conveyance systems, or walkways.
3. Accompany each delivery of bulk materials with appropriate certificates.

C. All plants shall be prepared and packed, and protected to ensure arrival at the site in good condition. They shall arrive fresh and properly dug, in sound, healthy, vigorous condition with healthy and well-developed tops and root systems, and with all parts moist and showing active green cambium when cut.

D. Do not prune trees and shrubs before delivery. Protect bark, branches, and root systems from sun scald, drying, wind burn, sweating, whipping, and other handling and tying damage. Do not bend or bind-tie trees or shrubs in such a manner as to destroy their natural shape. Provide protective covering of plants during shipping and delivery. Do not drop plants during delivery and handling.

E. Handle planting stock by root ball.

F. Store bulbs, corms, and tubers in a dry place at 60 to 65 deg F until planting.

G. Wrap trees and shrubs with burlap fabric over trunks, branches, stems, twigs, and foliage to protect from wind and other damage during digging, handling, and transportation. Remove all wrapping materials upon delivery to the site or while kept in holding yard.

H. Deliveries shall correspond to the planting schedule to ensure immediate planting. Deliver plants after preparations for planting have been completed, and install immediately. If planting is delayed more than six hours after delivery, set plants and trees in their

appropriate aspect (sun, filtered sun, or shade), protect from weather and mechanical damage, and keep roots moist.

1. Set balled stock on ground and cover ball with mulch or other acceptable material.
2. Do not remove container-grown stock from containers before time of planting.
3. Water root systems of plants stored on-site deeply and thoroughly with a drip irrigation system. Water as often as necessary to maintain root systems in a moist, but not overly wet condition.

1.12 FIELD CONDITIONS

A. Field Measurements: Verify actual grade elevations, service and utility locations, irrigation system components, and dimensions of plantings and construction contiguous with new plantings by field measurements before proceeding with planting work.

B. Planting Restrictions: Plant during one of the following periods. Coordinate planting periods with maintenance periods to provide required maintenance from date of Preliminary Acceptance. Planting shall progress only under favorable weather conditions and will not be permitted when the ground is frozen or excessively moist.

1. See Planting Schedule on Landscape Plans or as approved by Landscape Architect of Record.
2. If special conditions exist to justify a variance in the above planting dates, submit a written request to the Landscape Architect stating the special conditions and the proposed variance. Describe techniques in addition to those specified herein that will be employed to prevent dieback and mortality. No waiver of the plant guaranty will be granted for planting performed out-of-season.

C. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit planting to be performed when beneficial and optimum results may be obtained. Apply products during favorable weather conditions according to manufacturer's written instructions and warranty requirements.

D. Watering: The Installer shall bear sole responsibility for furnishing and applying all irrigation water, irrespective of whether or not an irrigation system is installed or operable. The Installer shall ensure that all irrigation water is applied at the proper frequency, coverage, and in proper amounts to fulfill the plant establishment and maintenance requirements of the Contract. The Installer’s responsibility for all watering shall begin upon delivery of plants the site, and shall continue through the end of the Warranty Period.

1. If no irrigation system is available, or if an available irrigation system is unsatisfactory to the Installer’s needs, then the Installer shall furnish and apply all irrigation water.
2. If an irrigation system is made available for the Installer’s use, and if the Installer elects to utilize this irrigation system; then the Installer shall accept total responsibility for ensuring that the system is satisfactorily adjusted and operated while utilized by the Installer.
3. If an irrigation system is to be provided or design/built under this Contract, and if the Installer elects to utilize this irrigation system; then the Installer shall coordinate with the irrigation designer, installer, and operator, and shall accept total responsibility for ensuring that the system is satisfactorily adjusted and operated while utilized by the Installer.

1.13 WARRANTY

A. Special Warranty: Installer agrees to repair or replace plantings and accessories that fail in materials, workmanship, or growth within specified warranty period.
   1. Failures include, but are not limited to, the following:
      a. Death and unsatisfactory growth.
      b. Structural failures including plantings falling or blowing over.
      c. Faulty performance of tree stabilization.
      d. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
   2. Warranty Periods: From date of Preliminary Acceptance of planting or upon Substantial Completion of the Contract, whichever occurs later.
      a. Trees, Shrubs, Vines, and Ornamental Grasses: 24 months, except that deciduous plants in a dormant condition on the date the warranty commences will be warranted for an additional period extending through June 1 of the next following spring.
      b. Ground Covers, Biennials, Perennials, and Other Plants: 12 months.
   3. Include the following remedial actions as a minimum:
      a. Immediately remove dead plants and replace unless required to plant in the succeeding planting season.
      b. Replace plants that are more than 25 percent dead or in an unhealthy condition at end of warranty period. Replace plants that have bark scald; foliage of abnormal density, size, and color; or that have more than 25 percent dead or dying branches and branch tips.
      c. Warranty replacement plants for an additional period of one year from date of replacement.
      d. Provide extended warranty for period equal to original warranty period, for replaced plant material.

1.14 ACCEPTANCE

A. The Landscape Architect will inspect all plant material for acceptance upon written request of the Installer. The request shall be received at least 10 calendar days before the anticipated date of inspection.

B. Acceptance of plant material will be granted for general conformance to the specified size, character, and quality, but will not relieve the Installer of responsibility for full conformance to the Contract Documents, including correct species.

C. Upon completion and re-inspection of all repairs or renewals necessary in the judgment of the Landscape Architect, the Landscape Architect will certify in writing that the plant material has been preliminarily accepted.

1.15 FINAL INSPECTION AND FINAL ACCEPTANCE

A. At the end of the Maintenance Period and upon written request of the Installer, the Landscape Architect will inspect all plant material for final acceptance. The request shall be received at least 10 calendar days before the anticipated date of inspection. Upon completion and re-inspection of all repairs and renewals necessary in the judgment of the Landscape Architect at that time, the Landscape Architect will certify in writing that the plant material has received final acceptance.

PART 2 - PRODUCTS

2.1 PLANT MATERIAL

A. General: Furnish nursery-grown plants true to genus, species, variety, cultivar, stem form, shearing, and other features indicated in Plant List, Plant Schedule, or Plant Legend indicated on Drawings and complying with ANSI Z60.1; and with healthy root systems developed by transplanting or root pruning within the last 2 years. Provide well-shaped, fully branched, healthy, vigorous stock, densely foliated when in leaf and free of disease, pests, eggs, larvae, and defects such as knots, sun scald, injuries, abrasions, and disfigurement.
   1. Trees with damaged, crooked, or multiple leaders; tight vertical branches where bark is squeezed between two branches or between branch and trunk ("included bark"); crossing trunks; cut-off limbs more than 3/4 inch in diameter; or with stem girdling roots are unacceptable.
   2. Collected Stock: Do not use plants harvested from the wild, from native stands, from an established landscape planting, or not grown in a nursery unless otherwise indicated.
   3. Plants shall have been grown under climatic conditions similar to those of the project site.
   4. Balled and burlapped plants shall be moved as solid units having firm natural balls of soil of sufficient size to encompass the fibrous and feeding root system to ensure full and prompt plant recovery. Plants with loose, manufactured, cracked, broken, or undersized balls will be rejected.

B. Form and Structure: Unless indicated otherwise in Plant List shown on Drawings, deciduous and evergreen trees shall comply with the following;
   1. Habit of growth shall be typical of the species or variety; heavy, symmetrical, well branched and proportioned, and densely foliated when in leaf.
   2. Trees shall have a single, relatively straight vertical trunk and central leader. Deciduous shade trees shall be free of major branches up to a height of at least 6-feet unless otherwise specified. Evergreen and clump-form trees shall have dense compact growth branched to the ground unless otherwise specified.
   3. Trees shall be free of codominant stems and vigorous, upright branches that complete with the central leader. If the original leader has been headed, a new leader at least one-half of the diameter of the original leader shall be present.
   4. Main branches shall be well-distributed along the central leader, and not clustered together. They shall form a balanced crown appropriate for the cultivar or species.
   5. Branch diameter shall be no larger than two-thirds (one-half is preferred) the diameter of the central leader measured 1 inch above the branch.
   6. The attachment of the largest branches (scaffold branches) shall be free of included bark.

C. Provide plants of sizes, grades, and ball or container sizes complying with ANSI Z60.1 for types and form of plants required. Plants of a larger size may be used if acceptable to Landscape Architect, with a proportionate increase in size of roots or balls.

D. Root-Ball Depth: Furnish trees and shrubs with root balls measured from top of root ball, which begins at root flare according to ANSI Z60.1. Root flare shall be visible before planting.

E. Labeling: Label at least one plant of each variety, size, and caliper with a securely attached, waterproof tag bearing legible designation of common name and full scientific name, including genus and species. Include nomenclature for hybrid, variety, or cultivar, if applicable for the plant.

F. If formal arrangements or consecutive order of plants is indicated on Drawings, select stock for uniform height and spread, and number the labels to assure symmetry in planting.

2.2 FERTILIZERS

A. Planting Tablets: Tightly compressed chip-type, long-lasting, slow-release, commercial-grade planting fertilizer in tablet form. Tablets shall break down with soil bacteria, converting nutrients into a form that can be absorbed by plant roots.
   1. Nutrient Composition: 20 percent nitrogen, 10 percent phosphorous, and 5 percent potassium, by weight plus micronutrients.

2.3 MULCHES

A. Organic Mulch: Free from deleterious materials and suitable as a top dressing of trees and shrubs, consisting of one of the following:
   1. Type: Double-shredded softwood bark composed primarily of pine and spruce bark. Aged not less than 9 months. Sample to be approved.
   2. Color: Natural brown to match campus standard.

2.4 TREE-STABILIZATION MATERIALS

A. Tree-Stabilization Materials:
   1. Upright and Guy Stakes: Rough-sawn, sound, new hardwood, free of knots, holes, cross grain, and other defects, 2-by-2-inch actual dimensions by length indicated, pointed at one end.
   2. Guys and Tie Wires: ASTM A 641/A 641M, Class 1, galvanized-steel wire, two-strand, twisted, 0.106 inch in diameter.
   3. Tree-Tie Webbing: UV-resistant polypropylene or nylon webbing with brass grommets.
   4. Flags: Standard surveyor's plastic flagging tape, white, 6 inches long.
   5. Proprietary Staking-and-Guying Devices: Proprietary stake or anchor and adjustable tie systems to secure each new planting by plant stem; sized as indicated and according to manufacturer's written recommendations.
      a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
         1) Foresight Products, LLC; Duckbill Professional Tree Guy System.

2.5 TREE-WATERING DEVICES

A. Slow-Release Watering Device: Standard product manufactured for drip irrigation of plants and emptying its water contents over an extended time period; manufactured from UV-light-stabilized nylon-reinforced polyethylene sheet, PVC, or HDPE plastic.
   1. Products: Subject to compliance with requirements, available products that may be incorporated in the Work include, but are not limited to, the following:

a. Spectrum Products, Inc.: Treegator.

2.6 MISCELLANEOUS PRODUCTS

A. Antidesiccant: Water-insoluble emulsion, permeable moisture retarder, film forming, for trees and shrubs. Deliver in original, sealed, and fully labeled containers and mix according to manufacturer's written instructions.

B. Mycorrhizal Fungi: Dry, granular inoculant containing at least 5300 spores per lb of vesicular-arbuscular mycorrhizal fungi and 95 million spores per lb of ectomycorrhizal fungi, 33 percent hydrogel, and a maximum of 28 percent inert material.

C. Free-Draining Material: Sand, gravel, stone or mixtures thereof, with not more than 70 percent by weight passing the No. 40 mesh sieve and not more than 10 percent by weight passing the No. 200 sieve.

D. Deer Repellant: Commercial product with documented deer-deterrent properties.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas to receive plants, with Installer present, for compliance with requirements and conditions affecting installation and performance of the Work.
   1. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in soil within a planting area.
   2. Verify that plants and vehicles loaded with plants can travel to planting locations with adequate overhead clearance.
   3. Suspend planting operations during periods of excessive soil moisture until the moisture content reaches acceptable levels to attain the required results.
   4. Uniformly moisten excessively dry soil that is not workable or which is dusty.

B. If contamination by foreign or deleterious material or liquid is present in soil within a planting area, remove the soil and contamination as directed by Landscape Architect and replace with new planting soil.

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

3.2 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities and turf areas and existing plants from damage caused by planting operations.

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

C. Lay out individual tree and shrub locations and areas for multiple plantings. Stake locations, outline areas, adjust locations when requested, and obtain Landscape Architect's acceptance of layout before excavating or planting. Make adjustments as directed.
   1. Plant locations on the Drawings are approximate and are to be used only as a guide. Installer shall accurately stakeout plant locations and bed outlines. Do not begin planting excavations until the Landscape Architect has approved or adjusted the stakeouts. Prior to installation, modify plant locations within the project area as directed by the Landscape Architect without additional cost to the Owner.
   2. Unless otherwise indicated, massed plantings and rows of shrubs, perennials, and grasses are to be installed in a staggered triangular or diagonal configuration. Straight, square rows will not be accepted.

3.3 PLANTING AREA ESTABLISHMENT

A. General: Prepare planting area for soil placement and mix planting soil according to Section 329116 - Topsoil and Planting Mix.

B. Placing Planting Soil: Place prepared planting soil over exposed subgrade.

C. Before planting, obtain Landscape Architect's acceptance of finish grading; restore planting areas if eroded or otherwise disturbed after finish grading.

D. Application of Mycorrhizal Fungi: Broadcast dry product uniformly over prepared soil at application rate according to manufacturer's written recommendations.

3.4 EXCAVATION FOR TREES AND SHRUBS

A. Planting Pits and Trenches: Excavate circular planting pits.
   1. Excavate planting pits with sides sloping inward at a 45-degree angle. Excavations with vertical sides are unacceptable. Trim perimeter of bottom leaving center area of bottom raised slightly to support root ball and assist in drainage away from center. Do not further disturb base. Ensure that root ball will sit on undisturbed base soil to prevent settling. Scarify sides of planting pit smeared or smoothed during excavation.
   2. Excavate approximately three times as wide as ball diameter for balled and burlapped, and container-grown stock.
   3. Do not excavate deeper than depth of the root ball, measured from the root flare to the bottom of the root ball.
   4. If area under the plant was initially dug too deep, add soil to raise it to the correct level and thoroughly tamp the added soil to prevent settling.
   5. Maintain angles of repose of adjacent materials to ensure stability. Do not excavate subgrades of adjacent paving, structures, hardscapes, or other new or existing improvements.
   6. Maintain supervision of excavations during working hours.
   7. Keep excavations covered or otherwise protected when unattended by Installer's personnel.

B. Continuous Planting Beds for Shrubs:
   1. Excavate shrub beds to a minimum depth of 18″ with sides sloping inward at a 45-degree angle. Loosen subgrade by dragging with teeth of bucket 3″ to 6″ deep.

Install first lift of planting soil immediately and do not allow loosened subgrade to become compacted.

2. Install planting soil in 2 equal lifts. Compact each lift to a minimum of 75 percent and a maximum of 82 percent of Standard Proctor Density. Scarify between lifts by dragging with the teeth of bucket.
3. Excavate circular planting pits in continuous beds aft the planting soil has been installed in continuous beds.

C. Backfill Soil: Subsoil and topsoil removed from excavations may not be used as backfill soil unless otherwise indicated.

D. Obstructions: Notify Landscape Architect if unexpected rock or obstructions detrimental to trees or shrubs are encountered in excavations.

E. Drainage: Notify Landscape Architect if subsoil conditions evidence unexpected water seepage or retention in tree or shrub planting pits.

3.5 RAISED PLANTERS

A. Install crushed stone, geotextile fabric, and Planting Soil Type 3 – Planter Mix as detailed.

3.6 TREE AND SHRUB PLANTING

A. Inspection: At time of planting, verify that root flare is visible at top of root ball according to ANSI Z60.1. If root flare is not visible, remove soil in a level manner from the root ball to where the top-most root emerges from the trunk. After soil removal to expose the root flare, verify that root ball still meets size requirements.

B. Roots: Remove stem girdling roots and kinked roots. Remove injured roots by cutting cleanly; do not break.

C. Balled and Burlapped Stock: Set each plant plumb and in center of planting pit or trench with root flare 2 inches above adjacent finish grades.
1. Backfill: Planting mixture Type 1 or Type 2.
2. After placing some backfill around root ball to stabilize plant, carefully cut and remove burlap, rope, and wire baskets from tops of root balls and from sides, but do not remove from under root balls. Remove pallets, if any, before setting. Do not use planting stock if root ball is cracked or broken before or during planting operation.
3. Backfill around root ball in layers, tamping to settle soil and eliminate voids and air pockets. When planting pit is approximately one-half filled, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed.
4. Place planting tablets equally distributed around each planting pit when pit is approximately one-half filled. Place tablets beside the root ball about 1 inch from root tips; do not place tablets in bottom of the hole.
    a. Quantity: According to manufacturer’s written recommendations.
5. Continue backfilling process. Water again after placing and tamping final layer of soil.

D. Container-Grown Stock: Set each plant plumb and in center of planting pit or trench with root flare 2 inches above adjacent finish grades.
1. Backfill: Planting mixture Type 1 or Type 2.

2. Carefully remove root ball from container without damaging root ball or plant.
3. Backfill around root ball in layers, tamping to settle soil and eliminate voids and air pockets. When planting pit is approximately one-half filled, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed.
4. Place planting tablets equally distributed around each planting pit when pit is approximately one-half filled. Place tablets beside the root ball about 1 inch from root tips; do not place tablets in bottom of the hole.
   a. Quantity: According to manufacturer's written recommendations.
5. Continue backfilling process. Water again after placing and tamping final layer of soil.

E. Slopes: When planting on slopes, set the plant so the root flare on the uphill side is flush with the surrounding soil on the slope; the edge of the root ball on the downhill side will be above the surrounding soil. Apply enough soil to cover the downhill side of the root ball.

3.7 TREE AND SHRUB PRUNING

A. Prune, thin, and shape trees, shrubs, and vines as directed by the Landscape Architect.
   1. Remove only dead, dying, or broken branches. Do not prune for shape unless otherwise directed by the Landscape Architect. Make clean cuts as close as possible to the trunk or parent branch without cutting into the branch collar or leaving a stub.

B. Do not apply pruning paint to wounds.

3.8 TREE STABILIZATION

A. Trunk Stabilization by Upright Staking and Tying: Install trunk stabilization as follows unless otherwise indicated on Drawings:
   1. Upright Staking and Tying: Stake trees of up to 5-inch caliper. Use a minimum length required to penetrate at least 12-inches below bottom of backfilled excavation and to extend to the dimension indicated on Drawings above grade. Set vertical stakes and space to avoid penetrating root balls or root masses.
   2. Support trees with two strands of tie wire, connected to the brass grommets of tree-tie webbing at contact points with tree trunk. Allow enough slack to avoid rigid restraint of tree.

B. Trunk Stabilization by Staking and Guying: Install trunk stabilization as follows unless otherwise indicated on Drawings. Stake and guy trees more than 14 feet in height and more than 3 inches in caliper unless otherwise indicated.
   1. Proprietary Staking and Guying Device: Install staking and guying system sized and positioned as recommended by manufacturer unless otherwise indicated and according to manufacturer's written instructions.

3.9 GROUND COVER AND PLANT PLANTING

A. Set out and space ground cover and plants other than trees, shrubs, and vines as indicated on Drawings in even rows with triangular spacing.

B. Use planting soil mixture Type 1 or Type 2 for backfill.

C. Dig holes large enough to allow spreading of roots.

D. For rooted cutting plants supplied in flats, plant each in a manner that minimally disturbs the root system but to a depth not less than two nodes.

E. Work soil around roots to eliminate air pockets and leave a slight saucer indentation around plants to hold water.

F. Water thoroughly after planting, taking care not to cover plant crowns with wet soil.

G. Protect plants from hot sun and wind; remove protection if plants show evidence of recovery from transplanting shock.

3.10 PLANTING AREA MULCHING

A. Mulch backfilled surfaces of planting areas and other areas indicated.
   1. Trees and Treelike Shrubs in Turf Areas: Apply organic mulch ring of 2-inch average thickness around trunks or stems. Do not place mulch within 6 inches of trunks or stems.
   2. Organic Mulch in Planting Areas: Apply 2-inch average thickness of organic mulch over whole surface of planting area, and finish level with adjacent finish grades. Do not place mulch within 6 inches of trunks or stems.

3.11 EDGING INSTALLATION

A. Shovel-Cut Edging: Separate mulched areas from turf areas, curbs, and paving with a 45-degree, 4- to 6-inch-deep, shovel-cut edge.

3.12 INSTALLING SLOW-RELEASE WATERING DEVICE

A. Provide one device for each tree.

B. Place device on top of the mulch at base of tree stem and fill with water according to manufacturer's written instructions.

3.13 PLANT MAINTENANCE

A. Maintain plantings by pruning, cultivating, watering, weeding, fertilizing, mulching, restoring planting saucers, adjusting and repairing tree-stabilization devices, resetting to proper grades or vertical position, and performing other operations as required to establish healthy, viable plantings.

B. Fill in, as necessary, soil subsidence that may occur because of settling or other processes. Replace mulch materials damaged or lost in areas of subsidence.

C. Keep plant materials, planted areas, and soils free of pests and pathogens or disease. Use integrated pest management practices acceptable to authorities having jurisdiction. Treatments include physical controls such as hosing off foliage, mechanical controls such as traps, and biological control agents.

D. Heavily water woody plants in late fall, after leaf drop and before the ground freezes.

E. Provide early spring clean-up of perennial and ornamental grass beds before new growth starts. Cut back and remove dead top growth, repair damage, remove weeds, refresh mulch, and re-edge beds.

F. Upon Final Acceptance at end of Maintenance Period, remove tree-stabilization devices and planting saucers. Dress with mulch.

3.14 DEER REPELLANT AND DETERRENT PRGRAM

A. Provide the services of a specialized provider of deer repellant and deterrent services for all plantings susceptible to deer damage during the maintenance and guaranty period. Targeted plantings shall include, but are not limited to, plants of the Ilex and Euonymus genera. Services shall include a site assessment to determine deer feeding patterns to develop a site-specific repellant and deterrent program, including:
   1. A proprietary treatment program of foliar repellants based on the specific time of year, amount of deer pressure, and client preferences.
   2. Continuously adjusting and modifying treatments to prevent deer adaptation.

B. Basis-of-Design: DeerTech available from SavATree Consulting Group Branch (571) 282-2500.

3.15 REPAIR AND REPLACEMENT

A. General: Repair or replace existing or new trees and other plants that are damaged by construction operations, in a manner approved by Landscape Architect.
   1. Submit details of proposed pruning and repairs.
   2. Perform repairs of damaged trunks, branches, and roots within 24 hours, if approved.
   3. Replace trees and other plants that cannot be repaired and restored to full-growth status, as determined by Landscape Architect.

3.16 CLEANING AND PROTECTION

A. During planting, keep adjacent paving and construction clean and work area in an orderly condition. Clean wheels of vehicles before leaving site to avoid tracking soil onto roads, walks, or other paved areas.

B. Remove surplus soil and waste material including excess subsoil, unsuitable soil, trash, and debris and legally dispose of them off Owner's property.

C. Protect plants from damage due to landscape operations and operations of other contractors and trades. Maintain protection during installation and maintenance periods. Treat, repair, or replace damaged plantings.

D. After installation and before Preliminary Acceptance, remove nursery tags, nursery stakes, tie tape, labels, wire, burlap, and other debris from plant material, planting areas, and Project site.

E. Remove any temporary irrigation systems for plant establishment within 18 months of the start of the Maintenance Period.

3.17 MAINTENANCE SERVICE

A. Maintenance Service for Trees and Shrubs: Provide maintenance by skilled employees of landscape Installer. Maintain as required in "Plant Maintenance" Article. Begin maintenance immediately after plants are installed and continue until plantings are acceptably healthy and well established, but for not less than maintenance period below:
   1. Maintenance Period: 12 months from date of Preliminary Acceptance or upon Substantial Completion of the contract, whichever occurs later.

B. Maintenance Service for Ground Cover and Other Plants: Provide maintenance by skilled employees of landscape Installer. Maintain as required in "Plant Maintenance" Article. Begin maintenance immediately after plants are installed and continue until plantings are acceptably healthy and well established, but for not less than maintenance period below:
   1. Maintenance Period: 12 months from date of Preliminary Acceptance or upon Substantial Completion of the contract, whichever occurs later.

C. A sum sufficient to cover the cost of possible replacement plants will be held by the Owner until the satisfactory completion of the Maintenance Period.

END OF SECTION 329300

SECTION 331000 – WATER UTILITIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors, and/or suppliers providing goods or services referenced in or related to this Section shall also be bound by the Documents identified in Division 01.

1.2 SUMMARY

A. Section Includes:

1. Water piping.
2. Tapping sleeves and valves.
3. Valves and fire hydrants.
4. Anchors, thrust blocks/restraints, and other system appurtenances.
5. Connections to existing water systems.
6. Disinfection and testing of relocated hydrant and appurtenances.

B. The requirements herein established regulate the sizes, materials, methods and workmanship to be used in the construction of domestic and fire water services and appurtenances connected or intended to be connected directly or indirectly to any public water mains of the Metropolitan District Commission (MDC), as provided in Section W5c of the Ordinances of The Metropolitan District Relating to Water Supply.

C. Where this specification differs to MDC standards, MDC standards shall be used.

D. These requirements are minimum requirements for the construction of water service connections but shall also apply to the construction of any water main or portion of a water main.

E. Contractor shall coordinate work between all Contractors, sections, and trades required for the proper completion of the work.

F. Contractor is solely responsible for obtaining permits or approvals which may be required to perform the work of this section, including all costs, fees and taxes required or levied. Notify and obtain such permits or approvals from MDC prior to starting work.

1.3 REFERENCES

A. Reference herein to any technical society, organization, group or regulation are made in accordance with the following abbreviations and, unless otherwise noted or specified, all work under this Section shall conform to the latest edition as applicable.

B. B. Code of Federal Regulations (CFR)

1. 29 CFR 1926, Safety and Health Regulations for Construction

C. American Society for Testing Materials (ASTM)

1. ASTM F477 - Elastomeric Seals (Gaskets) for Joining Plastic Pipe
2. ASTM D3139 - Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals
3. ASTM A536 - Ductile Iron Castings
4. ASTM D1557 - Compaction Characteristics of Soil Using Modified Effort (56,000 ftlbf/ft3(2,700 kN-m/m3))

D. American National Standards Institute (ANSI)

1. ANSI A21.50 - Thickness Design of Ductile-Iron Pipe
2. ANSI A21.51 - Ductile-Iron Pipe, Centrifugally Cast, for Water
3. ANSI A21.4 - Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water
4. ANSI A21.10 - Ductile-Iron and Gray-Iron Fittings, 3 in through 48 in (75 mm through 1200 mm), for Water and Other Liquids
5. ANSI 61 - Drinking Water System Components - Health Effects

E. American Waterworks Association (AWWA)

1. AWWA C150 - Thickness Design of Ductile-Iron Pipe
2. AWWA C151 - Ductile-Iron Pipe, Centrifugally Cast, for Water or Other Liquids
3. AWWA C104 - Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water
4. AWWA C110 - Ductile-Iron and Gray-Iron Fittings for Water
5. AWWA C550 - Protective Epoxy Interior Coatings for Valves and Hydrants
6. AWWA C111 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
7. AWWA C900 - Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 In.-12 In. (100 mm-300 mm), for Water Transmission and Distribution
8. AWWA C509 - Resilient-Seated Gate Valves for Water Supply Service
9. AWWA C504 - Rubber-Seated Butterfly Valves
10. AWWA C502 - Dry-Barrel Fire Hydrants
11. AWWA C207 - Steel Pipe Flanges for Waterworks Service, Sizes 4 In. Through 144 In. (100 mm Through 3,600 mm)
12. AWWA C800 - Underground Service Line Valves and Fittings (Also Included: Collected Standards for Service Line Materials)
13. AWWA C651 - Disinfecting Water Mains

F. National Science Foundation (NSF)

1. NSF 61 - Drinking Water System Components - Health Effects

1.4 State of Connecticut Department of Transportation (ConnDOT), Standard Specifications for Roads, Bridges, Facilities and Incidental Construction, Form 819. Coordinate with the MDC and jurisdictional authorities.

A. Contractor shall notify and coordinate the work of this Section with the MDC.

B. Contractor shall obtain all required approvals for connection to, or extension of, any portion of the domestic or fire protection water systems.

C. The closing of valves necessary for making connections with the existing water systems will be done by Contractor with the assistance of Engineer. Sufficient notice shall be given

the jurisdictional authority for a planned connection. No allowance will be made for any delay in the closing of valves. A 48-hour notice shall be given to adjacent buildings/residences affected by the shutdown, and shall be done by Contractor to the satisfaction of the MDC and Engineer. MDC or Engineer may require the work be completed outside of normal working hours during low use time periods.

1.5 CONTRACTOR'S APPLICATION, BOND, AND INSURANCE

A. In order to be permitted to install water service connections to the District system, the contractor shall submit a completed Application for Eligibility, Bond and Insurance, which information will be kept on file for future reference.

B. The Application for Eligibility form must indicate that applicants possess proper state licensing. A valid state license (P-1, P-2, P-3, P-4, P-6 or P-7) for plumbing/piping is required prior to obtaining a water service permit. State Fire Protection Sprinkler licenses (F-1, F-2, F-3 and F-4) are limited to fire protection sprinkler installations only. Authorized individuals representing the licensee are required to sign the water service connection application forms. Coordinate with MDC.

C. Prior to the District approving the application for a water service connection, the applicant shall present the required permit for street excavation from the proper local or state authority and the Call-Before-You-Dig ticket number.

D. Contractor's Bond shall be executed by the surety company's agent, including the name of the contractor, name of responsible state licensee, name of surety and proper signatures. Coordinate with MDC.

E. The Certificate of Insurance shall include coverage's for General Liability with the Metropolitan District added as additional insured, Automotive Liability, Protective Liability in the name of the Metropolitan District (with the policy) and Workers' Compensation and Employers' Liability. The amount of insurance coverage shall meet the prevailing minimum requirements and be presented on the District's Certificate of Insurance. Coordinate with MDC.

F. Water service connection applications will only be approved once all forms are completed and approved by the District for eligibility, bond, insurance and after all assessment costs, if any, are paid or time payment plan and voluntary lien are completed by the property owner. Coordinate with MDC.

1.6 SAFETY

A. Contractor shall comply with all pertinent provisions of CFR Chapter XVII Parts 1910 and Parts 1926.

B. Contractor alone shall be responsible for the safety, efficiency and adequacy of its plant, appliances and methods, and for any damage or injury which may result from their failure or the improper construction, maintenance or operation.

C. Contractor shall properly design and furnish all labor, materials, equipment, and tools necessary to completely construct the excavation support system, permanent or temporary, including sheet piling, trench shields (trench boxes), timber trench shoring, pneumatic/hydraulic shoring, steel sheeting or sheeting using other materials, sloping and

benching. All of the proper materials and all equipment necessary to protect employees in excavations against cave-ins shall be furnished and installed. Also, all employees and the general public shall be protected from hazards related to the construction. Adequate support systems shall also protect people from equipment which might fall or roll into an excavation, utilities within or adjacent to the excavation or which is impacted by operations under the construction.

D. If, in the opinion of the District, the Contractor has failed to maintain a safe trench and work area, District forces shall refuse to enter the trench until safety concerns are satisfied. This requirement shall not in any way relieve the Contractor of complete responsibility and liability for maintaining a safe and adequate trench excavation at all times and at any depth.

1.7 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.8 SUBMITTALS

A. Product Data:

1. Water piping.
2. Tapping sleeves and valves.
3. Valves and fire hydrants.
4. Anchors, thrust blocks/restraints, and other system appurtenances

B. Field Quality-Control Reports: For piping and pipe accessories.

C. Qualifications Statements: For manufacturer and installer.

D. Shop Drawings

1. Submit Shop Drawings or descriptive literature, or both, showing dimensions, joints and other details of all pipe materials and appurtenances to be furnished. Shop Drawings shall be submitted to Engineer for approval prior to ordering materials.

E. As-Built Drawings

1. Submit 3 copies of As-Built Drawings upon completion and acceptance of work.
2. As-Built Drawings shall be complete and shall indicate the true measurements and locations, horizontal and vertical, of all new construction. As-Built Drawings shall include a minimum of three ties to each gate valve box from fixed permanent objects. As-Built Drawings shall also contain the location of service lines and any additional information required by Engineer, and shall be stamped with the seal of a Licensed Land Surveyor or Licensed Professional Engineer.

1.9 CLOSEOUT SUBMITTALS

A. Project Record Documents: Record actual locations of piping mains, valves, connections, thrust restraints, and invert elevations.

1.10 QUALITY ASSURANCE

A. Manufacturers Qualifications: Company specializing in manufacturing products specified in this Section.

B. Installers Qualifications: Company specializing in performing Work of this Section.

C. Use equipment of adequate size, capacity and quantity to accomplish the work of this Section in a timely manner.

D. Maintain all temporary facilities and controls in proper and safe condition throughout the progress of the work.

1.11 DELIVERY, STORAGE, AND HANDLING

A. Storage of pipe, fittings, valves, hydrants and other water line appurtenances on the site shall be in accordance with the manufacturer's recommendations, subject to the approval of MDC and the Engineer.

B. Care shall be taken in loading, transporting and unloading to prevent injury to the pipe, fittings, valves, hydrants, and other water line appurtenances. Pipe or fittings shall not be dropped. All pipe or fittings shall be examined before laying and no piece shall be installed which is found to be defective. Any damage to pipe and fitting coatings shall be repaired as directed by MDC or the Engineer.

C. Pipe, fittings, valves, hydrants and other water system appurtenances which are defective from any cause, including damage caused by handling, and determined by the Engineer as non-repairable, shall be unacceptable for installation and shall be replaced at no cost to the Owner.

D. Pipe, and all water system appurtenances that are damaged or disturbed through any cause prior to acceptance of the work shall be repaired, realigned or replaced as required by Engineer at no additional cost to the Owner.

PART 2 - PRODUCTS

2.1 GENERAL

A. The Drawings are diagrammatic only and are intended to indicate the extent, but not all details, of the system, which shall be constructed. All materials and fittings are not shown; but the Contractor shall furnish and install all materials and fittings required for the complete system.

2.2 DUCTILE IRON PIPE

A. Conform to MDC Design Standards and Approved Materials List.

2.3 DUCTILE IRON PIPE FITTINGS

A. Conform to MDC Design Standards and Approved Materials List.

2.4 DUCTILE IRON PIPE COUPLINGS

A. A. Conform to MDC Design Standards and Approved Materials List.

2.5 DUCTILE IRON PIPE JOINTS

A. Conform to MDC Design Standards and Approved Materials List.

2.6 GATE VALVES

A. Conform to MDC Design Standards and Approved Materials List.

2.7 BUTTERFLY VALVES

A. Conform to MDC Design Standards and Approved Materials List.

2.8 VALVE BOXES

A. Conform to MDC Design Standards and Approved Materials List.

2.9 HYDRANTS

A. Conform to MDC Design Standards and Approved Materials List.

B. Hydrants shall be given two coats of primer paint before shipment. Contractor shall field paint the hydrant, the color required by the jurisdictional authority, after installation.

2.10 TAPPING SLEEVE AND VALVE

A. Conform to MDC Design Standards and Approved Materials List.

2.11 THRUST BLOCKS

A. Thrust restraints (concrete thrust blocks and/or clamps and tie rods) shall be installed in accordance with the details shown on the Drawings and as required by MDC.

B. Contractor shall discuss with the MDC the method to be used to restrain thrust prior to installing fittings and hydrants. Test pits may be required in areas of existing utilities to determine the exact location and dimensions of thrust restraints required.

C. Concrete for thrust blocks shall have a minimum 28-day compressive strength of 4,000 psi.

2.12 CORPORATION STOPS AND CURB STOPS

A. Conform to MDC Design Standards and Approved Materials List.

2.13 SERVICE BOXES

A. Conform to MDC Design Standards and Approved Materials List.

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 public water utility distribution piping to verify actual locations of piping connections before equipment installation.

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

3.1 TRENCH EXCAVATION

A. Contractor shall fully comply with the State of Connecticut Public Act No. 77-350 in regards to the proper notification to be given the Call-Before-You-Dig central clearinghouse 1-800-922-4455 prior to any excavation, discharging explosives or demolition and to all other actions concerning work near underground utility facilities.

B. Trenching in streets or highways shall conform to the requirements and specifications of the state, city or towns authorities having jurisdiction.

C. Contractor is responsible for the trench excavation and restoration and shall provide a safe and adequate trench for the tapping of the water main by District forces.

D. The District requires a minimum depth of 4.5 feet of cover over most water service pipes and shall be laid on a sand bed with 2′ minimum of bank gravel cover.

E. Excavations shall be made in such manner and to such width as required to give suitable room for laying the piping or for construction of structures; all sheeting, bracing, and supports shall be furnished and placed and the bottoms of the excavations shall be rendered firm and dry and acceptable in all respects.

F. Excavating near existing structures- Attention is directed to the fact that there are pipes, manholes, drains, and other utilities and structures in certain locations. The Contractor should exercise caution when excavating especially on private property, because the completeness or accuracy of the given information is not guaranteed.

G. Trenches in pavement shall have the traveled way surface cut in a straight line by a concrete saw or equivalent method to the full depth of pavement.

H. If pipe is to be laid in embankments or other recently filled areas, the fill material shall first be placed to a height of at least three feet above the top of the pipe and compacted before excavation.

I. The trench for pipes 4-inches and larger shall be at least 18-inches beyond the outside of the barrel of the pipe on each side, the top of the barrel of the pipe shall be as shown on the approved drawings and the bottom of the trench shall be at the bottom of the pipe.

J. Pipe trenches shall be made as narrow as practicable and shall not be widened by scraping or loosening materials from the sides. Every effort shall be made to keep the sides of the trenches firm and undisturbed until backfilling has been completed and consolidated.

K. In rock excavation there shall be no projecting rock within six (6) inches of the outside of the pipe on the sides, top and bottom. The bottom six (6) inches of trench shall be refilled with sand or gravel and properly tamped before the pipe is laid. All excavated rock shall be disposed of and the trench refilled with suitable sand or gravel.

3.2 WATER SERVICE TAP SCHEDULE

A. Subsequent to approval of the water service application, the applicant should contact the Operations Department of The Metropolitan District at 860-278-7850, extension 3614 or 3615 to schedule a water main tap.

3.3 INSPECTION

A. After the tap has been made by District Forces, the Contractor shall contact the South Meadows Service Center, 60 Murphy Road, Hartford 860-278-7850 to request an inspection. Do not backfill the service installation until approved by the District inspector.

B. Personnel of the District tap crew are not to be construed as inspectors.

C. In general, inspectors will be available between the hours of 8:00 a.m. to 3:30 p.m. on Monday through Friday inclusive. Inspection outside the hours of a normal 5-day work week must be pre-arranged and a fee shall be paid to The Metropolitan District at its office at 60 Murphy Road, Hartford, Connecticut 06114.

D. Water service connections 2-inch and smaller, serving buildings to be abandoned, demolished or relocated shall be physically severed while witnessed by a District inspector. Proposed abandoned water service connections larger than 2-inches shall be bulkheaded at the street line or other point approved by the District. If the owner has decided not to utilize the property then a letter should be sent to the District requesting the water service be severed at the main line. Abandonment of water services must be performed by a licensed plumber under District permit prior to demolition of the building.

E. Services 1″, 1-1/2″ and 2″

1. All service pipes installed shall be visible for the entire length of the trench and shall be inspected for type of pipe and for water tightness in the presence of the District inspector.
2. Water services before the meter of 1″, 1½″ and 2″ size shall be of type K copper tubing. No other material is allowed.
3. Pipe shall not be laid in a trench with other pipes or conduits unless separated from the other pipes or conduits by at least 2 feet and laid on undisturbed earth. Service pipes shall be laid at least 10 feet away from any septic tank leaching field. The inspector, where possible, should see that the service will not be under entrance walks, driveways, trees, large boulders or other obstructions and in the case of renewal of old services should recommend renewing, in a new location in order to avoid any of these obstructions.
4. Under unusual circumstances where suitable conditions exist, and with the approval of the District and the City, Towns or State of Connecticut Department of

Transportation a water service may be "blown" through an area where open excavation may not be desirable. This operation must be done in the presence of the District inspector.

5. If the service pipe on the owner's property is installed prior to the installation of that part of the service to be installed in the street the Contractor will pressure test his installation to 100 lbs. per square inch.
6. All service pipe shall be laid, so far as practical in a straight line from the main to the inside front cellar wall. No permit for service on the owners property will be issued prior to the construction of the foundation walls.
7. If the building has no cellar or has no suitable place for the meter, the meter shall be placed in a suitable housing or pit, provided and maintained by the owner on his property, at or near the street line. Crawl spaces are not considered suitable places for water meters. The owner will install a meter box or meter pit, at his expense.

F. Fully Excavated Cellars:

1. The service pipe shall preferably enter the front wall of the building with a gate valve of the same nominal size as the pipe immediately inside this wall. Beyond this valve the meter couplings, spacer, bypass and backflow prevention device if required shall be installed by the Plumber.
2. The property owner is responsible for any damage to the meter which must be accessible for reading, changing and maintenance during regular working hours of the District. Conditions such as a septic tank leeching field in the front lawn may necessitate moving the service. The point of entry may be either through the front wall, or through the side wall, generally not more than 24" beyond the inside face of the wall. The pipe shall enter the side wall on a smooth curve, free from any distortion or kinks. In special cases where plans or other proof is submitted to show that the meter would be in a finished room, such as recreation or living quarters, if standard practice were followed, the meter installation will be allowed just beyond the second wall provided all other requirements are approved, the pipe being extended either along the side of the house or under the floor contained in a sleeve extending from the front wall to the second or partition wall.

G. Partially Excavated Cellars:

1. Where the excavated portion of the cellar is adjacent to the front wall, the service may enter at any point along the front wall, or through either sidewall on a smooth curve of radius not less than 24" and shall be free from any distortion or kinks.
2. Where the excavated portion is located to the rear of the house and is adjacent to either side wall, the service shall be laid parallel to the side wall, and shall enter the wall as directed in 1).
3. Where the excavated portion of the cellar is located to the rear but is not adjacent to either side wall or front wall, the usual meter setting will be allowed at the wall facing the street provided the service is contained in a sleeve or duct under the unexcavated portion of the building. Any other condition will require a meter pit located at the street line.

H. 4" & Larger Services

1. The ductile iron pipe used in 4", 6" and 8" services shall be Class 54, all fittings shall have a pressure rating of 350 lbs. per square inch. All services 4" and larger whether

for domestic or fire use, shall be provided with a gate valve and gate box at the main, as well as the property line.

2. Bends, tees, and other fittings shall be restrained. Ductile iron pipe shall be laid flat on the solid trench bottom and not on blocks. It shall not be poured or cemented solidly into concrete walls or foundations. Mechanical joint pipe or push on joint pipe may be used. All fittings shall be mechanical joint unless otherwise specified.
3. All underground pipe in fire services and all pipe before the meters in domestic services shall be pressure tested in the presence of the inspector at a pressure of 150 lbs. per square inch for domestic services and 200 lbs. per square inch for fire services.
4. Fire service pressure tests may also require witnessing by the local fire authority.
5. Construction of meter pits including by-pass lines shall be checked and approved by the inspector prior to installation of meter. Meter pit piping details for large diameter water services are shown in Part 3 of this manual. Standard meter pit details showing pipe arrangement and meter dimensions should be used for all installations requiring meter pits. Piping arrangement in pits should be reviewed and approved by MDC prior to installation. Approved meter by-passes are required on all services, 1½" in size and larger.
6. Individual properties may receive their supply through one or more service pipes. In case of multiple services, each shall be metered and shall not be interconnected without the installation of approved check valves by the owner.
7. Water services shall not be connected to newly installed water main until the new main has been satisfactorily pressure tested and sterilized.
8. The use of lead solder joints on copper pipe for by-pass, and piping at the meter where acceptable, shall be made with 95/5 solder. DO NOT USE 50/50 SOLDER.

3.4 BACKFILL OPERATIONS

A. After the subgrade has been prepared and the water service pipes laid, the fill material shall be placed and built up in successive layers. Backfill for the trench excavation within public streets shall be in compliance with the specifications of the Town of East Hartford.

B. As soon as practicable after the pipes have been laid, warning tape shall be placed approximately 2 feet above the pipe. The trenches shall be refilled in 6-inch layers at least to a level 12-inches above the top of the pipe with bank gravel, compacted in accord with the requirements below, each layer to be leveled and thoroughly compacted to the satisfaction of the District before the next layer is deposited. The whole work of backfilling shall be done in a manner which will prevent subsequent settlement and injury to the pipe.

C. Each layer of material shall be compacted by the use of vibratory compaction equipment or rollers or other means to achieve the required compaction. At such points as cannot be reached by mobile mechanical equipment, the materials shall be thoroughly compacted by the use of suitable power-driven tampers.

D. All backfill material shall be compacted to at least the specified percent maximum density as determined by ASTM D1557 Method C:

Location	Percent Maximum Density
Below pipe centerline	95
Above pipe centerline (below unpaved surface)	92
Above pipe centerline (below paved surface)	95
Embankments	92
Below pipe in embankments	95
Below structures	95

E. Previously placed or new materials shall be moistened by sprinkling, if required, to ensure proper bond and compaction. No compacting shall be done when the material is too wet, from either rain or too great an application of water, to compact it properly; at such times the work shall be suspended until the previously placed and new materials have dried out sufficiently to permit proper compaction. The water content of the soil shall be adjusted by wetting or drying as may be necessary to obtain proper compaction.

3.5 STERILIZATION

A. Contractor in cooperation with District forces shall sterilize the new water service pipelines and sections thereof by using a modification of the Tablet Method as described in Sec 5.1 of the latest edition of AWWA C651. The appropriate number of five (5) gram calcium hypochlorite tablets as shown in Table 1 shall be cemented in each length of pipe by the Contractor. Tablets are to be attached by an adhesive such as Permatex No 2c to the top of each pipe. Subsequent to the completion of the water service lines, they shall be filled with water as part of the tablet method of sterilization. The water shall remain in the pipelines a minimum of 24 hours before flushing.

B. After final flushing and before placing the water service pipelines in service, District forces will make the appropriate bacteriological tests. If the water service fails these tests, the District will require additional sterilization flushing and testing. All expense for this additional work will be the responsibility of the Contractor.

C. Fire Services are not required to be sterilized.

D. Sterilization Dose shall be as follows:

Number of 5 gram Hypochlorite Tablets Required for 50 ppm Dose

Pipe Diameter (Inches)	Number of Tablets for 18 (Foot Pipe)	Number of Tablets for 20 (Foot Pipe)
4	1	1
6	1	1
8	2	2
10	3	3
12	4	4

E. Contractor is reminded that the complete test procedure requires four (4) consecutive working days for the results to be obtained.

F. Tablets are not to be left in pipes above ground over night or on the job site where they can come in contact with children or animals.

3.6 FLUSHING

A. Contractor shall make arrangements with the District to flush the system subsequent to sterilization. The District will be responsible for operating the gate valves in the street if necessary, and to supply materials for neutralizing the chlorine. Contractor shall be responsible for supplying equipment necessary to perform the flushing operation and determining where the water will drain during the flushing operation so as not to flood areas or cause damage to property

END OF SECTION 331000

SECTION 333000 - SANITARY SEWERAGE UTILITIES

PART 1 - GENERAL

RELATED DOCUMENTS

A. The Contractor, Subcontractors, and/or suppliers providing goods or services referenced in or related to this Section shall also be bound by the Documents identified in Division 01.

1.2 SUMMARY

A. Section Includes:

1. Sanitary sewerage piping.
2. Manholes.
3. Concrete encasement and cradles.

B. Work includes: Construction of sanitary sewers, manholes, and related work, complete in place, as shown on the Drawings and as specified. Leakage testing of sanitary sewers and manholes will also be required.

C. Related Sections:

1. Section 312300 – Earthwork;
2. Section 312333 – Trenching and Backfilling;
3. Section 312500 – Sedimentation and Erosion Controls.

1.3 COORDINATION WITH JURISDICTIONAL AUTHORITY

A. Contractor shall notify and coordinate the work of this Section with The Metropolitan District Commission (MDC).

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project Site.

1.5 ACTION SUBMITTALS

A. Submit Product Data:

1. Manufacturers' descriptive literature for all items proposed to be furnished and installed under this Section, including Material Safety Data Sheets (MSDS) on all PVC adhesives and primers.

2. Manufacturer's specifications and other data required to demonstrate compliance with the specified requirements.

3. Verification of installer’s qualifications.

4. Manufacturer’s literature on all required valves and other appurtenances.

5. Shop drawings for all pumping chambers, valve chambers, air/vacuum release valve chambers, grease traps and other sewer related structures.

6. Anti Buoyancy Calculations shall be provided to Engineer for review and approval for all structures to be placed within high groundwater.

1.6 INFORMATIONAL SUBMITTALS

A. Material Test Reports: For piping and accessories.

B. Manufacturer Instructions:

1. Indicate special procedures required to install specified products.
2. Submit detailed description of procedures for connecting new sewer to existing sewer line installation.

C. Source Quality-Control Reports: For piping and accessories.

D. Qualifications Statements: For manufacturer and installer.

1.7 SUBMITTALS

A. Submit Product Data

1. Manufacturers' descriptive literature for all items proposed to be furnished and installed under this Section, including Material Safety Data Sheets (MSDS) on all PVC adhesives and primers.

2. Manufacturer's specifications and other data required to demonstrate compliance with the specified requirements.

3. Verification of installer’s qualifications.

4. Manufacturer’s literature on all required valves and other appurtenances.

5. Shop drawings for all pumping chambers, valve chambers, air/vacuum release valve chambers, grease traps and other sewer related structures.

1.8 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this Section.

B. Installer Qualifications: Company specializing in performing Work of this Section.

C. Comply with local sanitary sewer authority standards. The local sanitary sewer authority is The Metropolitan District Commission (MDC).

1.9 DELIVERY, STORAGE, AND HANDLING

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

B. Storage:

1. Store materials according to manufacturer instructions.
2. Store valves in shipping containers with labeling in place.

C. Protection:

1. Protect materials from moisture and dust by storing in clean, dry location remote from construction operations areas.
2. Block individual and stockpiled pipe lengths to prevent moving.
3. Provide additional protection according to manufacturer instructions.
4. In the event of damage, immediately make all repairs and replacements necessary to the acceptance of the Engineer and at no additional cost to the Owner.

1.10 REGULATORY REQUIREMENTS

A. Conform to applicable MDC standards for installation of the Work in this section. In the event of a conflict between the plans, specifications, and the MDC standards; the MDC standards shall govern at no additional cost to the project.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Perform Work according to:

1. The State of Connecticut Department of Transportation standards.
2. The Metropolitan District standards.

2.2 PIPE MATERIALS

A. Polyvinyl Chloride Pipe (PVC)
1. Pipe: ASTM D3034, SDR 35, SDR 21, C900 and other pipe material as may be required by regulatory agencies.
2. Joints: Bell and spigot with O-ring gasket compressed between the bell and the spigot.

3. Gasket: Rubber gasket conforming to the requirements of AASHTO M198 or elastomeric gasket conforming to the requirements of ASTM D3212.
4. Provide fittings or couplings for joining pipes of different materials or provide concrete for fabricating a concrete collar where pipes of different materials are joined.

2.3 MANHOLE MATERIALS

A. Precast Reinforced Concrete Manhole Sections: Bases, manhole entrance slabs, riser sections, and conical sections shall conform to dimensions as shown on the Drawings and to the requirements of ASTM C478. All joints between sections shall be tongue and groove joints with recesses for rubber O-ring gaskets.

B. Rubber O-ring gaskets for joints shall conform to the requirements for rubber gaskets as specified under 5.9 Rubber Gaskets, ASTM C361.

C. Manhole Steps: Copolymer Polypropylene Plastic Manhole steps with serrated safety tread. Do not install steps by drilling and mortaring in place after casting of manhole sections.

D. Holes shall be preformed in the walls of base sections to accept sewer pipe. Flexible sleeves shall be cast into the preformed holes, as shown on the Drawings. The sleeves shall be made to fit and to be clamped around the pipe with stainless steel bands.

E. Alternatively, sleeves with internal-expanding stainless steel clamps may be used to install sleeves in preformed pipe holes.

F. Grout shall conform to Subarticle M.03.01-12 of the DOT Specifications.

G. Lubricant for use on joints and for use on O-ring rubber gaskets shall be an accepted vegetable soap compound.

H. Mortar shall conform to Article M.11.04 of the DOT Specifications.

I. Concrete grading rings, if used, shall conform to the requirements of ASTM C139.

J. Bricks used for adjusting frames to grade shall conform to the requirements of AASHTO M91, Grade MS. Bricks used for constructing inverts shall conform to the requirements of AASHTO M91, Grade SM.

K. Manhole frames and covers shall be standard models as shown on the Drawings. Material shall be cast iron conforming to the requirements of AASHTO M105, Class 25. Covers shall bear uniformly on their supports.

L. Dampproofing material and primer shall conform to the requirements of Article M.12.05 of the DOT Specifications.

2.4 BEDDING, COVER, AND BACKFILL MATERIALS

A. Crushed stone for bedding shall be sound, tough and durable; it shall be free from soft, thin elongated, or laminated pieces and vegetable or other deleterious substances. Grading Article M.01.01, DOT Specifications. Size: As indicated on the Drawings.

B. Sand Blanket for Cover: Use sand or sandy soil conforming to the requirements of Article M.08.08-21 of the DOT Specifications.

C. Geotextile Filter Cloth: Section 312333 – Trenching and Backfilling,

D. Suitable Backfill Material: Section 312333 – Trenching and Backfilling

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

C. All work under this item shall be in conformance with the appropriate sections of the MDC standards; latest revision.

3.2 PREPARATION

A. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

B. Remove large stones or other hard materials that could damage pipe or impede consistent backfilling or compaction.

C. Protect and support existing sewer lines, utilities, and appurtenances.

D. Utilities:

1. Maintain profiles of utilities.
2. Coordinate with other utilities to eliminate interference.
3. Notify Architect/Engineer if crossing conflicts occur.

3.3 HANDLING SANITARY WASTEWATER FLOWS

A. The Contractor is responsible for maintaining and handling existing sanitary wastewater flows throughout construction.

3.4 EXCAVATING FOR PIPES AND MANHOLES

A. Excavate in accordance with the provisions of Section 312300 – Earthwork.

B. Protect bottoms of excavations from frost. Do not place bedding, pipe, structures, or fill materials on frozen ground.

C. Provide dewatering as specified under Section 312300 - Earthwork. Keep all excavations dry.

3.5 LAYING PIPE; JOINTING PIPE

A. General

1. Carefully examine each pipe prior to placing. Promptly set aside all defective pipes and all damaged pipe. Clearly identify all defects. Do not install defective pipe or damaged pipe.
2. Place all pipes to the grades and alignment shown on the Drawings.
3. Provide all required equipment for lowering pipe safely into the trenches.
4. Lay pipe by proceeding upgrade with the spigot ends of bell-and-spigot pipe, and the tongue ends of tongue-and-groove pipe pointing in the direction of flow.

B. When the Engineer has accepted conditions at the bottom of the trench, place and compact the bedding of crushed stone. Provide a bedding surface to support the barrel of the pipe throughout its entire length. Accurately shape the bedding to conform to the lower quarter of the pipe. Make depressions in the bedding for making pipe joints.

C. Make watertight pipe joints. Use gaskets as specified for each kind of pipe. Do the jointing in accordance with the pipe manufacturer's instructions and as follows:

1. Clean gaskets and mating surfaces of pipes. Use lubricant on gaskets and pipes if required by pipe manufacturer. Align pipe to be installed with previously installed pipe, and, with gasket in place, put joint together. After pipes are put together, inspect joint to verify that gasket is properly positioned and that joint has been properly made and is tight. If, while making the joint, the gasket becomes loose or misplaced, remove the pipe and remake the joint to the acceptance of the Engineer.

D. Fill depressions under joints with crushed stone bedding and compact the material thoroughly.

E. Joining pipe of different materials: Provide fittings or couplings made for the pipe materials joining, or provide a concrete collar.

F. Joining Pipe to Manholes

1. If manhole base sections are equipped with flexible sleeves, slide pipe through sleeve until end of pipe is approximately flush with inside wall of manhole. Install and secure sleeve to pipe with stainless steel clamp. Comply with sleeve manufacturer's instructions.

2. If the joint is a grouted joint, place pipe through hole in manhole base section until end of pipe is approximately flush with inside wall of manhole. Mix and place grout all around pipe, to the full manhole wall thickness. Make a watertight joint.

3.6 BEDDING PIPES

A. For reinforced concrete pipe and ductile iron pipe 10 inches or less in diameter, and for polyvinyl chloride pipe of all diameters:

1. Place and compact crushed stone at both sides of pipe, to top of pipe as shown so that all the space in the trench on each side of the pipe is entirely filled and well compacted.
2. Place filter cloth over crushed stone for full width and full length of trench. Turn filter cloth up 6 inches at trench walls as shown. At joints, overlap filter cloth panels by one foot.
3. Place and compact sand blanket over filter cloth as shown on the Drawings

B. For reinforced concrete pipe and ductile iron pipe 12 inches or more in diameter:

1. Place filter cloth over crushed stone bedding on each side of pipe. Turn filter cloth up 6 inches at wall and at pipe as shown.
2. Place and compact sand blanket over filter cloth and at both sides of pipe as shown so that all space in the trench on each side of the pipe is entirely filled and well compacted.
3. Continue placing and compacting sand blanket over pipe as shown on the Drawings.

C. Place warning tape over pipe as shown on the drawings. Tape shall clearly indicate

1. "Buried Sewer Line" and be composed of a metallic material so as to be detectable by magnetic underground location indicators.

D. Place and compact suitable backfill material over sand blanket. Backfill in accordance with the requirements specified under Section 312333.

3.7 CONCRETE CRADLES AND CONCRETE ENCASEMENTS FOR PIPES

A. Construct concrete cradles and concrete encasements for additional support or protection of proposed and/or existing pipes at locations indicated on the Drawings or as directed by the Engineer. Use Class "A" concrete.

3.8 CONCRETE MANHOLES AND STRUCTURES

A. When the Engineer has accepted conditions at the bottom of the excavation, place and compact the bedding of crushed stone. Provide a bedding surface for the entire base area of the manhole/structure base section. Set manhole/structure base section at proper line and grade and so that it is uniformly supported on the bedding material.

B. Jointing: Clean all joint surfaces. Lubricate the gasket recess and the gasket. Install gasket in recess and equalize the gasket all around the joint. Complete the jointing by

bringing the sections together. Set manhole/structure sections vertical, in true alignment, and so that manhole/structure steps are aligned to form a continuous ladder.

C. Concrete Invert with Brick Lining: Using Class "A" concrete, construct concrete invert with brick lining inside manhole base section. Plan construction such that final brick lining will be at proper elevation, so that the brick lining diameter will match that of entering and leaving pipes, and so that, in plain view, the centerline of the invert will have the longest possible radius. Set bricks in full beds of mortar. Make joints no greater than 1/2 inch and finish smooth and flush.

D. Frames and Covers: Install manhole/structure frames and covers using bricks or concrete grading rings in quantities as required to bring top of frame to final grade. Set bricks, grading rings, and frames in full beds of mortar. Joints shall not exceed 1/2 inch and shall be pointed.

E. Dampproofing: Apply primer and dampproofing material to exterior surfaces of manhole as specified under Section 7.08 of the DOT Specifications.

F. Antibuoyancy: Add additional cast-in-place or precast concrete or other means necessary to provide antibuoyancy in high groundwater areas for all structures. Calculations to be provided to Engineer for approval.

3.9 BACKFILLING

A. Backfill and compact backfill material in accordance with the provisions of Section 312300 – Earthwork.

B. Where accepted by the Engineer, sheeting and portions of bracing used may be left in place. Do not leave untreated sheeting in place beneath structures or pavements.

3.10 TESTING AND INSPECTING

A. General: Provide all equipment and personnel necessary, and make all tests required to demonstrate that the work of this Section has been completed in strict accordance with the design and the specified requirements.

B. Closing-in uninspected work: Do not cause or allow any of the work of this Section to be covered up or enclosed until after it has been completely tested, inspected, and accepted by the Owner’s Representative.

C. Make air leakage test on sanitary sewer pipelines and hydrostatic leakage test on manholes as indicated below and as required by the Metropolitan District Commission.

D. If required, arrange for the local sanitary sewer authority to witness this work which is the Metropolitan District Commission.

3.11 AIR LEAKING TEST FOR SANITARY SEWERS

A. All leak testing shall be performed to the MDC Standards in Section 02605 and 02610 of their Project Manual and witnessed by the Owner's Representative.

3.12 LEAKAGE TEST FOR MANHOLES

A. When the construction of manholes and installation and sealing of entering-and-leaving sewer pipes have been completed, leakage tests shall be conducted on the manholes. All tests shall be performed to the MDC Standards in Section 02605 and 02610 of their Project Manual and witnessed by the Owner's Representative.

3.13 CONNECTIONS

A. Where a new pipe is to be connected into an existing manhole, the Contractor shall carefully cut into the existing manhole to obtain the minimum diameter hole required to construct the sewer to the line and grade indicated on the plans. The use of blunt instruments or excessive force will not be permitted.

B. The hole around the pipe shall be carefully sealed with non-shrink grout to obtain a watertight connection. A suitable invert channel, compatible with the existing formed invert, shall then be formed in the bottom of the existing manhole to the satisfaction of the Engineer.

3.14 CLEANING PIPELINES, MANHOLES, AND APPURTENANCES

A. Upon completion of construction, all dirt and other foreign material shall be removed from pipelines and manholes. No materials shall be left to impede sewage flows.

3.15 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 333000

SECTION 334000 – STORM DRAINAGE UTILITIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors, and/or suppliers providing goods or services referenced in or related to this Section shall also be bound by the Documents identified in Division 01.

1.2 DESCRIPTION

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

B. Wherever reference is made to the DOT Specifications, it shall mean the Connecticut Department of Transportation Standard Specifications for Roads, Bridges, Facilities and Incidental Construction Form 819 as modified by Supplemental Specifications issued by the Connecticut Department of Transportation.

1.3 SUMMARY

A. Section Includes:
   1. Pipe and fittings.
   2. Nonpressure transition couplings.
   3. Cleanouts.
   4. Drains.
   5. Manholes.
   6. Catch basins.
   7. Yard drains.
   8. Area drains.
   9. Dry wells.
   10. Water Quality units
   11. Warning tape.
   12. Underground Detention System (Shop Drawings & Spec)

1.4 DEFINITIONS

A. ABS: Acrylonitrile butadiene styrene.

B. DI: Ductile-iron.

C. FRP: Fiberglass-reinforced plastic.

D. HDPE: High density polyethylene.

E. PVC: Polyvinyl chloride plastic.

F. RCP: Reinforced concrete piping.

1.5 COORDINATION

A. Coordinate Work of this Section with termination of storm sewer connection outside building, trenching, connection to, and roof drainage system.

1.6 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project Site.

1.7 PERFORMANCE REQUIREMENTS

A. Gravity-Flow, Nonpressure Drainage-Piping Pressure Rating: At least equal to test pressure. Pipe joints shall be at least silt tight, unless otherwise indicated.

B. Precast concrete structures shall comply with ASTM C 890 Standard Practice for Minimum Structural Design Loading for Monolithic or Sectional Precast Concrete Water and Wastewater Structures.

1.8 ACTION SUBMITTALS

A. Product Data:

1. Pipe and fittings.
2. Nonpressure transition couplings.
3. Cleanouts.
4. Drains.
5. Manholes.
6. Catch basins.
7. Yard drains.
8. Area drains.
9. Dry wells.
10. Water Quality units
11. Warning tape.
12. Underground Detention System

B. Shop Drawings:

1. Catch Basins and Manholes: Include plans, elevations, sections, details, frames, and covers. Include design calculations and concrete design-mix report.

1.9 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Show pipe sizes, locations, and elevations. Show other piping in same trench and clearances from storm drainage system piping. Indicate interface and spatial relationship between manholes, piping, and proximate structures.

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.

1.10 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this Section.

1.11 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.
3. In the event of damage, immediately make all repairs and replacements necessary to the acceptance of the Architect/Engineer and at no additional cost to the Owner.

1.12 PROJECT CONDITIONS

A. Interruption of Existing Storm Drainage Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary service according to requirements indicated:

1. Do not proceed with interruption of service without Engineer's and Owner's written permission.

PART 2 - PRODUCTS

2.1 STORM DRAINAGE PIPING

A. Reinforced Concrete Piping:

1. Pipe:

a. Comply with ASTM C76 (C76M), Class IV, with Wall Type B
b. End Connections: Bell and spigot

2. Fittings: Reinforced concrete.
3. Joints:

a. Comply with ASTM C443 (C443M).
b. Gaskets: Rubber, compression.

B. PVC Piping:

1. Pipe:

a. Comply with ASTM D3034; SDR 35
b. Style: Bell and spigot with rubber-ring sealed gasket joint.

2. Fittings: PVC.
3. Joints:

a. Comply with ASTM F477.
b. Gaskets: Elastomeric.

C. Corrugated HDPE 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/F667M& AASHTO M294.
b. Type: S
c. With smooth waterway for coupling joints

2. Fittings: HDPE.
3. Joints: Comply with ASTM F667/F667M.
4. Silt tight couplings: HDPE sleeve with ASTM D1056, Type 2, Class A, Grade 2 gasket material that mates with tubes and fittings

D. HDPE Perforated Pipe

1. Pipe

a. Comply with ASTM D3350
b. Type: ADS Smoothwall
c. The perforations shall be 3/8″ diameter on 5″ centers, 120 degrees apart

2.2 NONPRESSURE TRANSITION COUPLINGS

A. Comply with ASTM C 1173, elastomeric, sleeve-type, reducing or transition coupling, for joining underground nonpressure piping. Include ends of same sizes as piping to be joined, and corrosion-resistant-metal tension band and tightening mechanism on each end.

B. Sleeve Materials:

1. For Concrete Pipes: ASTM C 443, rubber.
2. For Plastic Pipes: ASTM F 477, elastomeric seal or ASTM D 5926, PVC.
3. For Dissimilar Pipes: ASTM D 5926, PVC or other material compatible with pipe materials being joined.

2.3 MANHOLES

A. Standard Precast Concrete Manholes:

1. Description: ASTM C 478, precast, reinforced concrete, of depth indicated, with provision for sealant joints.
2. Diameter: 48 inches minimum unless otherwise indicated, or deeper than 10-feet.
3. Ballast: Increase thickness of precast concrete sections or add concrete to base section as required to prevent flotation.
4. Base Section: 6-inch minimum thickness for floor slab and 5-inch minimum thickness for walls and base riser section, and separate base slab or base section with integral floor.
5. Riser Sections: 5-inch minimum thickness and lengths to provide depth indicated.
6. Top Section: Eccentric-cone type unless concentric-cone or flat-slab-top type is indicated, and top of cone of size that matches grade rings.
7. Joint Sealant: Butyl rubber, mastic type seal that conforms to latest AASHTO specification M-198, and meets federal specification SS-S-0021(210-A).
8. Resilient Pipe Connectors: ASTM C923, cast or fitted into manhole walls, for each pipe connection.
9. Steps: Individual Copolymer Polypropylene Plastic steps, wide enough to allow worker to place both feet on one step and designed to prevent lateral slippage off step. Cast or anchor steps into sidewalls at 12- to 16-inch intervals. Omit steps if total depth from floor of manhole to finished grade is less than 36 inches.
10. Install frame over a minimum of three layers (8 inches) of concrete brick, continuous around frame, to allow vertical adjustment.
11. Mortar for Chimney, Frame and Cover Joints: Comply with ASTM C 270, Type M, except for quantities less than 2.3 cu. ft. where packaged mix complying with ASTM C387, Type M, may be used.

B. Manhole Frames and Covers:

1. Description: Size as indicated on drawings. Include indented top design with lettering cast into cover, using wording equivalent to "STORM SEWER" as required by the Town of East Hartford.
2. Material: ASTM A 48, Class 35 gray, designed for H20 structural loading.

2.4 CATCH BASINS, YARD DRAINS, AND AREA DRAINS

A. Standard Precast Concrete Drainage Structures:

1. Description: ASTM C 478, precast, reinforced concrete, of depth indicated, with provision for sealant joints. To be used for dry wells, catch basins and yard drains.
2. Base Section: 6-inch minimum thickness for floor slab and 3-inch minimum thickness for walls and base riser section, and separate base slab or base section with integral floor.
3. Riser Sections: 3-inch minimum thickness and lengths to provide depth indicated.
4. Joint Sealant: ASTM C 990, bitumen or butyl rubber.
5. Drainage Hood with Backing Plate: Provide on outlet pipe of drainage structure, where indicated. Provide aluminum or cast-iron trap with stainless steel fasteners. Size hood to accommodate pipe taking into account the pipe orientation. Should

field conditions preclude use of standard trap, Contractor to provide alternate solution for review and approval by Engineer.

B. Area Drains:

1. Description: ASTM A 536, ductile iron, painted black, with water tight PVC adapters. To be used for area drains.
2. Base Section: prefabricated by manufacturer and made of PVC.
3. Riser Sections: Nyoplast® or approved equal. Shall be field installed using the guidelines outlined in ASTM D 2855
4. Joint Sealant: ASTM D 2564, PVC cement
5. Water Tight Adapter: Provide an outlet pipe of drainage structure, where indicated. The outlet pipe shall be corrugated HDPE pipe, to be fit into the water tight joint. Drainage connection stub joint tightness shall conform to ASTM D 3212

2.5 CLEANOUTS

A. Cast-Iron Cleanouts:

1. Description: ASME A112.36.2M, round, gray-iron housing with clamping device and round, secured, scoriated, gray-iron cover. Include gray-iron ferrule with inside calk or spigot connection and countersunk, tapered-thread, brass closure plug.
2. Top-Loading Classification(s): Heavy Duty.
3. Sewer Pipe Fitting and Riser to Cleanout: ASTM A74, Service class, cast-iron soil pipe and fittings.

2.6 BEDDING, BASE, COVER, AND BACKFILL MATERIALS

A. Crushed stone for bedding shall be sound, tough and durable; it shall be free from soft, thin elongated, or laminated pieces and vegetable or other deleterious substances. Grading Article M.01.01, DOT Specifications. Size: As indicated on the Drawings for the various storm pipes.

B. Suitable Backfill Material: Section 312333 – Trenching and Backfilling.

2.7 UNDERGROUND DETENTION SYSTEMS

1. Pipe System (N12 60" diameter pipe by ADS or Engineer approved equal).

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. Verify that excavations, dimensions, and elevations are as indicated on drawings.

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

3.2 PREPARATION

A. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

B. Remove large stones and other hard matter that could damage piping or impede consistent backfilling or compaction.

3.3 INSTALLATION OF STORM DRAINAGE PIPING

A. General Locations and Arrangements: Drawing plans and details indicate general location and arrangement of underground storm drainage piping. Location and arrangement of piping layout take into account design considerations. Install piping as indicated, to extent practical. Where specific installation is not indicated, follow piping manufacturer's written instructions.

B. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements.

C. Install manholes for changes in direction unless fittings are indicated. Use fittings for branch connections unless direct tap into existing sewer is indicated.

D. Install proper size increasers, reducers, and couplings where different sizes or materials of pipes and fittings are connected. Reducing size of piping in direction of flow is prohibited.

E. When installing pipe under streets or other obstructions that cannot be disturbed, use pipe- jacking process of microtunneling.

F. Install gravity-flow, nonpressure drainage piping according to the following:

1. Install piping pitched down in direction of flow at a minimum slope of 0.5 percent, unless otherwise indicated.
2. Install piping with cover as indicated on Drawings.
3. Install HDPE corrugated sewer piping according to CPPA’s "Recommended Installation
4. Practices for Corrugated Polyethylene Pipe and Fittings."
5. Install PVC sewer piping according to ASTM D 2321 and ASTM F 1668.
6. Install reinforced-concrete sewer piping according to ASTM C1479 and ACPA's
7. "Concrete Pipe Installation Manual."

3.4 PIPE JOINT CONSTRUCTION

A. Join gravity-flow, nonpressure drainage piping according to the following:

1. Join corrugated HDPE piping according to CPPA 100 and the following:
    a. Use silt tight couplings for Type 1, silt tight joints.
2. Join PVC sewer piping according to ASTM D 2321 and ASTM D 3034 for elastomeric-seal joints or ASTM D 3034 for elastomeric-gasketed joints.
3. Join reinforced-concrete sewer piping according to ACPA's "Concrete Pipe Installation Manual" for rubber-gasketed joints.
4. Join dissimilar pipe materials with nonpressure-type flexible couplings.

3.5 MANHOLE INSTALLATION

A. General: Install manholes, complete with appurtenances and accessories indicated.

B. Install precast concrete manhole sections with sealants according to ASTM C 891.

C. Where specific manhole construction is not indicated, follow manhole manufacturer's written instructions.

D. Set covers flush with finished surface for manholes that occur in pavements. Set covers flush with topsoil and provide a graded transition away from covers to surrounding grade.

3.6 YARD DRAIN INSTALLATION

A. Construct yard drains sizes and installation details as indicated.

B. Set top of frames and grates flush with surrounding surface to allow for stormwater interception.

3.7 CATCH BASIN INSTALLATION

A. Construct catch basins to sizes and shapes indicated.

B. Set frames and grates flush with surrounding surface to allow for stormwater interception.

3.8 CONCRETE PLACEMENT

A. Place cast-in-place concrete according to ACI 318.

3.9 CONNECTIONS

A. Connect nonpressure, gravity-flow drainage piping in building's storm building drains specified in Section 22 14 13 "Facility Storm Drainage Piping."

B. Pipe couplings, expansion joints, and deflection fittings with pressure ratings at least equal to piping rating may be used in applications below unless otherwise indicated.

1. Use nonpressure-type flexible couplings where required to join gravity-flow, nonpressure sewer piping unless otherwise indicated.

a. Unshielded flexible couplings for same or minor difference OD pipes.
b. Unshielded, increaser/reducer-pattern, flexible couplings for pipes with different OD.
c. Ring-type flexible couplings for piping of different sizes where annular space between smaller piping's OD and larger piping's ID permits installation.

3.10 IDENTIFICATION

A. Materials and their installation are specified in Section 312300 "Earthwork." Arrange for installation of detectable warning tape 18 to 24 inches directly over piping and at outside edge of underground structures.

3.11 FIELD QUALITY CONTROL

A. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches of backfill is in place, and again at completion of Project.

1. Submit separate reports for each system inspection.
2. Defects requiring correction include the following:
   a. Alignment: Less than full diameter of inside of pipe is visible between structures.
   b. Deflection: Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 92.5 percent of piping diameter.
   c. Damage: Crushed, broken, cracked, or otherwise damaged piping.
   d. Infiltration: Water leakage into piping.
   e. Exfiltration: Water leakage from or around piping.
3. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.
4. Re-inspect and repeat procedure until results are satisfactory.

B. Test new piping systems, and parts of existing systems that have been altered, extended, or repaired, for leaks and defects.

1. Do not enclose, cover, or put into service before inspection and approval.
2. Test completed piping systems according to requirements of authorities having jurisdiction.
3. Schedule tests and inspections by authorities having jurisdiction with at least 24 hours' advance notice.
4. Submit separate report for each test.
5. Manhole Test: Visually inspect for damage.

C. Damage, leaks and loss in test pressure below limits stated above, constitute defects that must be repaired.

D. Replace leaking piping using new materials, and repeat testing until leakage is within allowances specified.

3.12 CLEANING

A. Clean interior of piping of dirt and superfluous materials. Flush with potable water.

END OF SECTION 334000

SECTION 337000 - ELECTRICAL UTILITIES

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 DESCRIPTION

A. Work Included: Site underground electric, cables, handholes, vaults, ductbanks and related work, complete in place, as shown on the Drawings and as specified.

B. Related Work Specified Elsewhere

1. Section 312300 – Earthwork;

2. Section 312333 – Trenching and Backfilling.

1.3 QUALITY ASSURANCE

A. Standards: Comply with Eversource Energy standards and as specified in this Section.

B. Qualifications of Installers: Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

1.4 SUBMITTALS

A. Submit data on the following:

1. Complete materials list of all items proposed to be furnished and installed under this Section.

2. Manufacturer's specifications and other data required to demonstrate compliance with the specified requirements.

3. Manufacturer's recommended installation procedures which, when accepted by the Engineer, shall become the basis for inspecting and accepting or rejecting actual installation procedures used on the Work.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Protection: Use all means necessary to protect the materials of this Section before, during, and after installation and to protect the work and materials of all other trades.

B. Protection of Utilities: Protect existing utilities.

C. Delivery and Storage: Deliver all materials to the job site in their original containers with all labels intact and legible at time of use. Store in strict accordance with the manufacturer's recommendations as accepted by the Engineer.

D. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the acceptance of the Engineer and at no additional cost to the Owner.

1.6 REFERENCES

A. Wherever reference is made to the Eversource Energy Standards, it shall mean the latest revision of the standards and specifications prepared by Eversource.

1.7 REGULATORY REQUIREMENTS

A. Conform to applicable Eversource Energy standards for installation of the Work in this section. In the event of a conflict between the plans, specifications, and Eversource Energy standards; the Eversource Energy standards shall govern at no additional cost to the project.

PART 2 - PRODUCTS

2.1 MATERIALS FOR ELECTRIC WORK

A. Ductbank Conduit: Size and quantity as shown on the plans and standards as specified by Eversource Energy.

B. Cable: As specified and installed by Eversource Energy.

2.2 BEDDING, COVER, BACKFILL, AND FILL MATERIALS

A. Conform to the requirements specified under Section 312300 – Earthwork, Section 312333 – Trenching and Backfilling, and standards as specified by Eversource Energy.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to the timely and proper completion of the Work. Do not proceed until unsatisfactory conditions have been corrected.

3.2 EXCAVATING, TRENCHING, AND BEDDING

A. General: Provide excavating, trenching, and bedding, if required, for vaults, duct banks, cables, and concrete bases in accordance with the provisions of Section 312333 - Trenching and Backfilling, and as follows:

B. Protect bottom of excavation from frost. Do not place bedding, fill materials, vaults, ductbanks, cables and concrete bases on frozen ground.

3.3 CONSTRUCTION METHODS

A. Pole Installation

1. A new utility pole will not be required for service.

B. Electric Vaults

1. Install as specified by Eversource Energy standards and as shown on the Drawings.

C. Ductbanks (Direct Buried)

1. Provide a firm, compacted bedding surface for the entire length of the duct bank.

2. Install and support conduits in trench such that they will not be displaced during backfilling.

3. Backfill as specified under Section 312333 - Trenching and Backfilling.

D. Cable Installations in Conduits

1. The contractor shall provide a drag line in each conduit for the utility company to pull the cable. The drag line shall be as specified by Eversource Energy standards.

2. No cables shall be installed in the ductbank; the cable installation will be by Eversource Energy.

E. Transformer Pad

1. Install as specified by Eversource Energy standards and as shown on the drawings.

END OF SECTION 337000

SECTION 338000 - COMMUNICATION UTILITIES

PART 1 - GENERAL

1.1 CONDITIONS AND REQUIREMENTS

A. The General Conditions, Supplementary Conditions, and Division 01 – General Requirements apply.

1.2 SECTION INCLUDES

A. Work included: Site data and telephone conduits, cables, handholes, ductbanks and related work, completed in place, as shown on the Drawings, and as specified.

1.3 RELATED SECTIONS

A. Section 312300 – Earthwork

1.4 SUBMITTALS

A. Submit data on the following:
   1. Complete materials list of all items proposed to be furnished and installed under this section.
   2. Manufacturer's specifications and other data required to demonstrate compliance with the specified requirements.
   3. Manufacturer's recommended installation procedures which, when accept by the Engineer, shall become the basis for inspection and accepting or rejecting actual installation procedures used on the Work.

1.5 QUALITY ASSURANCE

A. Standards: Comply with utility company's standards and as specified in this Section.

B. Qualifications of Installers: Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

1.6 COORDINATION

A. Coordinate connection with utility companies.

PART 2 - PRODUCTS

2.1 MATERIALS FOR TELEPHONE AND DATA WORK

A. Ductbank conduit: Size and quantity as shown on the Drawings and standards as specified by the utility company.

B. Handholes: If required, shall be furnished by the utility company.

C. Cable: As specified and installed by the utility company.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to the timely and proper completion of the Work. Do not proceed until unsatisfactory conditions have been corrected.

3.2 EXCAVATING, TRENCHING, AND BEDDING

A. General: Provide excavating, trenching, and bedding, if required, for handholes, ductbanks and conduits, per utility company standards.

B. Protect bottom of excavation from frost. Do not place bedding, fill materials, handholes, ductbanks, conduits on frozen ground.

3.3 CONSTRUCTION METHODS

A. Communication Handholes
   1. If required, the utility company shall furnish and install all handholes.
   2. Provide a firm, compact bedding surface for the entire base area of the handhole. Excavate to provide proper line and grade, on the bedding surface such that it is uniformly supported.
   3. Backfilled as specified.

B. Ductbanks
   1. Provide a firm, compact bedding surface for the entire length of the duct bank.
   2. Install and support conduits in trench such that they will not be displaced during backfilling.
   3. Backfill as specified.

C. Cable installation in Conduits
   1. The contractor shall provide a drag line in each conduit for the utility company to pull the cable. The drag line shall be as specified by the utility company’s standards.
   2. No cables shall be installed in the ductbank for telephone or data; the cable installation will be provided by the utility company.

END OF SECTION 338000