Standard Project Manual

Ensign Street Drainage Design

November 2018

Capital Region Development Authority

GOODWIN COLLEGE

ZUVIC · CARR
AND ASSOCIATES
CONSULTING ENGINEERS

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Goodwin College Inc.
Ensign Street Drainage Design

Project Manual
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SECTION 01540
MAINTENANCE AND PROTECTION OF TRAFFIC

PART 1 – GENERAL

1.0 DESCRIPTION

This work shall consist of the maintenance and protection of vehicular and pedestrian traffic on public streets and sidewalks in conformity with the requirements of this specification and other Contract Documents. The Contractor assumes full liability for the maintenance and protection of vehicular and pedestrian traffic.

2.0 MATERIALS

All signs, barricades, lights, flashers, traffic cones, and other items necessary to forewarn and guide vehicular and pedestrian traffic shall be of a number and quality satisfactory to the Engineer and governmental agencies having jurisdiction. The Contractor shall provide all signs, barricades, lights, flashers, traffic cones and other items necessary to forewarn and guide vehicular and pedestrian traffic.

3.0 CONSTRUCTION METHODS

A. General: The Contractor shall obey all applicable state and local regulations regarding maintenance and protection of traffic.

B. Meeting and Proposal: Prior to the commencement of any construction whatsoever, the Contractor shall meet with the Engineer or his representative and representatives from the Public Works and Police Department and shall present a detailed written plan showing the sequence of construction and the method of protecting vehicular and pedestrian traffic during each sequence. The plan shall show the location, width and construction details of travel lanes and the number and location of all proposed signs, barricades, flashers, traffic cones or other appurtenances to forewarn and guide traffic. Approval of the schedule of operations and plan by the Engineer shall in no way relieve the Contractor from his full responsibility for the maintenance and protection of traffic.

C. Existing Streets Open: Except as otherwise provided in this section, or permitted by the Engineer, the Contractor shall keep all existing streets open to traffic for the full length of the Project and shall provide a sufficient number of travel lanes to move that traffic ordinarily using the roadway. The travel lanes shall be drained and kept reasonably smooth and in suitable condition at all times in order to provide minimum interference to traffic consistent with the proper prosecution of the work.

D. Lanes of Travel: Travel lanes shall be maintained by the Contractor in a suitable manner at all times. The Contractor will be responsible for removal of snow and ice on all streets and detours within the Area of Work while he is actively prosecuting the completion of the Contract. If there is a temporary shutdown approved by the Engineer, the Contractor will not normally be responsible for snow and ice removal. The Contractor will maintain the trench in good repair during these periods.

E. Street Closings: The closing of any street for any purpose whatsoever shall be for the length of time and subject to the restrictions the Engineer may impose.
No street will be closed without the Contractor having received prior approval of the Police Department and the Department of Public Works of the City of East Hartford. The Contractor will make sure that the Fire Department and any other agencies which may be affected by the closing are notified.

F. Pedestrian Traffic – All Sidewalks Open: Except as indicated on the plans provided in this Section, or as permitted by the Engineer, the Contractor shall keep all public sidewalks open. On sidewalks open to the public the Contractor shall be responsible for removal of snow and ice and for repairs necessary to obtain safe pedestrian conditions. Sidewalks broken up during construction shall be removed and replaced and/or patched temporarily with bituminous concrete.

During temporary shutdowns approved by the Engineer, snow and ice removal will normally be performed by others. The Contractor will maintain the sidewalks and other pedestrian walkways in good repair during these periods.

G. Signs for Closing: In those instances where the Contractor is permitted to eliminate pedestrian access, the Contractor shall erect signs to warn pedestrians of the closing. Such signs shall be erected at the nearest street intersection at either end of the sidewalk on which pedestrian access is to be eliminated. Signs shall warn pedestrians of the closing and shall indicate the nearest alternate route of pedestrian passage. In addition, barricades shall be placed to separate areas in which pedestrian access is permitted.

H. Engineer's Restrictions: Elimination of pedestrian access at any area shall be for the length of time and subject to restrictions the Engineer may impose.

I. Pedestrian Detours: When work is to be done which will not necessitate eliminating pedestrian access but which will temporarily interfere with pedestrian access, adequate signs, barricades and other devices shall be employed to warn pedestrians. During non-working hours pedestrian detours shall be provided such that pedestrians will not be required to travel in the street or on private property. Work temporarily interfering with pedestrian movement shall be completed and the site cleaned up as quickly as is reasonably possible.

J. Provision for Private Access: The Contractor shall schedule his operations to cause a minimum of inconvenience to occupants of existing properties within the area of work. Prior to restricting or eliminating vehicular access to any property the Contractor shall give the occupants of the property twenty-four hours' notice. Thereafter, the Contractor shall complete the items of work and restore access as rapidly as reasonably possible. Restrictions of access shall at all times be subject to the approval of the Engineer. At no time shall the Contractor prevent pedestrian access to any existing building. Where existing access is eliminated and other access substituted therefor, the substituted access shall be maintained by the Contractor to a quality equal to or better than the eliminated access.

K. Signs and Other Warning Devices – Illumination of Warning Devices: All signs and barricades or other appurtenances for the protection of the public shall be illuminated by flashers during the hours of darkness or low visibility. The Contractor shall keep all signs in proper position, clean and legible at all times. Care shall be taken that weeds, shrubbery, construction materials or equipment and soil are not allowed to obscure any sign, light or barricade. Signs that do not apply to existing conditions shall be removed or adjusted so that the legend is not visible to approaching traffic.

L. Materials for Protection of Traffic: At any time, the Engineer may order materials furnished or work performed by the Contractor as the Engineer deems necessary for the maintenance and protection of traffic. The Contractor shall comply with such orders at no additional cost. The omission of the Engineer to so order shall not relieve the Contractor of his full responsibility for the maintenance and protection of traffic. If the Contractor fails to respond to the Engineer's order for work or material within the shortest reasonable time possible, the Engineer shall have the right to have the work done by private forces and shall deduct the cost thereof from monies due the Contractor.

M. Traffic Control during Storm Drainage installation: During the installation of the storm drainage and any other utility work, the Contractor shall maintain a minimum of 1 lane alternating traffic with an 11' wide lane.

N. Traffic Control during Road Pavement Reconstruction: The Contractor shall schedule the road pavement reconstruction during the summer when local public schools are not in session. Contractor shall coordinate with all local emergency response departments, and public works. The Contractor shall be allowed to close the road to all but local traffic (residents living on Ensign Street). The detour shall direct traffic to Riverside Drive via Willow Street. The detour shall be in effect for as short a period of time as reasonable. Contractor shall accommodate emergency response vehicles, mail and other delivery vehicles.

O. Pedestrian Traffic Control during Construction: The Contractor shall maintain pedestrian access through the project site during all phases of construction. During periods when the sidewalk along the south side of Ensign Street is closed to pedestrian traffic due to the installation of the storm sewer and any other utilities, appropriate signage directing pedestrians to use the north side sidewalk shall be installed and maintained. The sidewalk along the south side shall be replaced as soon as reasonable during the construction process. Pedestrian access shall be maintained to all residences during construction.

4.0 METHOD OF MEASUREMENT

The costs for construction, maintenance and removal of detours, signs, barricades, flashers and all else necessary

to maintain and protect traffic all in accordance with the provisions of the Contract Document will be measured for payment on a lump sum basis.

5.0 BASIS OF PAYMENT

Maintenance and Protection of Vehicular and Pedestrian Traffic required for or forming a part of the work called for by the Drawings, these Specifications, or other Contract Documents will be paid for at the lump sum price when the item appears in the Schedule of Prices in the Proposal. The price shall include construction, maintenance and removal of detours, signs, barricades, flashers, cones, and all else necessary to maintain and protect traffic all in accordance with the provisions of the Contract Documents

END OF SECTION

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SECTION 01540A
TRAFFIC CONTROL PERSONS

PART 1 - GENERAL

1.01 DESCRIPTION

A. The Contractor shall provide the services of traffic control persons of the type (uniformed police and/or uniformed flaggers) and number necessary to safely and efficiently control traffic in and around the work zone(s).

B. The intent of utilizing traffic control persons is to insure public safety by direction of both vehicular and pedestrian traffic. Traffic control persons shall not serve as watchmen to protect the Contractor's equipment and materials.

1.02 RELATED SECTIONS

A. Section 01570, Maintenance and Protection of Traffic

1.03 REFERENCES

A. Manual on Uniform Traffic Control Devices (MUTCD), most recent update

B. American Traffic Safety Services Association (ATSSA)

1. Traffic Control Technician (TCT) certification

2. Traffic Control Specialist (TCS) certification

C. National Safety Council

D. The American National Standard for High-Visibility Safety Apparel and Headwear (ANSI/ISEA 107-2004), most recent update

1.04 SUBMITTALS

A. Uniformed flaggers shall be persons who have successfully completed flagger training by the ATSSA, National Safety Council, or other program approved by the Owner. A copy of the flagger's training certificate shall be provided to the Owner prior to starting Work.

PART 2 – MATERIALS – NOT USED

PART 3 – CONSTRUCTION METHODS

3.01 GENERAL

A. On a weekly basis, the Contractor shall inform the Owner of their scheduled operations for the following week, including the number and type of traffic control persons and any police vehicles to be requested. Upon review, the Owner may require modifications to the number and type of traffic control persons and police vehicles.

B. The Contractor is responsible for making all arrangements to obtain police and/or uniformed flaggers (where permitted).

C. Cancellation of any scheduled traffic control detail due to inclement weather or any other reason shall be the responsibility of the Contractor and shall be made in accordance with the municipal or Owner requirements. The Contractor shall be responsible for payment of traffic control persons not cancelled or cancelled without proper notice at no cost to the Owner.

D. Uniformed flagger's equipment shall include: high visibility garments that meet ANSI Class 2 requirements or higher, a brightly colored hard hat, and a STOP/SLOW paddle that is at least 18 inches in width with letters at least 6 inches high. The bottom of the sign shall be 6 feet above the ground. Uniformed flaggers will only be used at such locations and for such periods as the Owner approves.

4.0 METHOD OF MEASUREMENT

Services of Trafficpersons will be measured for payment by the actual number of hours for each person rendering services approved by the Engineer. These services shall include only such Trafficpersons as are employed within the limits of construction, right-of-way of the Project, or along detours authorized by the Engineer in order to assist public travel through areas affected by Project construction.

Trafficpersons shall not work more than 12 hours in any one 24-hour period. If such services are essential for more than 12 hours in such period, for a use approved by the Engineer, additional Trafficpersons engaged by the Contractor to meet that circumstance shall be measured for payment. If a Trafficperson used with the Engineer's authorization is an employee on the Contractor's payroll, payment under the item "Trafficperson (Uniformed Flagger)" will be made only for those hours when said employee is performing Trafficperson services.

No travel time will be measured for payment for Uniformed Municipal Police Officers or Uniformed Flaggers.

Mileage fees associated with Trafficperson services will not be measured for payment. Safety garments and STOP/SLOW paddles will not be measured for payment.

5.0 BASIS OF PAYMENT

Traffic persons will be paid in accordance with the schedule described herein.

There will be no direct payment for safety garments or STOP/SLOW paddles. All costs associated with furnishing safety garments and STOP/SLOW paddles shall be considered included in the general cost of the item.

A. Uniformed Law Enforcement Personnel: The sum of money for this item shown on the Estimate and in the itemized proposal as "Estimated Cost" for this work will be considered the bid price even though payment will be made as described below. The estimated cost figure is not to be altered in any manner by the bidder. Should the bidder alter the amount shown, the altered figures will be disregarded and the original price will be used in determining the total amount for the Contract.

   The Contractor will be paid its actual costs for "Trafficperson (Municipal Police Officer)."

   The invoice must include a breakdown of each officer's actual hours of work and actual rate applied. Mileage fees associated with Trafficperson services are not reimbursable expenses and are not to be included in the billing invoice. The use of a Municipal police vehicle authorized by the Engineer will be paid at the actual rate charged by the Municipality. Upon receipt of the invoice from the Municipality, the Contractor shall forward a copy of it to the Engineer. No payment on such an invoice will be made until and unless the Engineer has reviewed the invoice and approved the payment. The rate charged by the Municipality for use of a Uniformed Municipal Police Officer or a Municipal police vehicle shall not be greater than the rate that the Municipality normally charges others for similar services.

B. Uniformed Flagger: Uniformed Flaggers will be paid for at the Contract unit price per hour for "Trafficperson (Uniformed Flagger)," which price shall include all compensation, insurance benefits and any other cost or liability incidental to the furnishing of the Trafficperson services authorized under the Contract or approved by the Engineer.

Pay Item	Pay Unit
Trafficperson (Municipal Police Officer)	est.
Trafficperson (Uniformed Flagger)	hr.

END OF SECTION

SECTION 31 10 00
SITE CLEARING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and General Provisions of the Contract, including General and Supplemental Conditions and Division 01 Specification Sections apply to this section.

B. Extent of the work under this Section is shown on the Drawings.

1.02 DESCRIPTION OF WORK

A. This Section includes the following:

1. Protecting existing trees and vegetation to remain.
2. Removing trees and other vegetation.
3. Clearing and grubbing.
4. Stripping existing topsoil.
5. Removing above grade site improvements.
6. Disconnecting, capping or sealing, and abandoning site utilities in place.
7. Disconnecting, capping or sealing, and removing site utilities.

B. Related Sections include the following:

1. Section 31 20 05: "Erosion and Sedimentation Control"
2. Section 31 32 19.16: "Geotextile"

1.03 DEFINITIONS

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

1.04 MATERIALS OWNERSHIP

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

1.05 QUALITY ASSURANCE

A. **Preconstruction Meeting: Conduct preconstruction meeting as required.**

1.06 SUBMITTALS

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

B. Record drawings according to Division 01 Section 01 77 00 "Closeout Procedures."

1. Identify and accurately locate utilities and other subsurface structural, electrical, and mechanical conditions installed or encountered during construction.

1.07 PROJECT CONDITIONS

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

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

B. Notify utility locator service for area where Project is located before site clearing.

PART 2 PRODUCTS

2.01 MATERIALS

A. Satisfactory Soil Materials: Requirements for satisfactory soil materials are specified in Division 31 Section 31 23 16 "Excavation."

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

PART 3 EXECUTION

3.01 PREPARATION

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

B. Provide erosion control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways in accordance with the Connecticut Department of Environmental Protection "2002 Connecticut Guidelines for Soil Erosion and Sediment Control."

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

1. Restore damaged improvements to their original condition at no additional cost to the Owner.

3.02 UTILITIES

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

B. Arrange to shut off any indicated utilities with utility companies.

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

1. Notify Owner's Representative in writing not less than two (2) days in advance of proposed utility interruptions.
2. Do not proceed with utility interruptions without written permission from the Owner's Representative.

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

3.03 CLEARING AND GRUBBING

A. Remove obstructions, trees, shrubs, grass, and other vegetation to permit installation of new construction. Removal includes digging out stumps and obstructions and grubbing roots.

1. Do not remove trees, shrubs, and other vegetation indicated to remain.
2. Use only hand methods for grubbing within drip line of remaining trees.

B. Fill depressions caused by clearing and grubbing operations with satisfactory soil material, unless further excavation or earthwork is indicated.

1. Place fill material in horizontal layers not exceeding 8-inch loose depth, and compact each layer to a density equal to adjacent original ground.

3.04 TOPSOIL STRIPPING

A. Remove sod and grass before stripping topsoil.

B. Strip topsoil to whatever depths are encountered in a manner to prevent intermingling with underlying subsoil or other waste materials.

1. Strip surface soil of unsuitable topsoil, including trash, debris, weeds, roots, and other waste materials.

C. Stockpile topsoil materials away from edge of excavations without intermixing with subsoil. Grade and shape stockpiles to drain surface water.

1. Limit height of stockpile as shown on plans.
2. Stockpile surplus topsoil and allow for respreading deeper topsoil.

3.05 SITE IMPROVEMENTS

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

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

1. Unless existing full-depth joints coincide with the line of demolition, neatly sawcut length of existing pavement to remain before removing existing pavement. Sawcut faces vertically.

C. Remove existing signs, posts, bollards, drainage structures, utilities, sidewalks, and other miscellaneous site features as indicated on the Drawings or as directed by the Owner's Representative as required to perform the work.

D. All salvageable items as determined by the Owner's Representative shall be stored on-site in an area approved by the Owner.

3.06 DISPOSAL

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

3.07 CONTRACT CLOSEOUT

A. Provide in accordance with Section 01 77 00.

END OF SECTION

SECTION 31 20 05
EROSION AND SEDIMENTATION CONTROL

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and General Provisions of the Contract, including General and Supplemental Conditions and Specification Sections, apply to this Section.

B. Extent of the work under this Section is shown on the Drawings.

1.02 DESCRIPTION OF WORK

A. Furnish all labor, materials, equipment and incidentals required to perform all installation, maintenance, removal and area cleanup related to erosion and sedimentation control work to meet Federal, State and Local permit requirements and for work shown on the Drawings and as specified herein. Erosion and sedimentation control shall include, but not be limited to: installation of temporary sediment traps, sediment removal and disposal, sediment and stormwater control device maintenance, removal of temporary control devices, temporary mulching or stabilization, and final cleanup and stabilization.

B. Related sections include the following:

1. Section 31 23 16: "Excavation"
2. Section 32 92 00: "Turf and Grasses"

1.03 REFERENCES

A. The Standard Specifications referenced herein shall be State of Connecticut, Department of Transportation Standard Specifications for Roads, Bridges, Facilities and Incidental Construction – Form 817, including all supplemental specifications.

B. 2002 Connecticut Guidelines for Soil Erosion and Sediment Control, including all updates, referenced hereafter as Guidelines.

C. 2004 Connecticut Stormwater Quality Manual, including updates.

D. American Society for Testing and Materials (ASTM) Publications:

1. D4355: Test Method for Deterioration of Geotextiles from Exposure to Ultraviolet Light and Water (Xenon-ARC Type Apparatus).
2. D4491: Test Methods for Water Permeability of Geotextile by Permittivity.
3. D4533: Test Method for Trapezoid Tearing Strength of Geotextiles.
4. D4632: Test Method for Grab Breaking Load and Elongation of Geotextiles.
5. D475 1: Test Method for Determining Apparent Opening Size of a Geotextile.
6. D4833: Test Method for Index Puncture Resistance of Geotextiles, Geomembranes and Related Products.

E. Town of East Hartford Manual of Technical Design with most recent revisions.

1.04 QUALITY ASSURANCE

A. The Contractor shall be responsible for the timely installation and maintenance of all control devices necessary to prevent the movement of sediment from the construction to offsite areas or into streams or wetlands via surface runoff or underground drainage systems. Measures outlined in the Erosion and Sediment Control Plan, as well as other measures as needed to prevent the movement of sediment offsite shall be installed, maintained, removed, and cleaned- up at the expense of the Contractor.

B. Erosion and sedimentation control measures shall conform to the requirements, standards and guidelines presented in the References.

C. Where the Contractor's efforts to control erosion and sedimentation have been demonstrated to be ineffective or potentially ineffective in the opinion of the Owner or Engineer, the Engineer may order that additional measures be implemented at no additional cost to the Owner.

D. Producer of geotextile fabric to maintain competent laboratory at point of manufacture to insure quality control in accordance with ASTM testing procedures. Laboratory to maintain records of quality control results.

E. Contractor shall take all precautions to protect geotextile fabric from damage resulting from any cause. Either repair or replace geotextile fabric to Engineer's satisfaction at no additional cost to the Owner.

1.05 SUBMITTALS

A. Submit the following in accordance with Section 1.03 – Submittals:

1. At least three weeks prior to shipment of all commercial products to be used for erosion and sedimentation control, submit manufacturer's certificate of compliance and physical property data sheet, indicating that requirements for materials and manufacture are in conformance as specified.
2. Prior to the start of work, the Contractor shall submit the following information:
   a. Applicable Contractor and Subcontractor information for all parties that will perform construction activities on the site that have the potential to cause pollution to waters of the State, including a contact person designated as responsible for compliance for each Contractor and Subcontractor.
   b. Designated normal working hours.

PART 2 PRODUCTS

2.01 MATERIALS

A. Sediment Control at Catch Basin – Materials to construct the sediment control filters as shown on the contract Drawings shall meet the requirements of the following:

1. Curb Opening Structures: The sediment control filter unit shall consist of a sewn geotextile fabric unit enclosing a porous structure in the form of a cylindrical tube placed in front and extending beyond the inlet opening on both sides and have a geotextile fabric sack attached, designed to fit the opening of the catch basin and to hang underneath the grate and into the catch basin.
2. Curb-less Structures: The sediment control filter unit shall consist of a sewn geotextile fabric sack designed to fit the opening of the catch basin and to hang underneath the grate and into the catch basin.
3. Geotextile fabric shall conform to the Section 7.55 of the Standard Specifications.
4. The sediment control filters shall have lifting straps to allow removal of the unit and manual inspection of the stormwater system.

B. Silt Fence

1. Wood posts shall be a minimum of 4 feet in length, 2-inches by 2-inches.
2. Silt fence fabric – physical properties of minimum average roll of the woven geotextile fabric for silt fence shall be:

Property	ASTM Test Method	Requirement
Grab Strength	ASTM D4632	100 lbs (min.)
Permittivity	ASTM D4491	0.10 cm/sec (min.)
Apparent Opening Size	ASTM D4751	Sieve No. 20-30
Ultraviolet Stability	ASTM D4355	70% (min.)

3. Silt fence fabric shall be on the CT DOT Qualified Product List for erosion control materials.

C. Erosion control matting shall conform to section M.13.09 of the CT DOT Form 817 Standard Specifications. Erosion control matting shall be on the CT DOT Qualified Product List for erosion control materials.

D. Temporary mulch shall conform to section M.13.05 of the CT DOT Form 817 Standard Specifications and shall be applied in areas which cannot be seeded because of the season, or are otherwise unfavorable for plant growth to protect areas against washouts and erosion. Material shall be organic such as straw, wood chips, bark and wood fiber mulch or other plant material as follows:

1. Wood chip or bark mulch material shall have uniform consistency and be free of rock, soil and other unacceptable materials.
2. Straw mulch shall be comprised of threshed straw of oats, wheat, barley, or rye that is free from noxious weeds, mold or other objectionable material. The straw mulch shall contain at least 50% by weight of material to be 10-inches or longer. Straw shall be in an air-dry condition and suitable for placement with blower equipment. Apply straw mulch at a rate of 100 lbs per 1000 square feet and tackified with latex acrylic copolymer at a rate of 1 gallon per 1000 square feet diluted in a ratio of 30 parts water to 1 part latex acrylic copolymer mix.

E. Latex acrylic copolymer or organic tackifier shall be a commercial product specifically manufactured for use as a straw mulch tackifier. Asphalt tackifier shall not be used.

F. Temporary Seeding

1. Materials shall conform to M.13.04 (b) of the CT DOT Form 817 Standard Specifications for temporary grass seed.
2. Apply temporary seed mix at a rate of 1 lb per 1000 square feet. After seed application, apply straw mulch and tackifier as specified herein.

PART 3 EXECUTION

3.01 GENERAL

A. Location of silt fence and all other erosion and sediment control measures shall be located as shown on the Drawings.

B. The Contractor shall install and maintain all erosion and sedimentation control devices necessary to prevent eroded materials from leaving the site.

C. The Contractor is responsible for implementation of any additional or modified erosion/ sedimentation controls deemed necessary by the Engineer/Owner, at no additional cost to the Owner.

D. The Contractor shall be responsible for measures necessary for dust control, including but not limited to roadway sweeping and watering. Dust control measures shall be implemented in accordance with the Guidelines and wet dust suppression methods shall comply with section 22a-174-18 (c) of the State of Connecticut DEEP Regulations.

E. Installation of erosion control measures shall be per the Erosion and Sedimentation Control Plan in the Contract Drawings.

F. Operations and maintenance of the temporary erosion and sediment control measures shall be per the Erosion and Sedimentation Control Plan in the Contract Drawings.

3.02 SILT FENCE

A. Install silt fence in accordance with the manufacturer's printed instructions and as indicated.

B. Install silt fence at locations shown on Drawings.

C. Firmly set stakes and filter fabric as indicated on Drawings.

D. Maintenance

1. Inspect weekly and after each rainfall.
2. Sediment deposits shall be removed when they exceed a height of one foot or ½ the height of the barrier.
3. Repair any damage immediately.

E. Removal and Clean-up

1. Remove silt fence when no longer required or when directed by the Engineer.
2. Restore disturbed areas to finish surface indicated on the Drawings.

3.03 SEDIMENT CONTROL AT CATCH BASINS

A. Install sediment control at catch basins in accordance with the manufacturer's recommendations, specifications, details and as ordered by the Engineer.

B. Maintenance

1. Inspect weekly and after each rainfall.
2. Clean all sediment that is accumulated in the sediment control filter. The filtering system shall be cleaned by using methods approved by the Engineer.
3. Sediment material that is removed from the filter shall be removed from the site. All material that accumulates shall be disposed of in accordance with any State and Federal requirements at the time of removal. The silt protection screening shall then be reinstalled in the same basin unless ordered to be disposed of by the Engineer. In the event that any part of the silt protection screening is determined unusable, the Contractor shall reconstruct or refurbish the silt protection at no additional cost to the Owner.

C. Removal and Clean-up

1. Remove sediment control at catch basins when no longer needed or when directed by the Engineer.
2. Restore disturbed areas to finish surface indicated on the Drawings.

3.04 STRAW MULCH

A. Spread mulch immediately following seeding operations.

B. Mulch shall be uniformly spread by hand or machine.

C. Apply mulch to obtain a uniform depth without matted spots.

D. Stabilize mulch immediately after mulch is spread.

E. Conform to manufacturer's instructions and obtain firm, continuous contact between mulch and soil.

F. Maintenance - Repair and replace areas which have been damaged.

3.05 STOCKPILES

A. Contractor staging and stockpile areas shall be located in the designated areas shown on the plans or at alternate locations as approved by the Engineer and Owner. The area selected for stockpiling shall be dry and stable. Stockpiles shall be protected as shown on the Drawings or as required and shall be stabilized.

B. Stockpiles shall be surrounded by silt fence. Stockpiles that are not to be used within 30 days shall be seeded or mulched immediately after formation of the stockpile.

3.06 INSPECTIONS

A. Contractor shall comply with the requirements for inspections as set forth.

B. All inspections shall be conducted by a "Qualified Inspector."

C. Make a visual inspection of all E&S control measures or devices, all disturbed areas, any designated concrete washout areas, all stockpiles, and all locations where vehicles enter and exit the site at least once per week and within 24 hours of the end of a storm that generates discharge. For storms that end on a weekend or holiday, an inspection is required within 24 hours only for a storm that equals or exceeds 0.5 inches. For storms less than 0.5 inches, inspection may occur immediately upon the start of the subsequent normal working hours. Contractor shall complete and maintain inspection reports on-site and make copies available to the Engineer at any time. If such inspection reveals that additional measures are needed to prevent movement of sediment to offsite areas or into drainage systems, promptly install additional devices as needed. Sediment controls in need of maintenance should be repaired promptly. Inspection reports shall be signed and certified by the Contractor. Non-engineered corrective actions shall be implemented within 24 hours. Engineered corrective actions must be implemented within 7 days.

D. Areas that have received temporary or permanent stabilization measures shall be inspected at least monthly for three months.

E. Inspectors from the owner may inspect the site at any time construction activities are ongoing and upon completion of construction activities to verify the final stabilization of the site and/or the installation of the post-construction stormwater management measures.

3.07 REMOVAL AND FINAL CLEAN-UP

A. Once the site has been permanently stabilized against erosion, remove and dispose of sediment control devices and all accumulated sediment. Dispose of waste materials in a legal, proper manner. Regrade all areas disturbed during this process and stabilize against erosion with surfacing materials as indicated in the Erosion Control Plan and/or restore disturbed areas to finish surface indicated on the Drawings.

B. All post-construction stormwater structures shall be cleaned of construction sediment and any remaining silt fence shall be removed upon final stabilization of the site.

END OF SECTION

SECTION 31 23 16
EXCAVATION

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and General Provisions of the Contract, including General and Supplemental Conditions and Specification Sections, apply to this Section.

B. Extent of the work under this Section is shown on the Drawings.

1.02 DESCRIPTION OF WORK

A. Perform all earth excavation, trench excavation, backfilling, filling, and grading operations, including but not limited to the following:

1. Excavation, compaction, and backfilling activities as required to remove existing piping, conduit, drainage structures, underground utilities, and all other structures in order to complete the work as specified.
2. Excavation, compaction, and backfilling activities as required to install new piping, conduit, drainage structures, underground utilities, and all other structures in order to complete the work as specified.
3. Sawcutting, excavation, compaction, and backfilling activities associated with the installation of all new bituminous concrete, concrete pavement, and curbing.
4. Excavation, compaction, and backfilling activities associated with all landscaping and turf establishment.
5. Provide materials for backfilling excavations and fills as indicated and specified.
6. Grade surfaces to meet finished grades as indicated.
7. Removal of boulders and unacceptable material as directed by the Construction Manager or Owner's Representative.
8. Test pits required to locate existing utilities.
9. Coordination of construction activities with mussel relocation requirements.

B. Immediately notify the Engineer if suspected hazardous materials are encountered and cease operations in that part of work.

C. Related sections include the following:

1. Section 31 20 05: "Erosion and Sedimentation Control"
2. Section 31 32 19.16: "Geotextile"
3. Section 31 41 00 "Shoring"
4. Section 32 12 16: "Asphalt Paving"
5. Section 32 13 13: "Concrete Paving"
6. Section 32 16 00: "Curbs and Gutters"
7. Section 32 92 00: "Turf and Grasses"
8. Section 32 92 10: "Exterior Plants"
9. Section 33 05 01.12: "Gravity Sewer Pipe and Fittings"

1.03 DEFINITIONS

A. Percentage of Compaction: The ratio of the field dry density, as determined by ASTM D1556, to the maximum dry density, as determined by ASTM D1557 Procedure C, multiplied by 100.

B. Proof Roll: Compaction with a minimum of four (4) passes of a vibratory steel drum or rubber tire roller. Vibratory plate compactors shall be used in small areas where vibratory steel drum or rubber tire roller cannot be used.

C. Acceptable Material: Material which does not contain organic silt or organic clay, peat, vegetation, wood or roots, stones or rock fragments over 6-inches in diameter, porous biodegradable matter, loose or soft fill, excavated pavement, construction debris, or refuse. Stones or rock fragments shall not exceed 40% by weight of the backfill material.

D. Unacceptable Materials: Material which does not comply with the requirements for acceptable material or which cannot be compacted to the specified or indicated density.

1.04 REFERENCES

A. The Standard Specifications referenced herein shall be State of Connecticut, Department of Transportation Standard Specifications for Roads, Bridges, Facilities and Incidental Construction – Form 817, including any addenda.

B. American Society for Testing and Materials (ASTM) Publications:

1. C33: Specification for Concrete Aggregates.
2. C136: Sieve Analysis of Fine and Coarse Aggregates.
3. D421: Practice for Dry Preparation of Soil Samples for Particle Size Analysis and Determination of Soil Constants.
4. D422: Test Method for Particle-Size Analysis of Soils.
5. D1140: Test Method for Amount of Material in Soils Finer than the No. 200 (75 micron) Sieve.
6. D1556: Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method.
7. D1557: Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lb/ft^3).
8. D2922: Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
9. D3017: Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).
10. D4959: Test Method for Field Determination of Water (Moisture) Content of Soil by Direct Heating Method.
11. D5080: Test Method for Rapid Determination of Percent Compaction.

C. Occupational Safety and Health Administration (OSHA) Standards and Regulations contained in Title 29: Part 1926 Subpart P – Excavations, Trenching and Shoring.

1.05 QUALITY ASSURANCE

A. Excavations shall be performed in the dry, and kept free from water, snow, and ice during construction. Bedding and backfill material shall not be placed in water. Water shall not be allowed to rise upon or flow over the bedding and backfill material.

B. The Contractor shall be solely responsible for making all excavations in a safe manner. All excavations shall comply with the requirements of OSHA excavation safety standards (29 CFR Part 1926 Subpart P) and State requirements. Where conflict between OSHA and State regulations exists, the more stringent requirements shall apply.

C. Do not excavate or fill until all the required submittals have been reviewed by the Engineer.

D. Formulate excavation, backfilling, and filling schedule and procedures to eliminate possibility of undermining or disturbing foundations of partially and completed structures, pipelines, and embankments or existing structures and pipelines.

E. Field Testing and Inspections:

1. **All field testing and inspections shall be performed by the Owner's independent testing laboratory. The Contractor shall be responsible for scheduling the required testing and inspections in accordance with these requirements. The Owner will not compensate the Contractor for any delays due to scheduling issues associated with the testing laboratory.**
2. Location of tests shall be mutually acceptable to the testing laboratory and the Owner's Representative.
3. In the event that compacted material does not meet specified in-place density, recompact material and retest the area until specified results are obtained. Any costs associated with additional testing shall be the responsibility of the Contractor.
4. Testing laboratory to perform inspection at least once daily to confirm lift thickness and compaction effort for entire fill area.

F. Methods of Field Testing:

1. In-Place Density: ASTM D1556 or ASTM D2922.
2. In-Place Moisture Content: ASTM D3017 or ASTM D4959.

G. Material Testing Frequency: The following testing frequencies are minimum required for all structural and non-structural fill and grading, and may be increased to comply with local requirements:

1. Field In-Place Density and Moisture Content: Screened gravel shall be compacted as specified and indicated. For other backfill and fill materials, minimum test frequency shall be as follows, and no less than one test per:
   a. Paved Areas: 250-square feet per lift.
   b. Around Structures: 250-square feet per lift.
2. Moisture Density: One per source, except for screened gravel. Repeat the moisture density test for every 50 cubic yards of material use, and whenever visual inspection indicates a change in material gradation as determined by the Engineer.
3. Gradation Analysis: A minimum of one per source and for each moisture density test, and whenever visual inspection indicates a change in material gradation as determined by the Engineer.

H. Construction Tolerances:

1. Construct finished surfaces to plus or minus 1-inch of the elevations indicated.
2. Grade cut and fill areas to plus or minus 0.20-foot of the grades indicated.
3. Provide the Engineer with adequate survey information to verify compliance with above tolerances.

I. Cut pavement with a saw or pneumatic tools to prevent damage to remaining pavement without extra compensation. Where pavement is removed in large pieces, dispose of pieces before proceeding with excavation.

J. Pipes, drains, and other utilities may exist in certain locations not indicated on Drawings. No attempt has been made to show all services. Completeness or accuracy of information given is not guaranteed.

K. Dig test pits considered as incidental to the normal excavation as indicated or as directed, at no additional compensation.

L. Carefully support and protect from damage existing pipes, poles, wires, fences, gates, hydrants, trees, curbing, property line markers, and other structures, which the Engineer determines must be preserved in place without being temporarily or permanently relocated. Should such items be damaged, restore without compensation therefore, to at least as good condition as that in which they were found immediately before the work was begun.

M. Haul away and dispose of surplus excavated materials at no additional cost to the Owner.

N. During progress of work, conduct earth moving operations and maintain work site so as to minimize the creation and dispersion of dust.

1.06 SUBMITTALS

A. Shop Drawings: Submit the following in accordance with General Conditions (GC):

1. Earthwork material submittals shall be submitted to the Engineer prior to backfilling and filling.
2. During Construction, submit written confirmation of fill lift thickness, in-place soil moisture content, and percentage of compaction to the Owner's Representative before placing the next lift or constructing foundations.

PART 2 PRODUCTS

2.01 MATERIALS

A. Common Fill used to grade the site below pavement, roadways, trenches, in landscaped areas, and to back fill over-excavations within structure foot prints should consist of soil free of organic material, debris, frozen soil, or other deleterious material. Common Fill shall not contain construction debris (broken concrete, masonry rubble, or other similar materials) in excess of 3-inches in maximum dimension. It shall have physical properties such that it can be readily spread and compacted during filling. Snow, ice frozen soil, and wet soil will not be permitted. The on-site material to be excavated, in general, is considered to be suitable for reuse as Common Fill. Common Fill shall conform to the following gradation requirements:

U.S. Standard Sieve Size	Percent Passing by Weight
3 in.	100
1½ in.	70-100
¾ in.	50-85
No. 4	30-50
No. 50	10-25
No. 200	0-5

B. Granular Fill shall conform to Section M.02.01 of the Standard Specifications. This material shall be free of organic material, debris, frozen soil, or other deleterious material, and shall conform to the following gradation requirements:

U.S. Standard Sieve Size	Percent Passing by Weight
3½ in.	100

1½ in.	55-100
¼ in.	25-60
No. 10	15-45
No. 40	5-25
No. 100	0-10
No. 200	0-5

C. Processed Aggregate Base material shall conform to Section M.05.01 of the Standard Specifications. This material shall be free of organic material, debris, frozen soil, or other deleterious material, and shall conform to the following gradation requirements:

U.S. Standard Sieve Size	Percent Passing by Weight
2½ in.	100
2 in.	95-100
¾ in.	50-75
¼ in.	25-45
No. 40	5-20
No. 100	2-12

D. Sand Bedding material shall consist of clean, hard particles, not frozen, and conform to the following gradation requirements:

U.S. Standard Sieve Size	Percent Passing by Weight
3/8 in.	100
No. 4	80-100
No. 10	30-50
No. 40	5-25
No. 100	0-5

E. 3/4-inch Crushed Stone material (Granular Fill) shall be free of organic material, debris, frozen soil, or other deleterious material, and shall conform to the following gradation requirements:

U.S. Standard Sieve Size	Percent Passing by Weight
1½ in.	100
1 in.	95-100
½ in.	25-60
No. 4	0-10
No. 8	0-5

F. Crushed Stone Dust material shall be free of organic material, debris, frozen soil, or other deleterious material, and shall conform to the following gradation requirements:

U.S. Standard Sieve Size	Percent Passing by Weight
1 in.	100
¾ in.	90-100
½ in.	20-55
3/8 in.	0-15
No. 4	0-5

G. Intermediate Riprap shall conform to Section M.12.02-2 of the Standard Specifications.

2.02 EQUIPMENT

A. The compaction equipment shall be selected by the Contractor, and shall be capable of consistently achieving the specified compaction requirements. The selected compaction equipment shall meet the following minimum requirements:

1. Manually operated vibratory plate compactors weighing no less than 200 pounds with vibration frequency no less than 1600 cycles per minute.
2. Vibratory steel drum or rubber tire roller weighing at least 14,000 pounds.

2.03 ACCESSORIES

A. Warning Tape: Detectable, acid and alkali resistant polyethylene film warning tape manufactured for marking and identifying underground utilities. The tape shall have a minimum width of 2-inches and a minimum thickness of 5-mils, and be five-ply composition ultra-high molecular weight virgin polyethylene material with a minimum tensile break strength of 150 pounds. The tape shall be continuously inscribed with a description of the utility; colored as follows:

1. Red: Electric.
2. Yellow: Gas, oil, steam, and dangerous materials.
3. Orange: Telephone and other communications.
4. Blue: Water systems.
5. Green: Sewer systems.

PART 3 EXECUTION

3.01 SITE MAINTENANCE

A. Site Leveling: Grade site as to maintain in a level unrutted condition and to eliminate puddling of surface and subsurface water.

3.02 EXCAVATION

A. Execution of any earth excavation shall not commence until the related dewatering, backfill, and fill materials submittals are reviewed by the Engineer, and all Engineer's comments are satisfactorily addressed.

B. Carry out program of excavation, dewatering, sheeting, and bracing in such a manner as to eliminate all possibility of undermining or disturbing foundations of existing structures or of work previously completed under this contract.

C. Excavate to widths that give suitable room for building structures; furnish and place all sheeting, bracing, and supports; do all coffer damming, pumping, and draining; and render bottom of excavations firm, dry, and acceptable in all respects.

D. Do not plow, scrape, or dig by machinery, earth near to finished subgrade so as to result in disturbance of material below subgrade, unless indicated or specified, and remove with pick and shovel, material to be excavated, just before placing pipe, masonry, or other structure.

E. Excavation, trenching, and shoring requirements for the protection of employees in accordance with OSHA Regulations, CFR 29 PART 1926.650, shall be employed and enforced.

F. Length of trench open at any one time will be controlled by conditions and subject to any limits that may be prescribed by the Owner's Representative.

G. Pavement shall be sawcut without extra compensation to Contractor.

H. The Owner's Representative may direct that sheeting and bracing be cut off at specified elevation and left in place.

I. The Owner's Representative may direct in writing to leave in place at any time during the progress of work all sheeting, bracing, etc., that are not indicated to be left in place.

J. There may be pipes, drains, and other utilities in certain locations not indicated on Drawings. The accuracy of information given is not guaranteed.

1. Contractor shall contact "Call-Before-You-Dig" for underground utilities information a minimum of 72 hours prior to start of construction. Contractor shall obtain all available underground utility information prior to excavation. Contractor shall locate all known utilities prior to excavation and shall repair/replace all damage by the Contractor at no extra cost to the Owner. Utilities damaged by the Contractor shall be repaired in accordance with the utility owner's requirements.

K. All existing pipes, poles, wires, fences, curbing, property line markers, and other structures which the Owner decides must be preserved in place without being temporarily or permanently relocated, shall be carefully supported and protected from damage by the Contractor. Should such items be damaged, they shall be restored by the Contractor, without compensation, to at least as good condition as that in which they were found immediately before the work was begun.

L. Whenever the Contractor encounters or damages existing structures as described in section N below, he shall perform all or a portion of the work described as directed in writing by the Owner's Representative to change the location of, remove and restore, or replace such structures, or to assist the Owner thereof in so doing. For all such work, the Contractor shall be paid as Extra Work.

M. In removing existing pipes or other structures, the Owner shall allow for payment only those new materials and labor which, in his judgment, are necessary to replace those unavoidably damaged.

N. The structures to which the provisions of the preceding two paragraphs shall apply include pipes, wires, and other structures which meet all of the following:

1. Are not indicated on the Drawings or otherwise provided for,
2. Encroach upon or are encountered near and substantially parallel to the edge of the excavation, and
3. In the opinion of the Owner's Representative, will impede progress to such an extent that satisfactory construction cannot proceed until they have been changed in location, removed (to be later restored), or replaced.

O. Branches, limbs, and roots shall not be cut except by permission of the Owner.

P. Restoration of existing property or structures should be done as promptly as practicable and not left until the end of the construction period.

Q. If material unsuitable for foundation, in the opinion of the Owner, is found at or below the grade to which excavation would normally be carried out in accordance with the Drawings and/or specifications, the Contractor shall remove such material to the required width and depth, and

replace it with thoroughly compacted material of a type as directed. For all such work, the Contractor shall be paid as Extra Work.

R. Surplus excavated materials not needed shall be hauled away and disposed of by the Contractor, at his expense, at appropriate locations, in accordance with arrangements made by him, and in accordance with all Federal, State, and local regulations.

S. During progress of work, the Contractor shall conduct his operations and maintain the area of his activities, including sweeping and sprinkling of streets as necessary, so as to minimize the creation and dispersion of dust. If the Owner decides that it is necessary to use calcium chloride for more effective dust control, the Contractor shall furnish and spread material, as directed. The Contractor shall be paid as Extra Work if calcium chloride is used.

T. In general, and unless other material is indicated on Drawings or specified, material used for backfilling trenches and excavations around structures shall be suitable material which was removed in the course of making the construction excavations. Suitable material can be used provided it is free of organic or other foreign materials and debris. Reuse of existing materials for backfill shall be approved by the Owner. If sufficient suitable material is not available from the excavations, the backfill material shall be Common Fill. Backfill shall be mechanically compacted to 95% optimum density (AASHTO-T-180 Method D) in 8-inch loose lifts maximum. Material may not be used as backfill until excavation from which fill was removed has been sampled and analyzed, and authorization to backfill the excavation has been obtained. Hazardous material may not be used as backfill. Excavated material with contamination below action levels, as defined by CT DEEP regulations, may be used on site as backfill, where directed or approved by the Owner. Contractor shall be responsible for testing of common fill for suitability as fill and for hazardous material.

U. The nature of materials will govern both their acceptability for backfill and methods best suited for their placement and compaction in backfill.

V. Excavate to lines and grades indicated in an orderly and continuous program.

W. Establish limits of excavation to allow adequate working space for installing forms and for safety of personnel.

X. Excavate to elevations indicated, or deeper, as directed by the Owner's Representative, to remove unacceptable bottom material.

Y. Exercise care to preserve material below and beyond the lines of excavations.

Z. Place excavated material at the approved stockpile locations and in no case closer than 3 feet from edge of excavations to prevent cave-ins of bank slides.

AA. Regard small, less than one-half (0.5) cubic yard, boulders, rock fragments, and concrete encountered during excavation as a normal part of in-place soils.

3.03 SEPARATION OF EXCAVATED MATERIALS FOR REUSE

A. Sawcut and remove only existing pavement that is necessary for execution of work.

B. Carefully remove loam and topsoil from excavated areas. Store separately for further use. Topsoil from slopes containing invasives is not to be reused on site and shall be removed as required.

C. Carefully remove acceptable material from excavated areas and store separately for further use as backfill material.

3.04 EXCAVATION NEAR EXISTING STRUCTURES

A. Discontinue digging by machinery when excavation approaches pipes, conduits, or other underground structures. Continue excavation by use of hand tools. Include such manual excavation in work to be done when incidental to normal excavation and under items involving normal excavation.

B. Excavate test pits when determination of exact location of pipe or other underground structure is necessary for doing work properly.

3.05 REMOVAL OF SUBSURFACE OBSTRUCTIONS

A. Promptly notify the Engineer when any unexpected subsurface facilities are encountered during excavation such as utility lines and appurtenances, walls and foundations.

3.06 SHEETING AND BRACING

A. Furnish, put in place, and maintain such sheeting, bracing, etc., as may be necessary to support sides of excavation and to prevent any movement of earth which could diminish width of excavation to less than necessary for proper construction, or could otherwise injure or delay work, or endanger adjacent structures.

B. Drive sheeting ahead of excavation, whenever possible, to avoid loss of material from behind sheeting. Avoid trimming behind face where sheeting will be driven, if excavating below sheeting. Prevent voids, where possible, outside of sheeting and immediately fill any remaining voids with sand, and compact.

C. Leave in place, as indicated, all sheeting, bracing, etc., that is to be embedded in backfill, or concrete.

D. Cut off sheeting and bracing at specified elevations when directed by Owner.

E. Carefully remove all sheeting and bracing not to be left in place as not to endanger construction or other structures. Immediately backfill all voids left or caused by withdrawal of sheeting. Use suitable materials and compacting methods.

3.07 UNAUTHORIZED EXCAVATION

A. When the bottom of any excavation for structures is taken out beyond limits indicated or specified, backfill, with screened gravel wrapped with non-woven geotextile fabric or with 1,500 psi concrete.

3.08 DISPOSAL OF SURPLUS EXCAVATED MATERIALS

A. Reuse acceptable excavated materials for backfill. Legally dispose of surplus excavated material off-site.

3.09 SUBGRADE PREPARATION AND PROTECTION

A. Remove loam and topsoil, loose vegetable matter, stumps and large roots from areas upon which material will be placed for grading. Shape subgrade as indicated on Drawings, and prepare by forking, furrowing, or plowing so that the first layer of new material placed thereon will be well bonded to it.

B. As directed by the Engineer, over excavate unacceptable materials below the foundation subgrade. Backfill the over excavation with compacted screened gravel wrapped with nonwoven geotextile fabric. In no case shall the screened gravel be placed directly on the exposed subgrade prior to placing the geotextile fabric.

3.10 CARE AND RESTORATION OF PROPERTY

A. Enclose uncut tree trunks adjacent to work in wooden boxes of such height as may be necessary for protection from injury from piled material, equipment, operations, or otherwise due to work. Operate excavating machinery and cranes of suitable type with care to prevent injury to trees not to be cut and particularly to overhanging branches and limbs.

B. Cut all branches, limbs, and roots smoothly and neatly without splitting or crushing. Neatly trim, cut the injured portions and cover with an application of grafting wax or tree healing paint as directed.

C. Protect cultivated hedges, shrubs, and plants which might be injured by the Contractor's operations by suitable means or dig up and temporarily replant and maintain. After construction operations have been substantially completed, replant in original positions and care for until growth is reestablished. If cultivated hedges, shrubs, and plants are injured to such a degree as to affect their growth or diminish their beauty or usefulness, replace by items of equal kind and quality as existed at the start of the work at Contractor's expense.

D. Do not use or operate tractors, bulldozers, or other power-operated equipment on paved surfaces when their treads or wheels are so shaped as to cut or otherwise damage such surfaces.

E. Restore surfaces damaged by the Contractor's operations to a condition at least equal to that in which they were found immediately before work commenced. Use suitable materials and methods for such restoration.

F. Existing fencing disturbed by construction activities to be restored to a condition at least comparable to pre-construction conditions.

3.11 BACKFILLING – GENERAL

A. Do not place frozen materials in backfill or place backfill upon frozen material. Remove previously frozen material or treat before new backfill is placed.

B. Do not place, spread, roll or compact fill material during unfavorable weather conditions. If interrupted by heavy rain or other unfavorable conditions, do not resume until ascertaining that the moisture content and density of the previously placed soil are as specified.

C. Do not use puddling, ponding or flooding as a means of compaction.

3.12 MATERIAL PLACEMENT AND COMPACTION REQUIREMENTS

A. Common Fill, Processed Aggregate Base and Subbase, and Granular Fill:

1. Dump and spread in layers not to exceed 8-inches uncompacted thickness.
2. Compact, fill and backfill under and directly adjacent to structures to not less than 95%. Compact to not less than 90% in other areas unless otherwise indicated.

B. Common Fill and Acceptable materials for use as non-structural fill:

1. Dump and spread in layers not to exceed 8-inches uncompacted thickness unless otherwise indicated.
2. Compact to not less than 90% unless otherwise indicated.

C. Backfilling and filling operation shall be suspended in areas where tests are being made until tests are completed and the testing laboratory has advised the Engineer that adequate densities are obtained.

3.13 NON-STRUCTURAL BACKFILL AROUND STRUCTURES

A. Use acceptable materials for non-structural backfill around structures and compact as specified and indicated.

B. Deposit material evenly around structure to avoid unequal soil pressure.

C. Do not place backfill against or on structures until they have attained sufficient strength to support the loads (including construction loads) to which they will be subjected, without distortion, cracking, or other damage.

3.14 COMPACTION CONTROL OF BACKFILL AND FILL

A. Compact to density specified and indicated for various types of material. Control moisture content of material being placed as specified or if not specified, at a level slightly lower than optimum.

B. The soil testing laboratory shall provide inspection during filling or backfilling operations to ensure compaction of screened gravel and record compaction equipment in use.

C. Moisture control may be required either at the stockpile area, pits, or backfill. Increase moisture content when material is too dry by sprinkling or other means of wetting uniformly. Reduce moisture content when material is too wet by exposing the greatest possible area to sun and air in conjunction with harrowing, plowing, spreading of material or any other effective methods.

3.15 ALLOWANCE FOR SHRINKAGE

A. Build embankments or backfill to a height above finished grade which will, in the opinion of the Engineer, allow for the shrinkage or consolidation of material. Initially, provide at all points, an excess of at least 1% of total height of backfill measured from stripped surface to top of finished surface.

B. Supply specified materials and build up low places as directed, without additional cost if embankment or backfilling settles so as to be below the indicated level for proposed finished surface at any time before final acceptance of the work.

3.16 USE OF PLATES/TEMPORARY PAVING DURING CONSTRUCTION

A. During all trench excavation, Contractor shall backfill trenches at end of work day and restore with gravel subbase, processed aggregate base and temporary paving. Contractor may secure trench

overnight in area of active excavation with steel plates installed on top of trench box. Steel plates shall match elevation of adjacent paved surfaces, and be secured. Plates to have pavement installed to match surface of plate and to readily insure plate does not move due to vehicle traffic. Steel plates shall be adequate for the traffic loads. No openings shall be left on edges of plates. Where slippage by pedestrians or vehicles may be an issue, plates shall have a non-slip surface.

END OF SECTION

SECTION 31 32 19.16
GEOTEXTILES

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and General Provisions of the Contract, including General and Supplemental Conditions and Specification Sections, apply to this Section.

B. Extent of the work under this Section is shown on the Drawings.

1.02 DESCRIPTION OF WORK

A. Provide woven geotextile fabric for filter fabric as indicated or specified.

B. Related Sections include the following:

1. Section 31 23 16: "Excavation"
2. Section 33 05 01.12: "Gravity Sewer Pipe and Fittings"

1.03 REFERENCES

A. American Society for Testing and Materials (ASTM) Publications:

1. D4355: Test Method for Deterioration of Geotextiles from Exposure to Ultraviolet Light and Water (Xenon-ARC Type Apparatus).
2. D4491: Test Methods for Water Permeability of Geotextile by Permittivity.
3. D4533: Test Method for Trapezoid Tearing Strength of Geotextiles.
4. D4632: Test Method for Grab Breaking Load and Elongation of Geotextiles.
5. D475 1: Test Method for Determining Apparent Opening Size of a Geotextile.
6. D4833: Test Method for Index Puncture Resistance of Geotextiles, Geomembranes and Related Products.

B. CTDOT Standard Specifications for Roads, Bridges, Facilities and Incidental Construction Form 817

1.04 SUBMITTALS

A. Shop Drawings: Submit the following in accordance with Section 1.03 – Submittals:

1. At least three weeks prior to shipment, submit manufacturer's certificate of compliance and physical property data sheet, indicating that requirements for materials and manufacture are in conformance as specified.

B. General:

1. Producer of geotextile fabric to maintain competent laboratory at point of manufacture to insure quality control in accordance with ASTM testing procedures. Laboratory to maintain records of quality control results.
2. Take all precautions to protect geotextile fabric from damage resulting from any cause. Either repair or replace geotextile fabric to Engineer's satisfaction at no additional cost to the Owner.

PART 2 PRODUCTS

2.01 MATERIALS

A. Filter fabric shall conform to Section M.08.01-19 of the CTDOT Standard Specifications for Roads, Bridges, Facilities and Incidental Construction Form 817, and be listed on CTDOT Approved Materials List.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install filter fabric as detailed in the Drawings.

END OF SECTION

SECTION 31 41 00
SHORING

PART 1 GENERAL

1.01 SUBMITTALS

A. Informational Submittals:

1. Excavation support plan.
2. Movement monitoring plan.
3. Movement measurement and data and reduced results indicating movement trends.

1.02 QUALITY ASSURANCE

A. Provide surveys to monitor movements of adjacent facilities.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 GENERAL

A. Design, provide, and maintain shoring, sheeting, and bracing as necessary to support the sides of excavations and to prevent detrimental settlement and lateral movement of existing facilities, adjacent property, and completed Work.

B. An excavation support system shall be utilized for the excavation required for the construction of the Storm Water Sewer. The location of the excavation support system shall be within the limits of excavation shown on Drawings.

3.02 EXCAVATION SUPPORT PLAN

A. Prepare excavation support plan addressing the following topics:

1. Details of shoring, bracing, sloping, or other provisions for worker protection from hazards of caving ground.
2. Design assumptions and calculations signed and sealed by a professional engineer licensed in the State of Connecticut.
3. Methods and sequencing of installing excavation support.
4. Proposed locations of stockpiled excavated material.
5. Minimum lateral distance from the crest of slopes for vehicles and stockpiled excavated materials.
6. Anticipated difficulties and proposed resolutions.

3.03 MOVEMENT MONITORING PLAN

A. Prepare movement monitoring plan addressing the following topics:

1. Survey control.
2. Location of monitoring points.
3. Plots of data trends.
4. Interval between surveys.

B. Movement monitoring points shall be established on all existing structures and utilities within 20 feet of deep excavation required for construction of the Storm Water Sewer.

3.04 REMOVAL OF EXCAVATIONI SUPPORT

A. Remove excavation support in a manner that will maintain support as excavation is backfilled.

B. Do not begin to remove excavation support until support can be removed without damage to existing facilities, completed Work, or adjacent property.

C. Remove excavation support and backfill in a manner that does not leave voids in the backfill.

END OF SECTION

SECTION 32 12 16
ASPHALT PAVING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and General Provisions of the Contract, including General and Supplemental Conditions and Specification Sections, apply to this Section.

B. Extent of the work under this Section is shown on the Drawings.

1.02 DESCRIPTION OF WORK

A. Section includes bituminous concrete pavement and curbing, including mixture design.

B. Related Sections include the following:

1. Section 31 23 16: "Excavation"
2. Section 32 17 23: "Pavement Markings"

1.03 REFERENCES

A. Standard Specification for Roads, Bridges, Facilities and Incidental Construction, State of Connecticut Department of Transportation, Form 817 as amended and supplemented. (Referred to herein as the Standard Specification or Standard Specifications).

B. Town of East Hartford Manual of Technical Design with most recent revisions.

1.04 QUALITY ASSURANCE

A. Conform to Section 2.09 of the Standard Specifications regarding Subgrade, Section 2.12 of the Standard Specifications regarding subbase course, Section 3.04 of the Standard Specifications regarding processed aggregate base, and Section 4.06 of the Standard Specifications regarding bituminous concrete paving.

B. Engineer reserves the right to inspect plant, paving materials, and preparation of paving materials at plant.

C. Do not place permanent pavement in cold or wet weather.

1.05 SUBMITTALS

A. Shop Drawings: Submit the following in accordance with Section 1.03 – Submittals:

1. Submit bituminous paving mix design with laboratory tests certifying conformance with the Standard Specifications.
2. Submit certification by the paving material plant of conformance with referenced standards.
3. Submit plant batch slips with each batch of material delivered to site, giving information as required by the Owner's Representative.

1.06 SAFETY

A. Ensure public safety.

PART 2 PRODUCTS

2.01 MATERIALS

A. Bituminous Materials: In accordance with referenced Sections of M.04.01 and M.04.02 of the Standard Specifications.

B. Bituminous Curb material: In accordance with CT DOT Form 817 Section 8.15.02.

PART 3 EXECUTION

3.01 GENERAL

A. Provide, maintain, and later remove devices necessary to ensure public safety.

B. Plants preparing paving materials to be satisfactory to the Engineer.

C. Except as otherwise indicated, specified, or approved by the Engineer, bituminous paving material shall be hot bituminous concrete conforming to HMA S0.5 (d) or HMA S0.375 (d) of Section M.04 of the Standard Specifications.

D. For temporary pavement, if required, bituminous paving material shall be bituminous concrete conforming to HMA S0.375 (d) of Section M.04 of the Standard Specifications.

E. Thickness indicated, specified, or directed by the Engineer where compaction required are thicknesses after compaction is completed satisfactorily.

F. Base and subbase courses as specified types are part of pavement construction.

G. Prior to removal of pavement, cut on the longest straight lines possible by pneumatic cutter or equivalent cutting device approved by Owner's Representative.

H. Compact backfill and fill in accordance with Section 31 23 16 "Excavation" prior to placing subbase, base, or pavement over it.

I. Remove and dispose of surplus and unsuitable material.

J. At time of installing permanent pavement, cut the existing pavement 12-inches, or more as required, beyond the edge of the trench excavation, or existing edge of pavement. The vertical face of the cut shall be comprised of sound, undamaged material. The vertical face shall be cleaned and prepared for bonding to the new permanent pavement as specified, or as directed by the Owner's Representative.

K. Where excavation is located in sidewalks and similar narrow paved areas, replace the whole width to have permanent pavement.

L. Adequately protect and leave in a clean condition manhole covers, catch basin grates, valve and meter boxes, curbs, walks, and walls.

M. Adjust manhole covers, catch basin grates, valve boxes, and similar items to conform with pavement grade or as directed by the Engineer.

N. Maintain surfaces of processed aggregate base course until pavement is placed.
O. Restore disturbed or eroded processed aggregate base course as required before placing pavement.

P. Sweep clean surfaces of existing pavement and binder course on which new pavement is to be placed, to satisfaction of Engineer prior to placing new pavement.

Q. Where Engineer deems necessary, treat surface of existing pavement to which new pavement is to bond with RC-250 cut back asphalt, RS-I or RS-2 emulsified asphalt applied at rate between .05 and 0.15 gallons per square yard.

R. Maintain surfaces throughout the guarantee period in a safe condition for traffic, correcting any defects in the pavement placed.

S. When cold weather dictates use of temporary pavement, Contractor shall be responsible for maintaining until permanent pavement can be provided. Temporary surface shall be adequately compacted and sealed to prevent degradation of the repair during the temporary period.

3.02 SUBBASE COURSE

A. Subbase course conforming to Section 2.12 of the Standard Specifications.

B. Construction methods to conform to applicable portions of Section 2.12 of the Standard Specifications.

C. Thickness of subbase course as indicated except where directed otherwise by the Owner's Representative.

3.03 PROCESSED AGGREGATE BASE COURSE

A. Processed aggregate base course conforming to Section 3.04 of the Standard Specifications.

B. Construction methods to conform to applicable portions of Section 3.04 of the Standard Specifications.

C. Thickness as indicated except where directed otherwise by the Engineer.

D. Place on previously constructed subbase course.

E. Top of processed aggregate base course to be below finished grade a distance equal to the depth of the pavement to be placed over it.

3.04 BITUMINOUS CONCRETE PAVEMENT

A. Conform to Section 4.06 of the Standard Specifications.

B. Where indicated and directed by the Engineer, place on previously prepared processed aggregate base course, dressed and recompacted as directed.

C. Clean and paint existing pavement edges with asphalt cement tack coat conforming to CTDOT requirements for bonding with new pavement.

3.05 BITUMINOUS CONCRETE CURB

A. Bituminous Concrete Curbs shall be installed in accordance with CTDOT Form 817 Section 8.15.03.

END OF SECTION

SECTION 32 13 13
CONCRETE PAVING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and General Provisions of the Contract, including General and Supplemental Conditions and Specification Sections, apply to this Section.

B. Extent of the work under this Section is shown on the Drawings.

1.02 DESCRIPTION OF WORK

A. Provide labor, materials, and equipment required to place exterior cement concrete sidewalks and ramps, and detectable warning panels as indicated on the Drawings.

B. Related Sections include the following:

1. Section 31 23 16: "Excavation"

1.03 REFERENCES

A. Standard Specifications for Roads, Bridges, Facilities and Incidental Construction, State of Connecticut Department of Transportation, Form 817 as amended and supplemented. (Referred to herein as the Standard Specification or Standard Specifications).

B. Town of East Hartford Manual of Technical Design with most recent revisions.

1.04 QUALITY ASSURANCE

A. Construction shall conform to Section 9.21 of the Standard Specifications.

B. Before submitting design mixtures, review concrete pavement mixture design and examine procedures for ensuring quality of concrete materials and concrete pavement construction practices.

1.05 SUBMITTALS

A. Product Data: For each type of manufactured material and product indicated.

B. Design Mixtures: For each concrete pavement mixture. Include alternate mixture designs when characteristics of materials, project conditions, weather, test results, or other circumstances warrant adjustments.

C. Material Certificates: Signed by manufacturers certifying that each of the following materials complies with requirements:

1. Cementitious materials.
2. Steel reinforcement and reinforcement accessories.
3. Admixtures.

D. Joint Materials

1.06 PROJECT CONDITIONS

A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities.

PART 2 PRODUCTS

2.01 MATERIALS

A. Forms

1. Form Materials: Plywood, metal, metal-framed plywood, or other approved panel-type materials to provide full-depth, continuous, straight, smooth exposed surfaces.
2. Use flexible or curved forms for curves with a radius of 25 feet or less.
3. 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.

B. Detectable Warning Panels

1. Detectable Warning Panel conforming to the 2010 ADA Standards for Accessible Design as amended or supplemented. Size and color shall be approved by the Engineer.
   a. Size: 2' minimum width extending the full width of the sidewalk, ramp or pad.
   b. For new concrete construction, detectable warning panels to be cast iron cast in place with suitable anchors to securely hold panels in place in accordance with manufacturer's requirements.
   c. For locations where detectable warning panels to be installed on existing concrete surfaces, detectable warning panels to be secured with anchors and adhesives in accordance with manufacturer's requirements.
   d. Surface shall contrast visually with the adjacent sidewalk, ramp or pad surfaces, either light on dark or dark on light.
2. Detectable Warning Panel Surface Adhesive shall be in accordance with detectable warning panel manufacturer's requirements.

C. Steel Reinforcement

1. Plain-Steel Welded Wire Fabric (WWF): ASTM A 185, fabricated from as-drawn steel wire into flat sheets.
2. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars, welded wire reinforcement, and dowels in place.
3. Reinforcing Bars: ASTM 615 Grade 60.

D. Concrete Mixtures for Sidewalks

1. Prepare design mixtures, proportioned according to ACI 301, for each type and strength of normal-weight concrete determined by either laboratory trial mixes or field experience.
2. Use a qualified independent testing agency for preparing and reporting proposed concrete mixture designs for the trial batch method.
3. Proportion mixtures to provide normal-weight concrete with the following properties:
   a. Compressive Strength (28 Days): 4,400 psi.
   b. Maximum Water-Cementitious Materials Ratio at Point of Placement: 0.44.

c. Slump Limit: 4-inches, plus or minus 1-inch.

4. Add air-entraining admixture at manufacturer's prescribed rate to result in normal-weight concrete at point of placement having an air content as follows:
   a. Air Content: 6% plus or minus 1.5% for 1-inch nominal maximum aggregate size.
5. Limit water-soluble, chloride-ion content in hardened concrete to 0.15% to 0.30% by weight of cement.
6. Chemical Admixtures: Use admixtures according to manufacturer's written instructions.
   a. Use high-range, water-reducing, plasticizing, and retarding admixture in concrete, as required, for placement and workability.
   b. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
7. Cementitious Materials: Limit percentage, by weight, of cementitious materials, other than Portland cement, according to ACI 301 requirements for concrete exposed to deicing chemicals, as follows:
   a. Fly Ash or Pozzolan: 25%.
   b. Ground Granulated Blast-Furnace Slag: 50%.
   c. Combined Fly Ash or Pozzolan, and Ground Granulated Blast-Furnace Slag: 50%, with fly ash or pozzolan not exceeding 25%.

E. Ancillary Materials

1. Tie Bars: Meet section M.06.01 of the Standard Specifications for Reinforcing Steel.
2. Dowels: Conform to requirements of AASHTO M227/M227M, Grade 70.
3. Joint Materials: Conform to CT DOT Form 817 M.03.08.
4. Backer Rod:
   a. Backer material conforming to ASTM D5249.
   b. Cylindrical sealant backing conforming to ASTM C1330.
5. Curing Materials: Conform to CT DOT Form 817 M.03.04.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine exposed subgrades and subbase surfaces for compliance with requirements for dimensional, grading, and elevation tolerances.

B. Proceed with concrete pavement operations only after nonconforming conditions have been corrected and subgrade is ready to receive pavement.

3.02. PREPARATION

A. Remove loose material from compacted subbase surface immediately before placing concrete.

3.03 EDGE FORMS

A. Set, brace, and secure edge forms to required lines, grades, and elevations. Install forms to allow continuous progress of work. All forms shall remain in place at least 24 hours after concrete placement.

B. Clean forms after each use, and coat with form-release agent to ensure separation from concrete without damage.

3.04 STEEL REINFORCEMENT

A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.

B. Clean reinforcement of loose rust and mill scale, earth, ice, or other bond-reducing materials.

C. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement. Maintain minimum cover over reinforcement.

D. Install welded wire reinforcement in lengths as long as practicable. Lap adjoining pieces at least one full mesh, and lace splices with wire. Offset laps of adjoining widths to prevent continuous laps in either direction.

3.05 JOINTS

A. General: Expansion and contraction joints shall be located as detailed on the Drawings. Construction joints shall not be used unless approved by the Engineer.

B. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt-coat one-half (1/2) of dowel length to prevent concrete bonding to one side of joint.

C. Isolation Joints: Form isolation joints of preformed joint-filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, walks, and other fixed objects, and where indicated.

D. Locate expansion joints at intervals as indicated, unless otherwise indicated. Extend joint fillers full width and depth of joint. Terminate joint filler not less than 1/2-inch or more than 1-inch below finished surface if joint sealant is indicated. Place top of joint filler flush with finished concrete surface if joint sealant is not indicated.

E. Furnish joint fillers in one-piece lengths. Where more than one length is required, lace or clip joint-filler sections together. Protect top edge of joint filler during concrete placement with metal, plastic, or other temporary preformed cap. Remove protective cap after concrete has been placed on both sides of joint.

F. Contraction Joints: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of the concrete thickness, as follows to match jointing of existing adjacent concrete pavement:

G. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint with grooving tool to a 1/4-inch radius. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover marks on concrete surfaces.

Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before developing random contraction cracks.

Edging: Tool edges of pavement, gutters, curbs, and joints in concrete, after initial floating, with an edging tool to a 1/4-inch radius. Repeat tooling of edges after applying surface finishes. Eliminate tool marks on concrete surfaces.

3.06 CONCRETE PLACEMENT

A. Inspection: Before placing concrete, inspect and complete formwork installation, steel reinforcement, and items to be embedded or cast in. Notify other trades to permit installation of their work.

B. Remove snow, ice, or frost from subbase surface and reinforcement before placing concrete. Do not place concrete on frozen surfaces.

C. Moisten subbase to provide a uniform dampened condition at time concrete is placed. Do not place concrete around manholes or other structures until they are at required finish elevation and alignment.

D. Comply with ACI 301 requirements for measuring, mixing, transporting, and placing concrete.

E. Do not add water to concrete during delivery or at Project site.

F. Do not add water to fresh concrete after testing.

G. Place concrete in two operations; strike off initial pour for entire width of placement and to the required depth below finish surface. Lay welded wire fabric or fabricated bar mats immediately in final position. Place top layer of concrete, strike off, and screed.

H. Remove and replace concrete that has been placed for more than 15 minutes without being covered by top layer, or use bonding agent if approved by Engineer.

I. Screed pavement surfaces with a straightedge and strike off.

J. Compact subbase and prepare subgrade of sufficient width to prevent displacement of paver machine during operations where paver machine is used.

K. Cold-Weather Placement: Comply with ACI 306.1 and as follows when cold-weather conditions exist: Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.

1. When air temperature has fallen to or is expected to fall below 40°F, uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50°F and not more than 80°F at point of placement.
2. Do not use frozen materials or materials containing ice or snow.
3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mix designs.

L. Hot-Weather Placement: Comply with ACI 301 and as follows when hot-weather conditions exist:

1. Cool ingredients before mixing to maintain concrete temperature below 90°F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
2. Cover steel reinforcement with water-soaked burlap so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.
3. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

M. Where concrete is installed adjacent to the outside face of a building foundation wall, install ½" pre-molded expansion joint filler per the manufacturer's specifications.

3.07 FLOAT FINISHING

A. General: Do not add water to concrete surfaces during finishing operations.

B. Float Finish: Begin the second floating operation when bleed-water sheen has disappeared and concrete surface has stiffened sufficiently to permit operations. Float surface with power-driven floats, or by hand floating if area is small or inaccessible to power units. Finish surfaces to true planes. Cut down high spots and fill low spots. Refloat surface immediately to uniform granular texture.

C. Medium-to-Coarse-Textured Broom Finish: Provide a coarse finish by striating float-finished concrete surface 1/16-inch to 1/8-inch deep with a stiff-bristled broom, perpendicular to line of traffic. **Match finish of adjacent sidewalks.**

3.08 CONCRETE PROTECTION AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.

B. Comply with ACI 306.1 for cold-weather protection.

C. Evaporation Retarder: Apply evaporation retarder to concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.

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

E. Curing Methods: Cure concrete by moisture curing, moisture-retaining-cover curing, or a combination of these as follows:
   1. Moist Curing: Keep surfaces continuously moist for not less than 7 days with the following materials:
      a. Water.
      b. Continuous water-fog spray.
      c. Absorptive cover, water saturated and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.
   2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12-inches, and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.

3.09 PAVEMENT TOLERANCES

A. Comply with tolerances of ACI 117 and as follows:
   1. Elevation: 1/4-inch.
   2. Thickness: Plus 3/8-inch, minus 1/4-inch.
   3. Surface: Gap below 10-feet long, unleveled straightedge not to exceed 1/4-inch.

4. Lateral Alignment and Spacing of Tie Bars and Dowels: 1-inch.
5. Vertical Alignment of Tie Bars and Dowels: 1/4-inch.
6. Joint Spacing: 3-inches.
7. Contraction Joint Depth: Plus 1/4-inch, no minus.
8. Joint Width: Plus 1/8-inch, no minus.

3.10 FIELD QUALITY CONTROL

A. Testing Agency: The Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Testing Services: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:

1. Testing Frequency: Obtain at least one composite sample for each 20-cubic yards or fraction thereof of each concrete mix placed each day.
2. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mix. Perform additional tests when concrete consistency appears to change.
3. Air Content: ASTM C 231, pressure method; one test for each composite sample, but not less than one test for each day's pour of each concrete mix.
4. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40°F and below or 80°F and above, and one test for each composite sample.
5. Compression Test Specimens: ASTM C 31/C 31M; cast and laboratory cure one set of three (3) standard cylinder specimens for each composite sample.
6. Compressive-Strength Tests: ASTM C 39/C 39M; test one specimen at 7 days and two (2) specimens at 28 days.

C. Strength of each concrete mix will be satisfactory if average of any three (3) consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.

D. Test results shall be reported in writing to the Engineer, concrete manufacturer, and Contractor within 48-hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.

E. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Engineer.

F. Remove and replace concrete pavement where test results indicate that it does not comply with specified requirements.

G. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.11 DETECTABLE WARNING PANELS

A. Install all detectable warning panels in accordance with the 2010 ADA Accessible Design Guidelines as amended or supplemented and per the "Detectable Warning Panel Notes" in the Drawings.

B. Detectable warning panels for new concrete sidewalk ramps shall be cast-in-place and installed per the details in the Drawings.

C. Install detectable warning panels on existing concrete ramps according to the following:

1. Prior to placement of the detectable warning panel, clean and prepare concrete surface per the detectable warning panel's manufacturer's recommendations.
2. Mount the detectable warning panel to the concrete surface using an adhesive in accordance with the manufacturer's recommendations.
3. Refer to Section 3.12 for repairs and protection.

3.12 REPAIRS AND PROTECTION

A. Remove and replace concrete walks and pavement that is broken, damaged, or defective or that does not comply with requirements in this Section.

B. Protect concrete from damage. Exclude traffic from walks and pavement for at least 14 days after placement. When construction traffic is permitted, maintain pavement as clean as possible by removing surface stains and spillage of materials as they occur.

C. Maintain concrete walks and pavement free of stains, discoloration, dirt, and other foreign material. Sweep concrete pavement not more than two (2) days before date scheduled for Substantial Completion inspections.

END OF SECTION

SECTION 32 16 00
CURBS AND GUTTERS

PART 1 GENERAL

1.01 SUBMITTALS

A. Action Submittals:

1. Form Material: Information on metal forms, if used, including type, condition, surface finish, and intended function.
2. Complete data on concrete mix, including aggregate gradations and admixtures in accordance with requirements of ASTM C94.

B. Informational Submittals:

1. Curbing Compound: Manufacturer's Certificate of Compliance and application instructions.
2. Ready-mix delivery ticket for each truck in accordance with ASTM C94.

1.02 QUALITY ASSURANCE

A. Regulatory Requirements: Conform to the State of CT DOT Standard Specifications for Roads, Bridges, Facilities and Incidental Construction Form 817.

PART 2 PRODUCTS

2.01 MATERIALS

A. Conform to the requirements of the CT DOT Form 817.

2.02 GRANITE CURBS

A. Per CT DOT Form 817 section M.12.06.1 "Granite Curbing" and M.12.07.1 "Granite Slope Curbing"

B. Match existing color and texture. Owner to approve of material selection prior to installation.

PART 3 EXECUTION

3.01 INSTALLATION

A. Perform work in accordance with the CT DOT Form 817.

3.02 GRANITE CURBS

A. Construct in accordance with plans, details and CT DOT Form 817 section 8.13.03.

END OF SECTION

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SECTION 32 17 23
PAVEMENT MARKINGS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

B. Extent of the work under this Section is shown on the Drawings.

1.02 DESCRIPTION OF WORK

A. Painted pavement markings applied to asphalt and concrete pavement of the type, size and color specified on the Drawings or as directed by the Engineer.

B. Related Sections include the following:

1. Section 32 12 16 "Asphalt Paving"
2. Section 32 13 13 "Concrete Paving"

1.03 REFERENCES

A. Standard Specification for Roads, Bridges, Facilities and Incidental Construction, State of Connecticut Department of Transportation, Form 817 as amended and supplemented. (Referred to herein as the Standard Specification or Standard Specifications).

B. Town of East Hartford Manual of Technical Design.

C. Latest edition of Manual on Uniform Traffic Control Devices (MUTCD).

1.04 QUALITY ASSURANCE

A. Comply with materials, workmanship, and other applicable requirements of Section 12.09 of the Standard Specifications.

1.05 SUBMITTALS

A. Product Data: For each type of product.

1. Include technical data and tested physical and performance properties.

1.06 FIELD CONDITIONS

A. Environmental Limitations: Proceed with pavement marking only on clean, dry surfaces and at a minimum ambient or surface temperature of 40 degrees F for alkyd materials and 55 degrees F for water-based materials, and not exceeding 95 degrees F.

1.07 DELIVERY, STORAGE AND HANDLING

A. Deliver pavement marking materials to project site in original packages with seals unbroken and bearing manufacturer's labels containing brand name and type of material, date of manufacture, and directions for storage.

B. Store pavement marking materials in a clean, dry, protected location within temperature range required by manufacturer. Protect stored materials from direct sunlight.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by a manufacturer approved by the CT DOT.

2.02 PAVEMENT MARKING PAINT

A. Pavement Marking Paint: Pavement marking paint of the color indicated on the Drawings in accordance with Section M.07.20 of Form 817.

1. Color: White, yellow or blue as indicated on Drawings.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that pavement is dry and in suitable condition to begin pavement marking according to manufacturer's written instructions.

B. Proceed with pavement marking only after unsatisfactory conditions have been corrected.

3.02 PAVEMENT MARKING

A. All markings to conform to the MUTCD. Do not apply pavement-marking paint until layout, colors, and placement have been verified with the Engineer.

B. Allow paving to age as required by the paint manufacturer prior to starting pavement marking.

C. Sweep and clean surface to eliminate loose material and dust.

D. Apply paint with mechanical equipment to produce pavement markings, of dimensions indicated, with uniform, straight edges. Apply paint at a rate of 100 to 115 square feet per gallon in accordance with the requirements of the Standard Specifications.

1. Apply graphic symbols and lettering with paint-resistant, die-cut stencils, firmly secured to pavement. Mask an extended area beyond edges of each stencil to prevent paint application beyond the stencil. Apply paint so that it cannot run beneath the stencil.
2. Broadcast glass beads uniformly into wet markings at a rate of six (6) lb/gallon.

3.03 PROTECTING AND CLEANING

A. Protect pavement markings from damage and wear during remainder of construction period.

B. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION

SECTION 32 92 00
TURF AND GRASSES

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and General Provisions of the Contract, including General and Supplemental Conditions and Specification Sections, apply to this Section.

B. Extent of the work under this Section is shown on the Drawings and described herein.

1.02 DESCRIPTION OF WORK

A. This item covers the furnishing of all labor, materials, testing, submittals, tools, and equipment necessary to provide turf establishment (seeding, hydroseeding, or sodding) on all disturbed areas as shown on the Drawings or as directed by the Engineer. The work shall consist of providing an accepted uniform stand of established perennial turf grasses, including watering, weed control, and mowing.

B. Related Sections include the following:

1. Section 31 20 05: "Erosion and Sedimentation Control"
2. Section 31 23 16: "Excavation"

1.03 DEFINITIONS

A. Finish Grade: Elevation of finished surface of planting soil.

B. Manufactured Topsoil: Soil produced off-site by homogeneously blending mineral soils or sand with stabilized organic soil amendments to produce topsoil or planting soil.

C. Subgrade: Surface or elevation of subsoil remaining after excavation is complete, or top surface of a fill or backfill before planting soil is placed.

D. Subsoil: All soil beneath the topsoil layer of the soil profile, and typified by the lack of organic matter and soil organisms.

E. Surface Soil: Soil that is present at the top layer of the existing soil profile at the Project site. In undisturbed areas, the surface soil is typically topsoil, but in disturbed areas such as urban environments, the surface soil can be subsoil.

1.04 REFERENCES

A. Standard Specification for Roads, Bridges, Facilities and Incidental Construction, State of Connecticut Department of Transportation, Form 817 as amended and supplemented. (Referred to herein as the Standard Specification or Standard Specifications).

B. Town of East Hartford Manual of Technical Design.

1.05 SUBMITTALS

A. Gradation test results for loam.

B. Label from bag and cut sheet for mulch.

C. Material Test Reports: Confirming percentage of organic matter in loam.

D. Affidavit and test report for seed mixture.

E. Manufacturer's guarantee statement of analysis of fertilizer.

F. Manufacturer's guarantee statement for sod.

1.06 DELIVERY, STORAGE, AND HANDLING

A. 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 fertilizers, lime, and soil amendments with appropriate certificates.

1.07 PROJECT CONDITIONS

A. Planting Restrictions: Plant during one of the following periods. Coordinate planting periods with initial maintenance periods to provide required maintenance from date of Substantial Completion.

1. Spring Planting: April 15 – June 15.
2. Fall Planting: August 15 – October 15.

B. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit planting to be performed when beneficial and optimum results may be obtained. Apply products during favorable weather conditions according to manufacturer's written instructions.

PART 2 PRODUCTS

2.01 MATERIALS

A. FERTILIZER

1. Composite commercial fertilizer shall bear the manufacturer's guarantee statement of analysis and meet the minimum requirements of 10% nitrogen, 10% phosphoric acid, 10% potash, with at least 50% of the nitrogen being organically carried.

B. MULCH

1. Mulch shall conform to Section M.13.05 of the Standard Specifications.

C. SEED

1. Lawn seed shall be fresh, clean, and new crop seed. Seed shall be as specified on the plans.

D. SOD

1. The sod shall have a seed mix as recommended by the grower and approved by the Engineer for the specific use of the sod. Sod shall be living sod obtained from a commercial sod farm, and shall be free from noxious weeds, insect infestations, and fungous and bacterial diseases. The sod shall be cut to a minimum depth of 1-inch to 1-1/2-inches.

E. Agricultural Ground Dolomitic Limestone shall conform to Section M.13.02 of the Standard Specifications.

F. TOPSOIL

1. Topsoil shall conform to Section M.13.01 of the Standard Specifications, except that it shall be free from rocks and stones greater than 3/4-inch. Topsoil shall be delivered unfrozen to the job site. **Topsoil shall not be removed from the site without approval of the Owner.** Topsoil to be delivered to the site shall be tested for contamination by the Contractor and approved by the Owner prior to delivery.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine areas to be planted for compliance with requirements and other conditions affecting performance.

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. Insure that all topsoil removed from sloped area within the outfall corridor on-site has been removed from the site and new topsoil meeting the above requirements is installed.

3.02 PREPARATION

A. Newly Graded Subgrades: Loosen subgrade to a minimum depth of 6-inches. Remove stones larger than 1-inch in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Owner's property.

B. Finish Grading: Spread 6-inch layer of topsoil. Grade area to a smooth, uniform surface plane with loose, uniformly fine texture. Grade to within plus or minus 1/2-inch of finish elevation. Roll and rake, remove ridges, and fill depressions to meet finish grades. Limit finish grading to areas that can be planted in the immediate future.

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. Apply fertilizer at a rate of 20-pounds per 1000-square feet or as recommended by the seed manufacturer or sod provider.

3.03 SEEDING

A. The grass seed shall be applied at a rate of 2-pounds per 1000-square feet. The seeded area shall be mulched with a layer of grass, hay or straw at a rate of 10-pounds per 100-square feet.

The seeded areas shall be thoroughly watered until a satisfactory stand of grass has been established. The Contractor is responsible for one mowing as directed by the Engineer.

3.04 HYDROSEEDING

A. Fertilizer, seed, and mulch shall be applied using an acceptable hydroseeding distribution method approved by the Engineer. Mulch shall be applied at a rate of 25-pounds to 40-pounds per 1000-square feet. The Contractor is responsible for one mowing as directed by the Engineer.

3.05 SODDING

A. The fertilizer and lime shall be spread at a rate recommended by the sod supplier. Live sod shall be installed in conformance with Section 9.53.03 of the Standard Specifications.

3.06 TURF MAINTENANCE

A. Maintain and establish turf by watering, fertilizing, weeding, mowing, trimming, replanting, and performing other operations as required to establish healthy, viable turf. Roll, regrade, and replant bare or eroded areas and re-mulch to produce a uniformly smooth turf. Provide materials and installation the same as those used in the original installation.

1. Fill in as necessary soil subsidence that may occur because of settling or other processes. Replace materials and turf damaged or lost in areas of subsidence.
2. In areas where mulch has been disturbed by wind or maintenance operations, add new mulch, and anchor as required to prevent displacement.

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. Water turf with fine spray at a minimum rate of 1-inch per week unless rainfall precipitation is adequate.

C. Turf – Post-Fertilization: Apply fertilizer after initial mowing and when grass is dry.

1. Use fertilizer that will provide actual nitrogen of at least 1-pound per 1000-square feet to turf area.

3.07 SATISFACTORY TURF

A. Turf installations shall meet the following criteria as determined by the Engineer:

1. Satisfactory Seeded Turf: Prior to the project closeout a healthy, uniform, close stand of grass has been established, free of weeds and surface irregularities, with coverage exceeding 90% over any 10-square feet, and bare spots not exceeding 5-inches by 5-inches.

B. Use specified materials to reestablish turf that does not comply with requirements and continue maintenance until turf is satisfactory.

3.08 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. 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.

C. **Contractor is responsible for protecting new lawn areas until grass is established, by whatever method necessary to ensure a full stand of grass.**

D. Remove non-degradable erosion control measures after grass establishment period.

END OF SECTION

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SECTION 33 05 01.12
GRAVITY SEWER PIPE AND FITTINGS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and General Provisions of the Contract, including General and Supplementary Conditions and Specification Sections, apply to this Section.

B. Extent of the work under this Section is shown on the Drawings.

1.02 DESCRIPTION OF WORK

A. Provide reinforced concrete pipe (RCP) of the specified size and class where indicated for the storm water drainage pipes.

B. Related Sections include the following:

1. Section 31 20 05: "Erosion and Sedimentation Control"
2. Section 31 23 16: "Excavation"
3. Section 31 32 19.16: "Geotextile"
4. Section 31 41 00 "Shoring"
5. Section 33 05 13: "Manholes"
6. Section 33 44 13.13: "Catch Basins"

1.03 REFERENCES

A. Standard Specifications for Roads, Bridges, Facilities and Incidental Construction, State of Connecticut Department of Transportation, Form 817 as amended and supplemented. (Referred to herein as the Standard Specification or Standard Specifications).

B. American Society for Testing and Materials (ASTM) Publications:

1. C76: Specification for Reinforced Concrete Culvert, Storm Drain and Sewer Pipe.
2. C361: Specification for Reinforced Concrete Low-Head Pressure Pipe.
3. C443: Specification for Joints for Circular Concrete Culvert and Sewer Pipe, Using Rubber Gaskets.

C. Town of East Hartford Manual of Technical Design.

1.04 QUALITY ASSURANCE

A. Provide pipe made by manufacturer of established good reputation in the industry and manufactured in a plant adapted to meet the design requirements of the pipe.

B. Provide certificates from manufacturers stating that pipe conforms to ASTM C76 and joint gaskets conform to ASTM C443 or C361.

C. Inspection by Engineer:

1. At site of work after delivery.
2. Reject pipe at any time if it fails to meet specified requirements. Immediately remove rejected pipe from site.

1.05 SUBMITTALS

A. Shop Drawings: Submit the following in accordance with Section 1.03 – Submittals:

1. Shop Drawings showing pipe dimensions, reinforcement, joint, and other details for each type and class pipe.
2. Certified copy of pipe tests on identical pipe units made by same manufacturer within past year.

PART 2 PRODUCTS

2.01 MATERIALS

A. Reinforced Concrete Pipe (RCP)

1. Conform to requirements of this section and of ASTM C76 for Class IV and Class V.
2. All pipe and fittings to meet CT DOT Form 817 M.08.01 (7) Reinforced Concrete Pipe.
3. Joints:

a. General: Use rubber gasket type with "captive gasket in groove" design. Joint mating length shall provide allowance for manufacturer's allowable joint deflection, preset joint opening to allow for joint sealing during joint movement.
b. Pipe 36-inches or less in diameter: Rubber gasket in accordance with ASTM-C-76.
c. Pipe larger than 36-inches in diameter: O-ring or ribbed-gasket: ASTM C443 and as specified.
d. Concrete Joints:
1) Push-on, self-centering bell and spigot type, using rubber gaskets.
2) Joints and gaskets shall conform to ASTM C443. Lubricant for joining pipe as approved by pipe manufacturer.
3) Flared bell type joints that provide full wall thickness at both bell and spigot.
4) Shall form watertight seal capable of resisting internal or external water head of minimum 30 feet.

B. Pipe to Manhole Connection

1. Manufacturers and Products:

a. Uniseal, Evansville, Indiana; Pipeconx, Universal Pipe Connector.
b. NPC Inc., Milford, NH; Kor-N-Seal.
c. Or equal.

C. Flexible Compression Collar

1. Mechanical joint coupling with No. 305 stainless steel bands.
2. Manufacturers:

a. Calder, Inc., Bellflower, CA.
b. Fernco Inc., Davison, MI.
c. Or equal.

D. Concrete

1. Compressive Strength: Minimum 2,500 psi at 28 days.

E. Joint Cement Mortar

1. Mixture: 1 part cement and 2 parts of clean sand well graded of such size that will pass No. 8 sieve.
2. Combine cement and sand in proper proportions and thoroughly mix with water.
3. Quantity of water used in preparation of mortar shall be minimum required to produce mixture sufficiently workable for purpose intended.
4. No admixtures shall be used, unless otherwise specified or acceptable to Engineer.

F. Quick Setting Grout

1. High strength, non-staining grout.
2. Reach initial set within 90 minutes at 70 degrees F and minimum compressive strength of 2,500 psi within 24 hours.
3. Shrinkage shall be less than 0.01 percent when tested in accordance with ASTM C596.

G. Pipe Caps
1. Pipe caps shall be constructed of concrete and made specifically for the capping of concrete pipes. Caps shall either be bell caps or spigot type caps depending upon the application.

PART 3 EXECUTION

3.01 EXAMINATION

A. Notify Engineer immediately of manufacturing imperfections or damage caused by improper handling.

B. Verify size, pipe condition, and pipe class prior to installation of pipe.

3.02 PREPARATION

A. Pipe Distribution: Do not distribute more than 1 week's supply of materials in advance of laying, unless otherwise approved by the Engineer.

B. Inspect pipe and fittings prior to lowering into trench to ensure no cracked, broken, or otherwise defective materials are being used.

C. Remove foreign matter and dirt from inside of pipe and fittings and keep clean during and after laying. Wash ends of section clean with wet brush prior to joining sections of pipe.

3.03 INSTALLATION

A. General:

1. Install pipe sections in accordance with manufacturer's recommendations.
2. Provide and use proper implements, tools, and facilities for safe and proper prosecution of Work.
3. Lower pipe, fittings, and appurtenances into trench, piece by piece, by means of crane, slings, or other suitable tools and equipment, in such a manner as to prevent damage to pipe materials, protective coatings and linings. Do not drop or dump pipe into trenches.

B. Bedding:

1. Support on compacted material as indicated. Do not permanently support on saddles, blocking, or stones.
2. Provide bell holes for imparting bearing pressure to pipe barrel.

C. Line and Grade

1. Establish line and grade for pipe by use of lasers.
2. Measure for grade at pipe invert, not at top of pipe.
3. Do not deviate from line or grade, as shown on Drawings, more than ½ inch, provided that such variation does not result in a level or reverse sloping invert.

D. Laying and Jointing:

1. Use gasket lubricant as recommended by gasket manufacturer.
2. Lay pipe upgrade with bell ends pointing in the direction of laying.
3. When field cutting or machining pipe is necessary, use only tools and methods recommended by pipe manufacturer and approved by Engineer.
4. After section of pipe has been placed in its approximate position for jointing, clean end of pipe to be joined, inside of joint, and rubber ring immediately before joining pipe.
5. Assemble joint in accordance with recommendations of manufacturer.
6. Apply sufficient pressure in making joint to assure that joint is "home" as defined in standard installation instructions provided by pipe manufacturer. Inside joint space shall not exceed 50 percent of pipe manufacturer's recommended maximum allowance.
7. Place pipe to specified line and grade to form smooth flow line.
8. Ensure that bottom of pipe is in contact with bottom of trench for full length of each section.
9. Check for alignment and grade after joint has been made.
10. Place sufficient pipe bedding material to secure pipe from movement before next joint is installed.
11. When pipe is laid within movable trench shield, take precautions to prevent pipe joints from pulling apart when moving shield ahead.
12. When laying operations are not in progress, and at close of day's work close and block open end of last laid section of pipe to prevent entry of foreign material or creep of gasketed joints.
13. Take precautions to prevent "uplift" or floating of line prior to completion of backfill operation.
14. Connections between one pipe material and another shall be by means of flexible compression collar, installed in accordance with the manufacturer's recommendations, or concrete closure collar.

E. Gasketed Joint Protection:

1. Point interior joints with openings greater than 3/8 inch on 24-inch and larger concrete pipe. Point (fill with joint cement mortar) 360 degrees of circumference. Quick setting grout may be substituted for joint cement mortar when approved by Engineer.
   a. Thoroughly clean joint of lubricant materials and dirt.
   b. Prewet joint before applying mortar.
   c. Pointing shall be done in such a manner that there are no bulges, ridges, or other irregularities.
   d. Pointing shall be flush with interior of pipe.
   e. Do not point joints closer than three pipe joints from next pipe section to be placed.
   f. Pointing Mortar:
      1) 1 part cement to 1.5 parts sand, unless otherwise approved by Engineer.
      2) Plastic and of such consistency that it will readily adhere to pipe.

F. Backfill:

1. Suitable backfill, compact gravel or crushed stone between pipe and sides of trenches to hold pipe in correct alignment. Fill bell holes with screened gravel or crushed stone and compact as indicated.
2. Prevent floatation in trench.

3.04 CONCRETE CLOSURE COLLAR

A. Use only when approved by Engineer, and then only to make connections between dissimilar pipe or where standard rubber gasketed joints or flexible compression collars are impractical or unavailable.

B. Procedure:

1. Remove water from excavation; placement of concrete in standing water will not be allowed.
2. Wash pipe to remove loose material.
3. Wrap and securely fasten light gauge sheet metal or building felt around pipe joint to ensure that concrete does not enter line.
4. Wet nonmetallic pipe thoroughly prior to concrete placement.
5. Placement shall be monolithic for each collar.
6. Place to minimum 6 inch thickness around outside diameter or pipe.
7. Extend concrete minimum of 12 inches on each side of joint.
8. Cure concrete, after initial set, by covering with well moistened earth.

3.05 CLEANING

A. Use watertight plugs in open ends of pipe and branches when installation not in progress.

B. Do not use pipeline as conductor for trench drainage.

C. Clean pipeline , manholes and catch basins upon completion. Remove material from each manhole section before cleaning the next section downstream.

END OF SECTION

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SECTION 33 05 13
MANHOLES

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and General Provisions of the Contract, including General and Supplementary Conditions and Specification Sections, apply to this Section.

B. Extent of the work under this Section is shown on the Drawings.

1.02 DESCRIPTION OF WORK

A. Provide reinforced concrete manholes and vault chambers of the specified size and class where indicated for the storm water drainage pipes.

B. Related Sections include the following:

1. Section 31 20 05: "Erosion and Sedimentation Control"
2. Section 31 23 16: "Excavation"
3. Section 31 32 19.16: "Geotextile"
4. Section 31 41 00 "Shoring"
5. Section 33 05 01.12: "Gravity Sewer Pipe and Fittings"

1.03 REFERENCES

A. Standard Specifications for Roads, Bridges, Facilities and Incidental Construction, State of Connecticut Department of Transportation, Form 817 as amended and supplemented. (Referred to herein as the Standard Specification or Standard Specifications).

B. American Society for Testing and Materials (ASTM) Publications, latest edition:

1. C478: Specification for Precast Reinforced Concrete Manhole Sections
2. C361: Specification for Reinforced Concrete Low-Head Pressure Pipe.
3. C443: Specification for Joints for Circular Concrete Culvert and Sewer Pipe, Using Rubber Gaskets.

C. Town of East Hartford Manual of Technical Design.

1.04 QUALITY ASSURANCE

A. All materials shall be inspected and tested at the place of manufacturer as required by the Standard Specifications to which the material is manufactured.

B. Inspection by Engineer:

1. At site of work after delivery.
2. Reject material at any time if it fails to meet specified requirements. Immediately remove rejected material from site.

C. Precast concrete manhole and vault chamber sections shall not be delivered to the work site until they have aged at
least seven (7) days. Any precast concrete structure delivered to the site not meeting the seven (7) day age requirement will be rejected by the Engineer.

1.05 SUBMITTALS

A. Submit the following in accordance with Section 1.03 – Submittals:

1. Shop Drawings including dimensions and details of construction, reinforcing and joints, anchors, lifting, erection inserts, and other items cast into members.
2. Details of joints between sections and between manhole/vault and entering pipe.
3. Product Data:
   a. Concrete mix design.
   b. Manhole frame to structure seals.
   c. Manhole frame to structure anchor bolt.
   d. Rubber gaskets and sealants.
   e. External joint wrap.
4. Location plan or list showing the location of each manhole/vault and such other information as needed for installation.
5. A certified statement that inspection and all of the specified tests have been made and met shall be submitted.
6. Vault design submittal shall be sealed by a CT Licensed Professional Engineer.

PART 2 PRODUCTS

2.01 MATERIALS

A. Precast concrete manhole and vault sections and appurtenances shall conform to ASTM C478 with the following exceptions and additional requirements:

1. The wall sections shall be not less than 5 inches thick for 48-inch I.D. manholes and 6 inches for 60-inch or greater I.D. manholes.
2. Portland cement concrete with a minimum 28-day compressive strength of 4,000 psi shall be used for 48-inch I.D. and 60-inch and greater I.D. manholes.
3. Seal tongue and groove joints of precast sections with either rubber O-ring gasket or preformed flexible joint sealant. O-ring rubber gaskets shall conform to ASTM C443. Preformed flexible joint sealant shall conform to ASTM C990 and shall be Kent Seal No. 2 by Hamilton-Kent; Ram-Nek by K.T. Snyder Company, ConSeal CS102 by ConSeal Sealants Inc. or equal.
4. The tops of the base sections shall be suitably shaped by means of accurate bell-ring forms to receive the barrel sections. All holes for pipes shall be cast in the base sections so that there is a clear distance of four inches minimum between the inside bottom of the base section and the bottom of the pipe.
5. Openings for pipe and materials to be embedded in the wall of the base shall be cast in the base at the required locations during the manufacture of the base.
6. Base pads shall be pre-cast with extended bases.
7. Cone sections shall be of the eccentric type and be manufactured in accord with the standards for wall and base sections.
8. Flat top slabs shall have a thickness and reinforcement in compliance with ASTM C478.
9. Manhole sections shall contain manhole steps so as to form a continuous ladder with a distance of twelve inches (12") between steps.
10. No more than two lift holes shall be cast or drilled in each manhole section. Lift holes as required for vault sections.
11. Sections shall be cured by subjecting them to thoroughly saturated steam at a temperature between 100 and 130 degrees F. for a period of not less than 12 hours or, when necessary, for such additional time as may be needed to enable the sections to meet the strength requirements. Cast date is required on all sections.
12. Shipment of precast manhole and vault sections to the construction site shall not be allowed until the precast sections have aged at least seven (7) days. Cast date is required on all sections. Any precast concrete structure delivered to the site not meeting the seven (7) day age requirement will be rejected by the Engineer.

13. The date of manufacture and the name or trademark of the manufacturer shall be clearly marked on the inside of each manhole/vault section.
14. All precast units shall be designated for AASHTO H-20 traffic loading.
15. Provide integrally cast knock-out panels in precast concrete manhole sections at locations and with sizes shown on the Contract Plans. Knock-out panels shall have no steel reinforcing.

B. Pipe to Manhole/Vault Connector

1. Connect pipe to manhole/vault using one of the following methods:
   a. Flexible sleeve – Integrally cast sleeve in precast elements or install sleeve in formed or cored opening. Pipe shall be fastened in sleeve with stainless steel clamp(s). Coat stainless steel clamp(s) with bituminous material to protect from corrosion. Flexible sleeve shall be Lock Joint Flexible Manhole Sleeve; Kor-N-Seal connector; PSX Press-Seal Gasket or equal.
   b. Compression gasket – Integrally cast compression gasket in precast element. Compression gasket shall be A-Lok or equal.

C. Brick

1. Brick shall conform to the requirements of Article M.08.02-1, of the Standard Specifications.

D. Concrete Masonry Units

1. Concrete masonry units shall conform to the requirements of Article M.08.02-3 of the Standard Specifications.

E. Mortar

1. Mortar shall conform to the requirements of Article M.11.04 of the Standard Specifications.

F. Manhole Frames and Covers

1. The manhole frames and covers shall conform to the Owner approved materials for sanitary sewer and storm sewer installations.
2. Castings:
   a. Tough, close-grained gray iron, sound, smooth, clean, free from blisters, blowholes, shrinkage, cold shuts, and defects.
   b. Cast Iron: ASTM A48/A48M Class 30B.
   c. Ductile Iron: ASTM A536, Grade 60-40-12.
   d. Plane or grind bearing surfaces to ensure flat, true surfaces.
3. Sewer manhole covers shall conform to Owner's standard.
4. Capscrews for Watertight Covers: High temper phosphor bronze with 60,000 psi minimum tensile strength meeting ASTM B139/B139M.
5. Watertight Cover Gasket: Molded from high-quality rubber such as nitrile or EPDM.
6. Rocking or rattling covers will be replaced at no additional cost to the Owner. In order to prevent covers from rocking or rattling under traffic and to insure proper fit and interchangeability between different frames and covers, the lower surface of the cover and the corresponding upper surface of the frame shall be machine-finished in a lathe to provide a round, smooth, flat contact with the dimensions and clearances called for on the Plans.
7. All manufactured manhole frames and covers submitted for Owner approval and use shall be clearly and conspicuously marked on the top surface of each in English letters designating the manufacturing country of origin. Such marking shall be made either by

means of die stamping, cast-in molding, etching or engraving. No other type of marking is acceptable.

G. Manhole Steps

1. Manhole steps, as shown on the Drawings, shall be built into manhole walls and elsewhere as indicated, and shall be aligned to form a continuous ladder with rungs equally spaced vertically at a maximum distance of 12-inches apart. The top step shall be between 12-inches and 16-inches below the manhole cover. Steps shall be embedded in the manhole wall a minimum distance of 3-inches and rungs or cleats shall project a minimum clear distance of 5-inches from the interior manhole wall, measured from the point of embedment. Additional steps shall be furnished and set as shown on the plans or where ordered by the Engineer.
2. Aluminum manhole steps shall be forged aluminum safety run, alloy 6061-T6. That portion of the manhole step encased in concrete or masonry shall be coated with either bitumastic or zinc chromate paints.
3. Plastic manhole steps shall be in conformance with ASTM C478 and shall be of copolymer polypropylene conforming to ASTM D4101 for Type 11 propylene copolymers. The copolymer polypropylene compound shall encase a ½-inch Grade 60 steel reinforcing rod conforming to ASTM A615. Plastic manhole steps shall be capable of withstanding ASTM C478 Vertical and horizontal load tests and resist pull out forces over 1,500 lbs.

H. Damp proofing

1. Two coats of bituminous waterproofing material applied to the exterior surfaces of sanitary sewer and storm sewer manholes by brush or spray in accordance with the manufacturer's recommendations. Damp proofing shall be Hydrocide 700B by Sonneborn Building Products, Dehydratine 4 by A.C. Horn Inc., RIW Marine Liquid by Toch Brothers, or equal.

I. Backfill Around and Under Manhole/Vault

1. Set manhole on minimum 4 inches of No. 3 aggregate meeting M.01.01 of the standard specifications.
2. Backfill with Pervious Structure Backfill meeting M.02.05 of the standard specifications.

PART 3 EXECUTION

3.01 GENERAL

A. Prior to installation inspect materials:

1. Sections not meeting requirements of this Section or that are determined to have defects which may affect durability of structure are subject to rejection.
2. Sections damaged after delivery will be rejected and if already installed shall be repaired to satisfaction of Owner and Engineer.
3. Remove and replace structure that cannot be repaired.

B. If needed, dewater excavation during construction and testing operations.

3.02 INSTALLATION OF PRECAST MANHOLE/VAULT

A. Concrete Base:

1. Precast:
   a. Place on compacted base.
   b. Properly locate, ensure firm bearing throughout, and plumb first section.
2. Cast-in-Place:
   a. Invert: Minimum 4 inches below lowest connecting pipe.
   b. First section of manhole shall be cast in concrete base.

B. Sections:

1. Inspect precast manhole sections to be joined.
2. Clean ends of sections to be joined.
3. Do not use sections with chips or cracks in tongue.
4. Locate precast steps in line with each other to provide continuous vertical ladder.
5. Carefully lift and lower to position in the excavation by suitable rigging.

C. Preformed Plastic Gaskets or Rubber O-Ring:

1. Rubber gaskets or approved equal shall be installed in all joints in accord with the manufacturer's recommendations.

3.03 MANHOLE/VAULT INVERT

A. Inverts and water tables shall be built of brick or formed with poured concrete as directed by the Engineer. Inverts shall, in general, have a uniform grade between the inverts of the inlet and outlet pipes. Joints in brick inverts shall be tooled to be slightly concave and polished.

B. Only clean bricks shall be used. Bricks shall be moistened by suitable means, until they are neither so dry as to absorb water from the mortar nor so wet as to be slippery when laid.

C. Construct with smooth transitions to ensure unobstructed flow through manhole. Remove sharp edges of pipe completely and mortar. Trowel mortar surfaces smooth.

D. Each brick shall be laid in a full bed and joint of mortar without requiring subsequent grouting, flushing or filling, and shall be thoroughly bonded.

E. Where full section of pipe is laid through manhole, break out top section and cover exposed edge of pipe completely with mortar. Trowel mortar surfaces smooth.

3.04 PLASTERING AND CURING MASONRY

A. Outside faces of masonry walls shall be plastered with mortar ½-inch thick.

B. If required, the masonry shall be properly moistened prior to application of the mortar. The mortar shall be carefully spread and troweled. After hardening, the mortar shall be carefully checked by being tapped for bond. Unbonded or unsound mortar shall be removed and replaced.

C. Brick masonry and mortar shall be protected from too rapid drying by the use of burlap, kept continually moist, or by other suitable means, and shall be protected from the weather and frost.

3.05 MANHOLE FRAMES AND COVERS

A. Cast iron frames shall be set to a full even bearing on cement mortar flush with finished grade or as directed by the Engineer. The flange of the frame shall not project outside of the masonry on which it rests. The inner circle of the frame shall not overhang the brickwork by more than one inch (1").

1. A minimum of two courses of red brick ASTM C-32-72, Grade SM mortared in place (not to exceed 18" in height) shall be placed directly under the manhole frame. Under no circumstances shall precast concrete grade rings be allowed.

B. Until such time as cast iron frames and covers are set, manhole tops must be kept covered with temporary coverings to exclude persons, animals, dirt and foreign substances.

C. Anchor frame to manhole with specified bolts.

3.06 WATERTIGHT MANHOLES

A. If noted, manhole covers shall be bolted down with sealing gasket.

B. Paint outer surfaces of sanitary sewer or drain manholes with two coats of bituminous dampproofiing at the rate of 30 to 60 square feet per gallon, in accordance with the manufacturer's instructions.

3.07 MANHOLES OVER EXISTING PIPING

A. Maintain flow through existing pipelines at all times.

B. Concrete Pipe: Apply bonding agent on surfaces in contact with concrete.

C. Construct base under existing piping.

D. Construct manhole as detailed on Drawings.

E. Apply minimum of two complete wraps of hydrophilic waterstop centered on pipe in wall.

F. Place a minimum of 24 inches of concrete around each pipe penetration outside manhole against undisturbed soil or compacted aggregate unless otherwise detailed.

G. Grout channel through manhole.

H. Saw cut out or demolish existing pipe within new manhole using method approved by Engineer.

I. Protect new concrete or grout for 7 days after placing concrete.

3.08 CONNECTIONS TO EXISTING MANHOLES

A. Core manhole bases and grouting as necessary.

B. Seal pipe in manhole using flexible connector.

C. Regrout to provide smooth flow into and through manholes.

D. Provide diversion facilities and perform work necessary to maintain flow during connection.

3.09 LEAKAGE TESTS FOR DRAIN MANHOLES

A. The Engineer will visually inspect drain manholes for possible leaks before backfilling is allowed. All joints shall be sealed to the satisfaction of the Engineer.

B. The Engineer may require an exfiltration test on any structure for which he/she deems appropriate.

3.10 CLEANING

A. Thoroughly clean all new manholes of all silt, debris and foreign matter of any kind, prior to final inspections.

END OF SECTION

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SECTION 33 44 13.13
CATCH BASINS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

B. Extent of the work under this Section is shown on the Drawings.

1.02 DESCRIPTION OF WORK

A. Provide and construct precast concrete catch basins as indicated on the Drawings and as specified herein.

1. Bases: Precast concrete.
2. Walls: Precast Concrete.
3. Top of Cone: Brickwork for adjusting frame to meet finished surface (not to exceed 12-inches as specified on detail).
4. Tops with Grates, Risers, and Sumps: As indicated and specified.

B. Related Sections include the following:

1. Section 31 23 16: "Excavation"
2. Section 33 05 01.12: "Gravity Sewer Pipe and Fittings"
3. Section 33 05 15: "Manholes"

1.03 REFERENCES

A. Standard Specifications for Roads, Bridges, Facilities, and Incidental Construction, State of Connecticut Department of Transportation, Form 817 as amended and supplemented. (Referred to herein as the Standard Specification or Standard Specifications).

1.04 QUALITY ASSURANCE

A. Construction shall conform to Section 5.07 of the Standard Specifications.

1.05 SUBMITTALS:

A. Shop Drawings: Submit the following in accordance with Section 01 40 00 – Quality Requirements:

1. Submit manufacturer's specifications and product data.

PART 2 PRODUCTS

2.01 MATERIALS

A. Precast Concrete Sections: Precast concrete sections (base, riser, and cones) shall conform to Section M.08.02-4 of the Standard Specifications and the following:

1. Joints between sections: Butyl rubber-based sealants.
2. Cones and conical transitions similar in design and construction to riser sections. Use flat slab tops only where indicated.
3. Cast and build into bases during manufacture:
   a. Resilient connectors for pipe connections.
   b. Holes for future pipe connections.

B. Frames and Grates: Frames and grates shall conform to Section M.08.02-5 of the Standard Specifications.

C. Brick: Brick shall conform to Section M.08.02-1 of the Standard Specifications.

D. Mortar: Mortar shall conform to Section M.11.04 of the Standard Specifications.

E. Water: Water shall be potable.

PART 3 EXECUTION

3.01 LAYING BRICKWORK AND MASONRY UNITS

A. Use clean units.

B. Moisten bricks by suitable means, until neither dry as to absorb water from mortar nor wet as to be slippery when laid.

C. Do not moisten concrete masonry units.

D. Lay each brick in full bed and joint of mortar without requiring subsequent grouting, flushing, or filling; bond thoroughly.

E. Lay each masonry unit in full bed of mortar; bond thoroughly. Fill vertical keyways, completely, with mortar.

3.02 PLASTERING AND CURING BRICK MASONRY

A. Plaster outside faces with mortar 1/4-inch to 3/8-inch thick.

B. Moisten brick masonry before application of mortar, if required.

C. Spread and trowel plaster carefully.

D. After hardening check for bond and soundness, by tapping.

E. Remove and replace unbonded and unsound plaster.

F. Protect from too rapid drying by use of moist burlap or other approved means.

G. Protect from weather and frost.

3.03 SETTING TOPS AND GRATES

A. Set tops conforming accurately to finished ground or pavement surface as indicated and directed.

B. Set tops in full bed of mortar to fill and make watertight completely the space between top of masonry and bottom flange of the catch basin top.

C. Place grates in the tops upon completion.

3.04 PLUGGING LIFT HOLES IN SUMPS

A. Plug lift holes in sumps, used for handling, with mortar. Hammer mortar into holes until dense and excess of paste appears, then smooth flush with adjacent surface.

3.05 ADJUSTMENT TO GRADE OF EXISTING CATCH BASIN

A. Adjust existing catch basin tops to line and grade as indicated on Drawings or as directed by Engineer.

B. Use only new brick for adjustment.

3.06 CONTRACT CLOSEOUT

A. Provide in accordance with Section 01 77 00.

END OF SECTION

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