

SECTION 00410

FORM OF GENERAL BID

Bid of _____ (hereinafter called "Bidder")*

(_____) a corporation, organized and existing under the laws of the state of _____

(_____) a partnership

(_____) a joint venture

(_____) an individual doing business as _____

To the City of New London, Connecticut (hereinafter called "Owner").

Gentlemen:

The Bidder, in compliance with your invitation for bids for the Ocean Avenue Roadway Reconstruction Project, having examined the plans and specifications with related documents and the site of the proposed work, and being familiar with all of the conditions surrounding the construction of the proposed project including the availability of materials and labor, hereby proposes to furnish all labor, materials, and supplies, and to construct the project in accordance with the contract documents within the time set forth below, and at the prices stated below. These prices are to cover all expense incurred in performing the work required under the contract documents, of which this proposal is a part.

The Bidder hereby agrees to commence work under this contract on or before a date to be specified by the Owner in the written Notice to Proceed, and to fully complete the project within timeframe indicated in the Agreement, exclusive of the winter shut-down period (November 15th through April 1st). The Bidder further agrees to pay liquidated damages as described in the Agreement.

* Insert corporation, partnership or individual as applicable.

Bidder acknowledges receipt of the following addenda:

No. _____ Dated: _____

No. _____ Dated: _____

No. _____ Dated: _____

UNIT PRICE BID:

BASE PROPOSAL: Bidder agrees to perform all of the work described in the specifications and shown on the plans for the following unit prices:

Amount shall be in both words and figures. In case of discrepancy, the amount shown in words will govern.

Item quantities are assumed for comparison of bids.

OCEAN AVENUE (Niles Hill Road to Neptune Avenue)

Mobilization & Project Closeout

Item No.	Est. Qty.	Description
1	1	Mobilization & Project Closeout, lump sum

Unit Price _____ Total Item \$ _____
 (dollars)
 and _____
 (cents)
 (\$ _____)

Drainage Pipe

Item No.	Est. Qty.	Description
2	40 lf	8-inch SDR 35 PVC Drainage Pipe, per lf

Unit Price _____ Total Item \$ _____
 (dollars)
 and _____
 (cents)
 (\$ _____)

3	940 lf	8-inch Perforated SDR 35 PVC Drainage Pipe, per lf
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Unit Price _____ Total Item \$ _____
(dollars)
and _____
(cents)
(\$ _____)

4	340 lf	12-inch HDPE Drainage Pipe, per lf
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Unit Price _____ Total Item \$ _____
(dollars)
and _____
(cents)
(\$ _____)

5	24 lf	12-inch Reinforced Concrete (Type IV) Drainage Pipe, per lf
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Unit Price _____ Total Item \$ _____
(dollars)
and _____
(cents)
(\$ _____)

6	720 lf	15-inch HDPE Drainage Pipe, per lf
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Unit Price _____ Total Item \$ _____
(dollars)
and _____
(cents)
(\$ _____)

7	525 lf	18-inch HDPE Drainage Pipe, per lf
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Unit Price _____ Total Item \$ _____
(dollars)
and _____
(cents)
(\$ _____)

Precast Catch Basins, Manholes, and Appurtenances

Item No.	Est. Qty.	Description
8	7	Precast Concrete Manhole with Standard Frame and Cover, 4 ft Diameter, each

Unit Price _____ Total Item \$ _____
 (dollars)
 and _____
 (cents)
 (\$ _____)

9	9	12-inch Diameter PVC Drain Basin, each
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Unit Price _____ Total Item \$ _____
 (dollars)
 and _____
 (cents)
 (\$ _____)

10	9	Precast Concrete Type 'C' Catch Basin with 4 ft Sump, each
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Unit Price _____ Total Item \$ _____
 (dollars)
 and _____
 (cents)
 (\$ _____)

11	1	Precast Concrete Type 'C' Catch Basin with No Sump, each
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Unit Price _____ Total Item \$ _____
 (dollars)
 and _____
 (cents)
 (\$ _____)

12	2	Precast Concrete Type II double Type 'C' Catch Basin with 4 ft Sump, each
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Unit Price _____ Total Item \$ _____
 (dollars)
 and _____
 (cents)
 (\$ _____)

13	1	Precast Concrete Type II double Type 'C' Catch Basin with No Sump, each
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Unit Price _____ Total Item \$ _____
 (dollars)
 and _____
 (cents)
 (\$ _____)

14	3	Precast Concrete Offset Type 'C' Catch Basin with 4 ft Sump, each
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Unit Price _____ Total Item \$ _____
 (dollars)
 and _____
 (cents)
 (\$ _____)

15	5	Hydrodynamic Separator Unit, 4 ft Diameter, each
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Unit Price _____ Total Item \$ _____
 (dollars)
 and _____
 (cents)
 (\$ _____)

16	14	Catch Basin Hood, each
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Unit Price _____ Total Item \$ _____
 (dollars)
 and _____
 (cents)
 (\$ _____)

Concrete Sidewalk

Item No.	Est. Qty.	Description
17	1,560 sy	Cement Concrete Sidewalk, per sy

Unit Price _____ Total Item \$ _____
 (dollars)
 and _____
 (cents)
 (\$ _____)

18	345 sy	Cement Concrete Wheelchair Ramp, per sy
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Unit Price _____ (dollars) Total Item \$ _____
 and _____ (cents)
 (\$ _____)

19	445 sy	Cement Concrete Driveway Apron, per sy
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Unit Price _____ (dollars) Total Item \$ _____
 and _____ (cents)
 (\$ _____)

20	395 cy	Processed Gravel Base Course for Concrete Sidewalk, Wheelchair Ramp, & Driveway Apron, per cy
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Unit Price _____ (dollars) Total Item \$ _____
 and _____ (cents)
 (\$ _____)

Signage

Item No.	Est. Qty.	Description
21	31	Provide Signage, each

Unit Price _____ (dollars) Total Item \$ _____
 and _____ (cents)
 (\$ _____)

22	2	Relocate Existing Signage, each
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Unit Price _____ (dollars) Total Item \$ _____
 and _____ (cents)
 (\$ _____)

Curbing

Item No.	Est. Qty.	Description
23	2,220 lf	Granite Curb, per lf

Unit Price _____ Total Item \$ _____
 (dollars)
 and _____
 (cents)
 (\$ _____)

24	6,490 lf	Remove & Reset Granite Curb, per lf
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Unit Price _____ Total Item \$ _____
 (dollars)
 and _____
 (cents)
 (\$ _____)

Pavement Replacement

Item No.	Est. Qty.	Description
25	1,600 lf	Temporary Trench Pavement, per lf

Unit Price _____ Total Item \$ _____
 (dollars)
 and _____
 (cents)
 (\$ _____)

26	19,310 sy	Reclaim Roadway Pavement & Subbase, per sy
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Unit Price _____ Total Item \$ _____
 (dollars)
 and _____
 (cents)
 (\$ _____)

27	5,400 gal	Calcium Chloride for Subbase Stabilization, per gallon
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Unit Price _____ Total Item \$ _____
 (dollars)
 and _____
 (cents)
 (\$ _____)

28	1	Grading and Compaction of Roadway Base Course, lump sum
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Unit Price _____ Total Item \$ _____
 (dollars)
 and _____
 (cents)
 (\$ _____)

29	2,780 tons	HMA S0.5 (Superpave) Binder Course Pavement, per ton
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Unit Price _____ Total Item \$ _____
 (dollars)
 and _____
 (cents)
 (\$ _____)

30	2,780 tons	HMA S0.375 (Superpave) Top Course Pavement, per ton
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Unit Price _____ Total Item \$ _____
 (dollars)
 and _____
 (cents)
 (\$ _____)

31	870 gal	Bitumen for Tack Coat, per gallon
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Unit Price _____ Total Item \$ _____
 (dollars)
 and _____
 (cents)
 (\$ _____)

32	590 lf	Hot Poured Joint Sealer, per lf
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Unit Price _____ Total Item \$ _____
 (dollars)
 and _____
 (cents)
 (\$ _____)

33	75 tons	Bituminous Concrete Driveway, per ton
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Unit Price _____ Total Item \$ _____
 (dollars)
 and _____
 (cents)
 (\$ _____)

34	1	Pavement Markings, lump sum
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Unit Price _____ Total Item \$ _____
 (dollars)
 and _____
 (cents)
 (\$ _____)

35	50 ton	Additional Pavement, per ton
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Unit Price _____ Total Item \$ _____
 (dollars)
 and _____
 (cents)
 (\$ _____)

Rock Excavation and Disposal

Item No.	Est. Qty.	Description
36	100 cy	*Rock Excavation and Disposal, per cy

Unit Price _____ *Thirty* Total Item \$ 3,000.00
 (dollars)
 and _____ *Zero*
 (cents)
 (\$ 30.00)

37	100 cy	*Rock Excavation and Disposal, per cy (add'l)
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Unit Price _____ Total Item \$ _____
 (dollars)
 and _____
 (cents)
 (\$ _____)

* The unit price in Item 36 is the minimum for rock excavation and disposal. Bidder may add to the minimum in Item 37.

Earthwork

Item No.	Est. Qty.	Description
38	100 cy	**Gravel Fill, per cy

Unit Price _____ *Twenty* _____ Total Item \$ 2,000.00
 (dollars)
 and _____ *Zero* _____
 (cents)
 (\$ _____ *20.00* _____)

39	100 cy	**Gravel Fill, per cy (add'l)
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Unit Price _____ Total Item \$ _____
 (dollars)
 and _____
 (cents)
 (\$ _____)

** The unit price in Item 38 is the minimum for gravel fill. Bidder may add to the minimum in Item 39.

Utility Poles

Item No.	Est. Qty.	Description
40	4	Relocate Existing Utility Pole, each

Unit Price _____ Total Item \$ _____
 (dollars)
 and _____
 (cents)
 (\$ _____)

Landscaping

Item No.	Est. Qty.	Description
41	1	Loaming (6-inches thick) and Seeding, lump sum

Unit Price _____ Total Item \$ _____
 (dollars)
 and _____
 (cents)
 (\$ _____)

42	1	Removal & Disposal of Existing Trees, lump sum
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Unit Price _____ Total Item \$ _____
 (dollars)
 and _____
 (cents)
 (\$ _____)

43	1	Selective Trimming of Existing Trees, lump sum
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Unit Price _____ Total Item \$ _____
 (dollars)
 and _____
 (cents)
 (\$ _____)

Repair of Street Sign Monuments

Item No.	Est. Qty.	Description
44	1	Repair of Existing Street Sign Monuments, lump sum

Unit Price _____ Total Item \$ _____
 (dollars)
 and _____
 (cents)
 (\$ _____)

Environmental Protection

Item No.	Est. Qty.	Description
45	16	Inlet Protection, per catch basin

Unit Price _____ Total Item \$ _____
 (dollars)
 and _____
 (cents)
 (\$ _____)

Traffic Signals

Item No.	Est. Qty.	Description
46	1	Remove Existing Traffic Signals & Appurtenances at Intersection of Ocean Avenue & Glenwood Avenue, lump sum

Unit Price _____ Total Item \$ _____
 (dollars)
 and _____
 (cents)
 (\$ _____)

47	1	Remove Existing Traffic Signals & Appurtenances at Intersection of Ocean Avenue & Neptune Avenue, lump sum
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Unit Price _____ Total Item \$ _____
 (dollars)
 and _____
 (cents)
 (\$ _____)

48	1	Remove & Replace Existing Loop Detector at Intersection of Niles Hill Road & Ocean Avenue, lump sum
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Unit Price _____ Total Item \$ _____
 (dollars)
 and _____
 (cents)
 (\$ _____)

Maintenance & Protection of Traffic

Item No.	Est. Qty.	Description
49	1,300 hrs	Uniformed Officer for Traffic Control, per hour

Unit Price _____ *Ninety-Seven* Total Item \$ 126,750.00
 (dollars)
 and *Fifty*
 (cents)
 (\$ *97.50*)

50	1	Traffic Control, lump sump
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Unit Price _____

(dollars)

Total Item \$ _____

and _____

(cents)

(\$ _____)

TOTAL OF BASE BID (Ocean Avenue)

The Base Bid computed contract price for Items 1 through 49 inclusive is:

Dollars and _____ Cents

(\$ _____).

Based upon findings:

The undersigned agrees that, if he is selected as general contractor, he will within seven consecutive calendar days (holidays excluded), after presentation thereof by the awarding authority, execute a contract in accordance with the terms of this bid and furnish a performance bond and also a labor and materials or payment bond, each of a surety company qualified to do business under the laws of the State of Connecticut and satisfactory to the awarding authority and each in the sum of the contract price, the premiums for which are to be paid by the general contractor and are included in the contract price.

The undersigned hereby certifies that he is able to furnish labor that can work in harmony with all other elements of labor employed or to be employed on the work and that he will comply fully with all laws and regulations.

The undersigned further certifies under the penalties of perjury that this bid is in all respects bona fide, fair and made without collusion or fraud with any other person. As used in this subsection the word "person" shall mean any natural person, joint venture, partnership, corporation or other business or legal entity. The undersigned further certifies under penalty of perjury that the said undersigned is not presently debarred from doing public construction work in the State of Connecticut.

I certify under the penalties of perjury that I, to my best knowledge and belief, have filed all state tax returns and paid all state taxes required under law.

Respectfully submitted:

Date: _____ By: _____
(Signature)

(SEAL - if bid is by a corporation)

(Name of Bidder)

(Title)

(Business Address)

(City and State)

(Telephone Number)

SECTION 00890

PERMITS

1. General Requirements

- A. The Owner has obtained or will obtain the permits as listed below. The Contractor shall obtain and pay for certain permits, as indicated. The Contractor shall obtain and pay for all other permits required.
- B. The Contractor shall perform the work in accordance with the Contract Documents, including the referenced permits, terms and conditions of the Inland Wetlands & Watercourses Agency, and any applicable municipal requirements.

<u>Permits by Contractor</u>	<u>Status</u>	<u>Party Responsible for Fees, Bonding, Payment, etc.</u>
Street Opening Permit	Pending	Contractor

2. Inland Wetlands & Watercourses Agency Terms and Conditions

The Inland Wetlands & Watercourses Agency, under the authority of Connecticut General Statutes sections 22a-36 to 22a-45, as amended, may issue terms and conditions on the work under this contract. These terms and conditions shall become a part of the Contract Documents and the Contractor shall perform all work in strict conformance with said terms and conditions.

END OF SECTION

SECTION 01110

CONTROL OF WORK AND MATERIALS

1. Hauling, Handling and Storage of Materials
2. Open Excavations
3. Maintenance of Traffic
4. Care and Protection of Property
5. Protection and Relocation of Existing Structures and Utilities
6. Maintenance of Flow
7. Rejected Materials and Defective Work
8. Sanitary Regulations
9. Safety and Health Regulations
10. Site Investigation
11. Electric Service
12. Hazardous Waste

1. Hauling, Handling, and Storage of Materials

- A. The Contractor shall, at his own expense, handle and haul all materials furnished by him and shall remove any of his surplus materials at the completion of the work.
- B. The Contractor shall provide suitable and adequate storage for equipment and materials furnished by him that are liable to injury and shall be responsible for any loss of or damage to any equipment or materials by theft, breakage, or otherwise.
- C. All excavated materials and equipment to be incorporated in the Work shall be placed so as not to injure any part of the Work or existing facilities and so that free access can be had at all times to all parts of the Work and to all public utility installations in the vicinity of the work. Materials and equipment shall be kept neatly piled and compactly stored in such location as will cause a minimum of inconvenience to public travel and adjoining owners, tenants and occupants.
- D. The Contractor shall be responsible for all damages to the work under construction during its progress and until final completion and acceptance even though partial payments have been made under the Contract.
- E. Unless approved by the Engineer, the use of easements for ease of access to and egress from other areas of the project will not be permitted.

2. Open Excavations

- A. All open excavations shall be adequately safeguarded by providing temporary barricades, caution signs, lights and other means to prevent accidents to persons, and damage to property. The Contractor shall, at his own expense, provide suitable and safe means for completely covering all open excavations and for accommodating travel when work is not in progress.
- B. Bridges provided for access to private property during construction shall be removed when no longer required.

- C. The length of open trench will be controlled by the particular surrounding conditions but shall always be confined to the limits prescribed by the Engineer.
- D. If the excavation becomes a hazard, or if it excessively restricts traffic at any point, then special construction procedures shall be taken, such as limiting the length of trench and prohibiting stockpiling excavated material in the street.
- E. All street excavations shall be completely closed at the end of each work day. Backfilling or use of steel plates of adequate strength to carry traffic shall be used.

3. Maintenance of Traffic

- A. Unless permission to close the street is received in writing from the proper authority, all materials shall be placed so that vehicular and pedestrian traffic may be maintained at all times.
- B. Should the Owner deem it necessary, uniformed officers will be assigned to direct traffic. The Contractor shall make all arrangements in obtaining uniformed officers as required.
- C. The Contractor shall at his own expense, as directed by the Owner, provide and erect acceptable barricades, barrier fences, traffic signs, and all other traffic devices not specifically covered in a bid item, to protect the work from traffic, pedestrians, and animals. He shall provide sufficient temporary lighting such as lanterns/flashers (electric battery operated) or other approved illuminated traffic signs and devices to afford adequate protection to the traveling public, at no additional cost to the Owner.
- D. The Contractor shall furnish all construction signs that are deemed necessary by and in accordance with Part VI of the Manual on Uniform Traffic Control Devices as published by the U.S. Department of Transportation. In addition, the Contractor may be required to furnish up to 128 square feet of additional special construction warning signs. Size and exact wording of signs shall be determined by the Engineer during construction.
- E. The intent of policing is to ensure public safety by direction of traffic. Police officers are not to serve as watchmen to protect the Contractor's equipment and materials.
- F. Nothing contained herein shall be construed as relieving the Contractor of any of his responsibilities for protection of persons and property under the terms of the Contract.

4. Care and Protection of Property

The Contractor shall be responsible for the preservation of all public and private property, and shall use every precaution necessary to prevent damage thereto. If any direct or indirect damage is done to public or private property by or on account of any act, omission, neglect, or misconduct in the execution of the work on the part of the Contractor, such property shall be promptly restored by the Contractor, at his expense, to a condition similar or equal to that existing before the damage was done, to the satisfaction of the Engineer.

5. Protection and Relocation of Existing Structures and Utilities

- A. All existing buildings, utilities, pipes, poles, wires, fences, curbing, property line markers and other structures which the Engineer 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 property be damaged, it shall be restored by the Contractor, at no additional cost to the Owner.
- B. The Contractor shall determine the location of all underground structures and utilities (including existing water services, drain lines, electrical lines, and sewers). Services to buildings shall be maintained, and all costs or charges resulting from damage thereto shall be paid by Contractor.
- C. When fences interfere with the Contractor's operations, he shall remove and (unless otherwise specified) promptly restore them to a condition at least equal to that in which it was found immediately before work was begun.
- D. Protection or temporary removal and replacement of existing utilities and structures as described in this Section shall be a part of the work under the Contract and all costs in connection therewith shall be included in the Total Price Bid in the FORM OF GENERAL BID.
- E. On paved surfaces the Contractor shall not use or operate tractors, bulldozers, or other power-operated equipment with treads or wheels which are shaped so as to cut or otherwise damage such surfaces.
- F. All property damaged by the Contractor's operations shall be restored to a condition at least equal to that in which it was found immediately before work was begun. Suitable materials and methods shall be used for such restoration.
- G. Restoration of existing property and structures shall be carried out as promptly as practicable and shall not be left until the end of the construction period.

6. Maintenance of Flow

- A. The Contractor shall at his own cost, provide for the flow of sewers and drains interrupted during the progress of the work, and shall immediately cart away and dispose of all offensive matter. The entire procedure of maintaining existing flow shall be fully discussed with the Engineer well in advance of the interruption of any flow.
- B. All existing drainage facilities including, but not limited to; brooks, streams, canals, channels, ditches, culverts, catch basins and drainage piping shall be adequately safeguarded so as not to impede drainage or to cause siltation of downstream areas in any manner whatsoever. If the Contractor damages or impairs any of the aforesaid drainage facilities, he shall repair the same within the same day.
- C. At the conclusion of the work, the Contractor shall remove all silt in drainage structures caused by his operations as described in Section 01740, SITE CLEANUP.

7. Rejected Materials and Defective Work

- A. Materials furnished by the Contractor and condemned by the Engineer as unsuitable or not in conformity with the specifications shall forthwith be removed from the work by the Contractor, and shall not be made use of elsewhere in the work.
- B. Any errors, defects or omissions in the execution of the work or in the materials furnished by the Contractor, even though they may have been passed or overlooked or have appeared after the completion of the work, discovered at any time before the final payment is made hereunder, shall be forthwith rectified and made good by and at the expense of the Contractor and in a manner satisfactory to the Engineer.
- C. The Contractor shall reimburse the Owner for any expense, losses or damages incurred in consequence of any defect, error, omission or act of the Contractor or his employees, as determined by the Engineer, occurring prior to the final payment.

8. Sanitary Regulations

Sanitary conveniences for the use of all persons employed on the work, properly screened from public observation, shall be provided in sufficient numbers in such manner and at such locations as may be approved. The contents shall be removed and disposed of in a satisfactory manner as the occasion requires. The Contractor shall rigorously prohibit the committing of nuisances within, on or about the work. Any employees found violating these provisions shall be discharged and not again employed on the work without the written consent of the Engineer. The sanitary conveniences specified above shall be the obligation and responsibility of the Contractor.

9. Safety and Health Regulations

This project is subject to the Safety and Health regulations of the U.S. Department of Labor set forth in 29 CFR, Part 1926. Contractors shall be familiar with the requirements of these regulations.

10. Site Investigation

The Contractor acknowledges that he has satisfied himself as to the conditions existing at the site of the work, the type of equipment required to perform this work, the quality and quantity of the materials furnished insofar as this information is reasonably ascertainable from an inspection of the site, as well as from information presented by the drawings and specifications made a part of this contract. Any failure of the Contractor to acquaint himself with available information will not relieve him from the responsibility for estimating properly the difficulty or cost of successfully performing the work. The Owner assumes no responsibility for any conclusion or interpretation made by the Contractor on the basis of the information made available by the Owner.

11. Electric Service

- A. The Contractor shall make all necessary applications and arrangements and pay for all fees and charges for electrical energy for power and light necessary for the proper completion of this contract during its entire progress. The Contractor shall provide and pay for all temporary wiring, switches, connections, and meters.
- B. There shall be sufficient electric lighting so that all work may be done in a workmanlike manner where there is not sufficient daylight.

12. Hazardous Waste

Should the Contractor, while performing work under this contract, uncover hazardous materials, as defined by the Connecticut General Statutes and or the EPA's Resource Conservation and Recovery Act (RCRA), he shall immediately notify the Engineer. The Contractor is not, and has no authority to act as, a handler, generator, operator or disposer of hazardous or toxic substances found or identified at the site, and the Owner shall undertake all such functions.

END OF SECTION

SECTION 01140

SPECIAL PROVISIONS

1. Water for Construction Purposes
2. Pipe Location
3. Dimensions of Existing Structures
4. Occupying Private Property
5. Existing Utility Locations - Contractor's Responsibility
6. Coordination of Work
7. Time for Completion of Contract
8. Maintenance of Trench Surface
9. Design of Equipment
10. Cutting, Fitting and Patching
11. Protection of Water Resources
12. Contractor's Representative
13. Hours of Construction Activity
14. Construction Crews
15. Compliance with Permits

1. Water for Construction Purposes

A. In locations where water is in sufficient supply, the Contractor may be allowed to use water without charge for jetting backfill and other construction purposes. The express approval of the Owner shall be obtained before water is used. Waste of water by the Contractor shall be sufficient cause for withdrawing the privilege of unrestricted use.

B. If no water is available, the Contractor shall supply water at no additional cost to the Owner.

2. Pipe Location

Pipe shall be located substantially as indicated on drawings. The Owner reserves the right, acting through the Engineer, to make such modifications as may be deemed desirable to avoid interference with existing structures or for other reasons.

3. Dimensions of Existing Structures

Where the dimensions and locations of existing structures are of critical importance in the installation or connections of new work, the Contractor shall verify such dimensions and locations in the field before the fabrication of any material or equipment which is dependent on the correctness of such information.

4. Occupying Private Property

The Contractor shall not enter upon nor occupy with men, equipment or materials any property outside of the public highways or Owner's easements, except with the written consent of the property owner or property owner's agent.

5. Existing Utility Locations - Contractor's Responsibility

- A. The location of existing underground services and utilities shown on the drawings is based on available records. It is not warranted that all existing utilities and services are shown, nor that shown locations are correct. The Contractor shall be responsible for having the utility companies locate their respective utilities on the ground prior to excavating.
- B. The Contractor shall, at least 72 hours, exclusive of Saturdays Sundays and holidays, prior to excavation in the proximity of telephone, gas, cable television and electric utilities, notify the utilities concerned by calling "CALL BEFORE YOU DIG" at telephone number: 1-800-922-4455.
- C. The Contractor shall coordinate all work involving utilities and shall satisfy himself as to the existing conditions of the areas in which he is to perform his work. He shall conduct and arrange his work so as not to impede or interfere with the work of other contractors working in the same or adjacent areas.

6. Coordination of Work

- A. The General Contractor shall be responsible for coordinating his own work as well as that of any subcontractors. He shall be responsible for notification of the Engineer when each phase of work is expected to begin and the approximate completion date.
- B. The Contractor shall be responsible for coordinating his work with other town contractors such as refuse collection, water and sewer operations and maintenance. The Contractor must also coordinate his work with the town's school busing requirements.

7. Time for Completion of Contract

The time for completion of this contract is stipulated in the Agreement. The Bidder shall base his bid on completing the proposed work by the completion date stipulated.

8. Maintenance of Trench Surface

- A. After backfilling and compacting the trench, the Contractor shall be responsible for keeping the ground surface dry and passable at all times until the surface has been restored to original conditions.
- B. The Contractor shall be responsible for temporary paving of the trench surface at the end of each week.

9. Design of Equipment

Attention is directed to the fact that the layout of certain equipment is based on that of one manufacturer. If other equipment is submitted for approval, the Contractor shall prepare and submit for approval at his expense, detailed structural, mechanical and electrical drawings, equipment lists, maintenance requirements, and any other data required by the Engineer, showing all necessary changes and embodying all special features of the equipment he proposes to furnish. Such changes, if approved, shall be made at the expense of the Contractor.

10. Cutting, Fitting, and Patching

- A. The Contractor shall do all cutting, fitting, or patching of his work that may be required to make its several parts come together properly and fit it to receive or be received by work of other Contractors, as shown upon or reasonably implied by the drawings and the specifications for the completed structure, including all existing work.
- B. The Contractor shall not endanger any work by cutting, digging, or otherwise and shall not cut or alter the work of any other Contractor, save with the consent of the Engineer.
- C. All holes or openings required to be made in new or existing work, particularly at pipe, conduit, or other penetrations not covered by escutcheons or plates shall be neatly patched. All such holes shall be made completely watertight as approved by the Engineer.
- D. Size and locations of holes required in steel, concrete, or other structural or finish materials for piping, wiring, ducts, etc., which have not been located and detailed on the drawings shall be approved by the Engineer prior to layout and cutting thereof. All holes shall be suitably reinforced as required by the Engineer.

Workmanship and materials of patching and repair work shall match the adjacent similar work and shall conform to the applicable sections of the specification. Patches and joints with existing work shall provide, as applicable in each case, visual, structural, and waterproofing continuity.

11. Protection of Water Resources

The Contractor's attention is directed to the fact that the construction area is located within the vicinity of water resources. The Contractor shall take extra precautions to ensure that no pollutants enter either surface water or groundwater resources from the construction area. The Contractor shall not store fuels or other hazardous materials or potential contaminants on the construction site. In the event of a spill, the Contractor shall immediately notify the Engineer.

12. Contractor's Representative

The Contractor shall designate a representative who will be available to respond to emergency calls by the Owner at any time day and night and on weekends and holidays should such a situation arise.

13. Hours of Construction Activity

- A. The Contractor shall conduct all construction activity between 7:00 a.m. and 5:00 p.m., Monday through Friday. No construction work shall be allowed on Saturdays, Sundays or Holidays without written authorization from the Owner.
- B. The Owner will provide personnel for assistance in locating and operating valves at no cost to the Contractor during the Owner's normal working hours (Monday through Friday 7:00 am. to 3:00 p.m.). When this assistance is required by the Contractor outside of the Owner's normal working hours the cost will be incurred by the Contractor at the prevailing overtime rate of pay for the personnel providing the assistance. The Owner will bill the Contractor directly.

14. Construction Crews

The Contractor shall not increase the number of construction crews assigned to the work without providing one week advance notice to the Engineer.

15. Compliance with Permits

The Contractor shall perform all work in conformance with requirements of the Permits, which appear in Section 00890, PERMITS.

END OF SECTION

SECTION 01270

MEASUREMENT AND PAYMENT

PART 1 - DESCRIPTION

1.01 GENERAL:

- A. The following subsections describe the measurement of and payment for the work to be done under the items listed in Section 00410, FORM OF GENERAL BID.
- B. All work performed as described in these contract documents shall be paid for under one or more of the items listed in Section 00410, FORM OF GENERAL BID. All other activities required in connection with performance of the work, whether described in the contract documents or mandated by applicable codes, permits and laws, will not be separately paid for unless specifically provided for in the FORM OF GENERAL BID, but will be considered incidental to performance of the overall project.
- C. Each unit or lump-sum price stated in the Section 00410, FORM OF GENERAL BID shall constitute full compensation as herein specified for each item of work completed in accordance with the drawings and specifications.
- D. The payment items listed herein and in Section 00410 (FORM OF GENERAL BID) are intended to provide full payment for the work shown on the drawings and specified herein. Any work called for or implied in the documents but not listed as a payment item shall be considered incidental to the overall project.
- E. Unless otherwise noted, all earthwork shall be included under any item requiring excavation. Unless otherwise noted, each item specified or shown on the drawings shall be furnished and installed in accordance with the technical section whether a specific applicable payment item exists or not.
- F. The prices for those items which involve excavation shall include compensation for disposal of surplus excavated material, and installation of all necessary sheeting and bracing.
- G. In all items involving excavation, the price shall be based on doing the entire excavation in earth. Where rock is excavated, the price therefore shall be in addition to the cost of excavating the earth, and no deduction shall be made in the amount for earth excavation.
- H. The price for all pipe items for sewers, wyes, service connections, chimneys, fittings, and other pipelines shall constitute full compensation for furnishing, laying, jointing, and testing pipe; earth excavation and backfill; by-pass pumping; crushed stone bedding; and clean up.

1.02 MOBILIZATION & PROJECT CLOSEOUT

- A. The unit price for this item shall constitute full compensation for all costs associated with: Insurance, Bonding, Preparation & Submittal of Shop Drawings, Mobilization, Project Administration, Safety Programs, Preparation & Submission of Record Drawings, Site Cleanup & Maintenance. Payment for this item shall be made based on the following schedule: 25% following receipt and approval of required insurance certificate(s), bonding, and shop/working drawings; 25%

when 40% of the original Contract Price is earned; 25% when 80% of the original Contract Price is earned; and 25% following receipt and approval of record drawings.

1.03 DRAINAGE PIPE:

- A. The length of drainage pipe to be paid for under the appropriate subdivisions of this item shall be measured by the linear foot along the completed drain, from centerline of structure to centerline of structure. The unit prices shall constitute full compensation for constructing the drains, complete in place as indicated in the drawings and as specified, including furnishing and installing pipe and fittings, excavation, backfill, bedding, select material, clearing, grubbing, testing, removal and disposal of existing drain pipe, and all work incidental thereto and not specifically included for payment under other items.

1.04 PRECAST CATCH BASINS, MANHOLES, AND APPURTENANCES:

- A. Unless otherwise provided for, the work shall be measured per unit of completed work under the appropriate subdivisions of the item Precast Catch Basins, Manholes, and Appurtenances.
- B. Bases, walls, cones, frames, and covers shall be measured per set installed in place. The unit price for this subdivision shall include excavation, crushed stone bedding, and backfill; furnishing and installing base, invert channels, steps, gaskets, sealants, connections and couplings; and all incidental work necessary to complete the precast or poured in place concrete base as shown on the drawings and as specified herein. The unit price shall also include furnishing and installing the frame and cover/grate, and grouting the frame to the brick courses. Removal and disposal of existing drainage structures shall be considered incidental to the cost of this item. The unit price shall also include delivery of removed frames, covers and grates to a location in the City specified by the Owner.
- C. Catch basin hoods shall be measured per hood installed and shall include furnishing and installation of the hood as shown on the drawings and in the specifications. It shall be paid for under the appropriate subdivision of the item Precast Catch Basins, Manholes, and Appurtenances.

1.05 VALVE BOXES:

- A. The removal and replacement of valve boxes and coordination with local utility companies shall not be separately measured for payment, but shall be considered incidental to the project.

1.06 CONCRETE SIDEWALK:

- A. Cement concrete sidewalk shall be measured per square yard under the appropriate subdivisions of the item Cement Concrete Sidewalk. This subdivision shall include all materials and labor to install cement concrete sidewalks and the removal and disposal of existing pavement and/or concrete according to the drawings and specifications.
- B. Cement concrete wheelchair ramps shall be measured per square yard under the appropriate subdivisions of the item Concrete Sidewalk. This subdivision shall include all materials and labor to install the wheelchair ramp with detectable warning and the removal and disposal of existing pavement according to the drawings and specifications.
- C. Payment for cement concrete driveway apron shall be measured per square yard of apron installed in place and will include the removal and disposal of existing pavement, new concrete, keyways,

pavement, and gravel or loam pavement backing as required, and as shown on the drawings and in the specifications. It shall be paid under the subdivision Cement Concrete Driveway Apron.

- D. Processed gravel subbase for concrete sidewalk, wheel chair ramp, driveway apron, and steps shall be measured per cubic yard compacted and in place. It shall be paid for under the appropriate subdivisions of the item Concrete Sidewalk. This subdivision shall include removal and disposal of existing subbase, 6-inches of new gravel, and placement, grading, and compaction of the new gravel according to the drawings and specifications.
- E. Raising and adjusting castings:
Raising and adjusting castings shall not be separately measured for payment and shall be considered incidental to the concrete sidewalk.

1.07 SIGNAGE:

- A. The removal and replacement of signage shall be measured per sign assembly removed and replaced with new signage complete under the appropriate subdivision of the item Signage. The unit price shall include labor, new sign assembly, and all other materials required for the installation. A sign assembly shall be considered the post or posts, all signs and sign faces mounted to post, and hardware as required to replace sign.
- B. The cost of delivering removed signs, posts, and associated City property to a location in the City designated by the Owner shall be considered incidental to the item.
- C. Removing and resetting signage, as called out on the drawings, shall be measured per sign assembly removed and reset under the appropriate subdivision of the item Signage. Signs damaged by the contractor during removal and/or storage shall be replaced with new signs at no additional cost to the City.
- D. All signage to be replaced and paid under this item shall meet State and City requirements at time of installation.

1.08 CURBING:

- A. Granite curbing shall be measured per linear foot of straight, radius, and transition curbing installed complete. It shall be paid under the appropriate subdivision of the item Curbing. The unit cost shall include curbing, compacted subbase, Class 'C' concrete and non-shrink joint mortar as shown on the drawings and as specified.
- B. Removing and resetting granite curbing shall be measured per linear foot of straight, radius, and transition curbing installed complete. It shall be paid under the appropriate subdivision of the item Curbing. The unit cost shall include removing existing curbing, excavation of existing subbase, new compacted subbase, resetting curbing, Class 'C' concrete, and non-shrink joint mortar as shown on the drawings and as specified.

1.09 PAVEMENT REPLACEMENT:

- A. Bituminous pavement shall be measured per linear foot, square yard, or ton of work completed, and shall be paid at the contract unit prices under the subdivisions of the item Pavement Replacement as further described below.

- B. Pavement disturbed by the Contractor's operations outside payment limits shall not be paid under these subdivisions, but shall be repaired to its original condition by the Contractor at no cost to the Owner.
- C. Temporary trench pavement shall be measured per linear foot of trench and shall be paid under the subdivision Temporary Trench Pavement. The use of temporary trench pavement shall be as determined by the Owner or Engineer.
- D. Removal and Disposal of existing sidewalk and pavements shall be considered incidental to the project and not separately measured for payment.
- E. The reclamation of the existing roadway pavement and subbase shall be measured per square yard of complete as shown on the drawings and as specified. It shall be paid under the appropriate subdivision of the item Pavement Replacement. It shall include pulverization of the existing pavement and subbase material, and all necessary work to prepare the subbase for grading and compaction. It shall also include the removal and off-site disposal of excess material.
- F. Calcium chloride for subbase stabilization shall be measured per gallon of calcium chloride solution applied and incorporated into the subbase material. The unit cost for this item shall include furnishing and applying liquid calcium chloride solution at the defined rate, incorporation of the solution into the reclaimed material as specified, and all other work incidental thereto.
- G. Grading and compaction of the roadway base course shall be measured per lump sum complete as shown on the drawings and as specified. It shall be paid under the appropriate subdivision of the item Pavement Replacement. It shall include the grading and compaction of the new road base course, and all necessary work to prepare the base course for the new binder course of pavement.
- H. Binder course pavement shall be measured per ton of pavement installed and shall include the furnishing and installation of binder course pavement as shown on the drawings and as specified. It shall be paid for under the subdivision Binder Course Pavement.
- I. Payment for top course pavement shall be measured per ton of pavement installed and shall include the furnishing and installation of top course pavement, keyways, and loam pavement backing as required. It shall be paid under the subdivision Top Course Pavement.
- J. Payment for bitumen for tack coat shall be measured per gallon applied. It shall be paid under the subdivision Bitumen for Tack Coat.
- K. Payment for bituminous concrete driveways shall be measured per ton of driveway pavement installed and shall include keyways, compacted gravel subbase, and gravel and/or loam backing as required. It shall be paid for under the subdivision bituminous concrete driveway.
- L. Payment for hot poured rubberized asphalt sealer shall be measured per linear foot of pavement joint sealed, and shall include all labor and materials necessary to seal asphalt pavement joints as directed by the Engineer.
- M. Payment for pavement markings shall be measured per lump sum. It shall be paid under the subdivision Pavement Markings. Pavement markings shall include all pavement markings as shown on the drawings, in the specifications, and as required by the Owner.

- N. Additional pavement required for increasing pavement thickness to existing conditions where ordered by the Engineer shall be measured per ton and paid at the contract unit price under the subdivision Additional Pavement.
 - O. Raising and Adjusting Castings:
 - 1. Raising and adjusting castings shall not be separately measured for payment and shall be considered incidental to paving.
 - 2. Castings shall be raised and adjusted as often as required for winter shut-down and for final top course paving. This shall be considered incidental to paving.
 - 3. New castings installed as part of the contract shall not be measured for payment under this item.
 - 4. Castings owned by private utilities shall be adjusted by their forces at their expense.
- 1.10 ROCK EXCAVATION AND DISPOSAL:
- A. Rock excavation and disposal shall be measured per cubic yard within the trench limits and paid at the contract unit price under the item Rock Excavation and Disposal. Payment shall include replacement of the excavated rock with gravel borrow.
 - B. Only boulders and concrete structures greater than one cubic yard inside the pay limit area shown on the drawings shall be included for measurement and payment.
 - C. Where rock is encountered, it shall be uncovered but not excavated until measurements have been made by the Engineer, unless, in the opinion of the Engineer, satisfactory measurements can be made in some other manner.
 - D. The bidder shall include in the bid for items involving excavation, the cost of doing the entire excavation as earth. The price for the item Rock Excavation and Disposal is intended to cover the difference between the cost of rock excavation and the cost of earth excavation.
 - E. The cost of pre-blast surveys, if required, shall be considered incidental to the cost of rock excavation and disposal and will not be separately paid.
 - F. When two or more pipes are installed parallel to one another and the trench payment limits overlap, rock excavation in the overlap section will only be paid once.
- 1.11 EARTHWORK:
- A. Except as designated in Section 1.11, Paragraphs B and C, earthwork shall not be separately measured for payment, but shall be considered incidental to construction of the project.
 - B. Excavation and backfill of unsuitable material above normal grade:
 - 1. If, in the opinion of the Engineer, the material at or above normal grade is unsuitable for use as backfill, it shall be removed and disposed of to such depths and widths within the limits of payment as he may order. Normal grade is defined as the elevation of the trench bottom, as shown on the drawings.

2. The quantity of excavation and backfill of unsuitable material above normal grade to be included for payment shall be the number of cubic yards of material ordered to be removed and measured by the Engineer within the normal trench limits shown on the contract drawings.
 3. Removal of topsoil, paving materials, frozen material or ledge excavation above the normal grade of the trench excavation will not be considered for payment.
 4. The unit price for this item shall constitute full compensation for excavation of unsuitable material above normal grade, disposal of unsuitable material and furnishing, installing and compacting approved backfill materials, excluding materials noted in this Section or as specified in Section 02300, EARTHWORK, of the Contract Documents.
 5. Payment shall be made at the contract unit price under the subdivision Gravel Fill.
 6. The Contractor will not be reimbursed for excavation of unsuitable material above grade, which has not been ordered by the Engineer.
- C. Excavation and backfill of unsuitable material below normal grade:
1. If, in the opinion of the Engineer, the material at or below normal grade is unsuitable for use as foundation, it shall be removed and disposed of to such depths and widths as he may order. Normal grade is defined as the elevation of the trench bottom, as shown on the drawings.
 2. The quantity of earth excavation and backfill below normal grade to be included for payment shall be the number of cubic yards of material ordered to be removed and measured by the Engineer within the normal trench width shown on the contract drawings.
 3. The unit price for excavation and backfill of unsuitable material below normal grade shall constitute full compensation for excavation of unsuitable material below normal grade, disposal of unsuitable material and furnishing, installing and compacting approved backfill materials as specified in Section 02300, EARTHWORK, of the Contract Documents.
 4. Payment shall be made at the contract unit price of the subdivision Gravel Fill.
 5. The Contractor will not be reimbursed for excavation of unsuitable material below grade, which has not been ordered by the Engineer.
- D. Additional earthwork necessary to lower the pipeline below the grade indicated on the drawings, if ordered by the Engineer, shall be measured per cubic yard and paid at the contract unit price under the Item "Additional Earthwork Below Grade." Payment shall cover both earth excavation and backfill with excavated material. Payment for the removal, disposal, and replacement of unsuitable material shall be in accordance with Item 1.11, Paragraphs B and C, where the normal grade is defined as the bottom of the trench at the elevation ordered by the Engineer.
- 1.12 DUST CONTROL:
- A. The work of this section shall not be measured separately for payment, but shall be considered incidental to the project.

1.13 UTILITY POLES:

- A. Relocation of existing utility poles shall be measured per pole relocated complete in place, and shall include all required coordination with utility companies, relocation of the existing pole or installation of a new pole and relocation of conductors, removal of old pole, cleanup, and all other work incidental thereto.

1.14 LANDSCAPING:

- A. Loaming and seeding shall be measured per lump sum complete. The extent of loaming and seeding required for the project is not indicated on the drawings. The Contractor shall be required to loam and seed all areas disturbed by their forces or their subcontractor's forces. The work of this section shall include furnishing and installing loam and seed as indicated on the drawings and as specified herein, weekly watering of seeded areas for 1 month following seeding, and all work and materials incidental thereto.
- B. Removal and disposal of existing trees shall be measured per lump sum complete. The work of this section shall include the professional removal and disposal of the three (3) trees as shown on the drawings and specified herein.
- C. Selective trimming of existing trees shall be measured per lump sum complete. The work of this section shall include the professional removal and disposal of all branches projecting into the work area up to a height of 15-feet above grade.

1.15 REPAIR OF EXISTING STREET SIGN MONUMENTS

- A. Payment for the repair/restoration of existing street sign monuments shall be measured per lump sum complete, and shall include: washing; labor, mortar, and stone required for re-pointing; decorative precast concrete finial with appropriate street names inset; and all other work and materials incidental thereto.

1.16 ENVIRONMENTAL PROTECTION:

- A. Unless otherwise indicated, the work of this section shall not be separately measured for payment, but shall be considered incidental to the project.
- B. Inlet protection for catch basins shall be measured per catch basin protected, including maintenance for the duration of the work in the area, and paid at the contract unit price under the subdivision Inlet Protection.

1.17 TRAFFIC SIGNALS:

- A. The removal of existing traffic signals shall be measured per lump sum complete. The unit cost for this item shall include the removal of all existing traffic control signals, posts, wiring, appurtenances, and foundations; the salvage and delivery to a City Facility of materials as determined by the Owner; and the disposal of all other materials.
- B. Removal replacement of loop detectors shall be measured per lump sum complete. The unit cost for this item shall include removal of the existing loop detector wiring, saw cut and installation of new wiring, connection and integration into the existing system, and all other work and materials incidental thereto.

1.18 TRAFFIC CONTROL:

- A. The services of uniformed officers shall be measured per hour worked and paid at the contract unit prices under the subdivisions of the item Traffic Control. The unit prices under this subdivision include administration charges required by the police.
- B. The set prices for Uniformed Officers are based on the prevailing hourly wage rates. Payment will be made based on invoices submitted by the City of New London Police Department to the Contractor. The Contractor shall forward copies of these invoices to the Engineer and include the cost in his Application for Payment. Actual payment to the City of New London Police Department shall be made by the Contractor and the Contractor shall be reimbursed by the Owner through the payment estimate. If police wages change during the course of the Contract, the unit prices under this subdivision will be changed accordingly.
- C. Traffic control shall be measured as a lump sum and paid at the contract unit price under the subdivision Traffic Control. Traffic control shall include all signage, flagmen, warning devices, and all other means to protect traffic from the work site as directed by the Owner and as shown in the specifications.

1.19 SUPPORT OF EXCAVATION:

- A. Unless otherwise indicated, the work of this section shall not be separately measured for payment, but shall be considered incidental to the project.

1.20 DEWATERING:

Unless otherwise indicated, the work of this section shall not be separately measured for payment, but shall be considered incidental to the project.

1.21 CONNECTIONS TO EXISTING MAINS:

Unless otherwise indicated, the work of this section shall not be separately measured for payment, but shall be considered incidental to the project.

1.22 FIELD CONCRETE:

Unless otherwise indicated, the work of this section shall not be separately measured for payment, but shall be considered incidental to the project.

1.23 RECONSTRUCTION OF EXISTING SEWERS AND DRAINS:

Reconstruction of existing sewers and drains damaged by the Contractor shall not be separately measured for payment, but shall be considered incidental to the project.

1.24 SIDEWALK & CURBING REPAIR:

Unless otherwise indicated, the work of this section, including the repair of concrete sidewalks and the repair of curbing sections using bituminous concrete, shall not be separately measured for payment, but shall be considered incidental to the project.

1.25 PEDESTRIAN SAFETY:

Labor and materials required for the protection of pedestrian traffic from excavations and construction activities, such as: construction fence, steel plating, flagmen, flashing barrels, etc., shall not be separately measured for payment, but shall be considered incidental to the project.

END OF SECTION

SECTION 01330

SUBMITTALS

1. SHOP AND WORKING DRAWINGS

- A. As required by the General Conditions, Contractor shall submit a schedule of shop and working drawing submittals.
- B. In accordance with the accepted schedule, the Contractor shall submit promptly to the Engineer, or its authorized resident representative at the job site, shop or working drawings required as noted in the specifications, of equipment, structural details and materials fabricated especially for this Contract. Electronic submission is preferred. If hard copies are to be submitted a minimum of four (4) copies must be provided.
- C. Such drawings shall show the principal dimensions, weight, structural and operating features, space required, clearances, type and/or brand of finish of shop coat, grease fittings, etc., depending on the subject of the drawings. When it is customary to do so, when the dimensions are of particular importance, or when so specified, the drawings shall be certified by the manufacturer or fabricator as correct for this Contract.
- D. All shop and working drawings shall be submitted to the Engineer by and/or through the Contractor, who shall be responsible for obtaining shop and working drawings from his subcontractors and returning reviewed drawings to them. All shop and working drawings shall be prepared on standard size, 24-inch by 36-inch sheets, except those which are made by changing existing standard shop or working drawings. All drawings shall be clearly marked with the names of the Owner, Project, Contractor and building, equipment or structure to which the drawing applies, and shall be suitably numbered.
- E. Only drawings which have been prepared, checked and corrected by the fabricator should be submitted to the Contractor by his subcontractors and vendors. Prior to submitting drawings to the Engineer, the Contractor shall check thoroughly all such drawings to satisfy himself that the subject matter thereof conforms to the Contract Documents in all respects. Shop drawings shall be reviewed and marked with the date, checker's name and indication of the Contractor's approval, and only then shall be submitted to the Engineer. Shop drawings unsatisfactory to the Contractor shall be returned directly to their source for correction, without submittal to the Engineer. Shop drawings submitted to the Engineer without the Contractor's approval stamp and signature will be rejected. Any deviation from the Contract Documents indicated on the shop drawings must be identified on the drawings and in a separate submittal to the Engineer.
- F. The Contractor shall be responsible for the prompt submittal and resubmittal, as necessary, of all shop and working drawings so that there will be no delay in the work due to the absence of such drawings.
- G. The Engineer will review the shop and working drawings as to their general conformance with the design concept of the project and general compliance with the information given in the Contract Documents. Corrections of comments made on the drawings during the review do not relieve the Contractor from compliance with requirements of the Contract Documents. The Contractor is responsible for: confirming and correlating all quantities and

dimensions; selecting fabrication processes and techniques of construction; coordinating his work with that of all other trades; and performing his work in a safe and satisfactory manner. The review of the shop drawings is general and shall not relieve the Contractor of the responsibility for details of design, dimensions, code compliance, etc., necessary for interfacing with other components, proper fitting and construction of the work required by the Contract and for achieving the specified performance.

- H. With few exceptions, shop drawings will be reviewed and returned to the Contractor within 30 days of submittal.
- I. No material or equipment shall be purchased or fabricated especially for this Contract nor shall the Contractor proceed with any portion of the work, the design and details of which are dependent upon the design and details of equipment or other features for which review is required, until the required shop and working drawings have been submitted and reviewed by the Engineer as to their general conformance and compliance with the project and its Contract Documents. All materials and work involved in the construction shall then be as represented by said drawings.
- J. Two copies of the shop and working drawings and/or catalog cuts will be returned to the Contractor. The Contractor shall furnish additional copies of such drawings or catalog cuts when he needs more than two copies or when so requested.

END OF SECTION

SECTION 01400

QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for quality assurance and quality control. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve the Contractor of the responsibility for compliance with the Contract Document requirements.
- B. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and -control procedures that facilitate compliance with the Contract Document requirements.
- C. Requirements for Contractor to provide quality-assurance and -control services required by Engineer, Owner or authorities having jurisdiction are not limited by provisions of this Section.

1.2 RELATED WORK

- A. Section 00890, PERMITS
- B. Section 02300, EARTHWORK
- C. Section 03302, FIELD CONCRETE

1.3 DEFINITIONS

- A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.
- B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Services do not include contract enforcement activities performed by Engineer.
- C. Preconstruction Testing: Tests and inspections performed specifically for Project before products and materials are incorporated into the Work, to verify performance or compliance with specified criteria.
- D. Product Testing: Tests and inspections that are performed by an NRTL, an NVLAP, or a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with specified requirements.
- E. Source Quality-Control Testing: Tests and inspections that are performed at the source, e.g., plant, mill, factory, or shop.

- F. Field Quality-Control Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work.
- G. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.
- H. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.
 - 1. Use of trade-specific terminology in referring to a trade or entity does not require that certain construction activities be performed by accredited or unionized individuals, or that requirements specified apply exclusively to specific trade(s).

1.4 CONFLICTING REQUIREMENTS

- A. Referenced Standards: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer conflicting requirements that are different, but apparently equal, to Engineer for a decision before proceeding.
- B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Engineer for a decision before proceeding.

1.5 REPORTS AND DOCUMENTS

- A. Test and Inspection Reports: Prepare and submit certified written reports specified in other Sections. Include the following:
 - 1. Date of issue.
 - 2. Project title and number.
 - 3. Name, address, and telephone number of testing agency.
 - 4. Dates and locations of samples and tests or inspections.
 - 5. Names of individuals making tests and inspections.
 - 6. Description of the Work and test and inspection method.
 - 7. Identification of product and Specification Section.
 - 8. Complete test or inspection data.
 - 9. Test and inspection results and an interpretation of test results.
 - 10. Record of temperature and weather conditions at time of sample taking and testing and inspecting.
 - 11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
 - 12. Name and signature of laboratory inspector.
 - 13. Recommendations on retesting and reinspecting.
- B. Manufacturer's Field Reports: Prepare written information documenting tests and inspections specified in other Sections. Include the following:

1. Name, address, and telephone number of representative making report.
 2. Statement on condition of substrates and their acceptability for installation of product.
 3. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
 4. Results of operational and other tests and a statement of whether observed performance complies with requirements.
 5. Other required items indicated in individual Specification Sections.
- C. Permits, Licenses, and Certificates: For Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

1.6 QUALITY ASSURANCE

- A. General: Qualifications paragraphs in this article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.
- B. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- C. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- D. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.
- E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that are similar in material, design, and extent to those indicated for this Project.
- F. Testing Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, as documented according to ASTM E 329; and with additional qualifications specified in individual Sections; and, where required by authorities having jurisdiction, that is acceptable to authorities.
1. NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.7.
 2. NVLAP: A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program.
- G. Manufacturer's Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to observe and inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

1.7 QUALITY CONTROL

- A. Contractor Responsibilities: Perform quality-control activities required to verify that the Work complies with requirements, whether specified or not.
1. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.
 2. Notify testing agencies at least twenty-four (24) hours in advance of time when Work that requires testing or inspecting will be performed.
 3. Submit a certified written report, in duplicate, of each quality-control service.
 4. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
 5. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.
- B. Testing Agency Responsibilities: Cooperate with Engineer and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.
1. Notify Engineer and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
 2. Determine the location from which test samples will be taken and in which in-situ tests are conducted.
 3. Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
 4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
 5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
 6. Do not perform any duties of Contractor.
- C. Associated Services: Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:
1. Access to the Work.
 2. Incidental labor and facilities necessary to facilitate tests and inspections.
 3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
 4. Facilities for storage and field curing of test samples.
 5. Delivery of samples to testing agencies.
 6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
 7. Security and protection for samples and for testing and inspecting equipment at Project site.
- D. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and -control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.
1. Schedule times for tests, inspections, obtaining samples, and similar activities.

E. Schedule of Testing:

1. Earthwork:

Testing will be performed by a certified inspection laboratory engaged and paid for by the Contractor. If test results indicate work does not conform to specification requirements, the Contractor shall remove or correct the defective Work by recompacting where appropriate or replacing as necessary and approved by the Engineer, to bring the work into compliance, at no additional cost to the Owner. All backfilled materials under structures and buildings shall be field tested for compliance with the requirements of the Contract Documents.

<p>1. Aggregate Base for Pavement</p>	<p><i>Perform sieve tests (ASTM D422 & D1140) and modified Proctor tests (ASTM D1557) of each source of base material. Frequency: periodic, once for each source minimum and every six months.</i></p> <p><i>Inspect removal of unsuitable material and preparation of subgrade prior to placement of controlled fill. Frequency: continuous observation</i></p> <p><i>Inspect placement, lift thickness and compaction of material. Frequency: continuous, test each lift every 1000 square feet with two tests minimum per lift</i></p> <p><i>Test density of each lift of fill by nuclear methods (ASTM D2922) to achieve 95% maximum density.</i></p>
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2. Cast-in-Place Concrete:

The Contractor shall engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.

<p>1. Mix Design</p>	<p><i>Review concrete batch tickets and verify compliance with approved mix design. Verify that water added at the site does not exceed that allowed by the mix design. Frequency: continuous for each delivery during all concrete placement</i></p>
<p>2. Reinforcement Installation</p>	<p><i>Inspect size, spacing, cover, positioning and grade of reinforcing steel. Verify that reinforcing bars are free of form oil or other deleterious materials. Inspect bar laps and mechanical splices. Verify that bars are adequately tied and supported on chairs or bolsters. Frequency: periodic for all reinforcing</i></p>
<p>3. Concrete Placement</p>	<p><i>Inspect placement of concrete. Verify that concrete conveyance and depositing avoids segregation or contamination. Verify that concrete is properly consolidated. Frequency: continuous during all concrete placement</i></p>

<p>4. Sampling and Testing of Concrete</p>	<p><i>Test concrete compressive strength (ASTM C31 & C39), slump (ASTM C143), air-content (ASTM C231 or C173) and temperature (ASTM C1064). Frequency: according to referenced standards, one compressive strength test minimum for each building footing, foundation wall, slab or concrete mix used.</i></p>
<p>5. Curing and Protection</p>	<p><i>Inspect curing, cold weather protection and hot weather protection procedures. Frequency: periodic daily for one week during curing, periodic daily for duration of other procedures</i></p>

- a. Test results shall be reported in writing to Engineer, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing 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.
- b. 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. The costs associated with additional testing will not be considered for additional payment.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 TEST AND INSPECTION LOG

- A. Test and Inspection Log: Prepare a record of tests and inspections. Include the following:
 - 1. Date test or inspection was conducted.
 - 2. Description of the Work tested or inspected.
 - 3. Date test or inspection results were transmitted to Engineer.
 - 4. Identification of testing agency or special inspector conducting test or inspection.
- B. Maintain log at Project site. Post changes and revisions as they occur. Provide access to test and inspection log for Engineer’s reference during normal working hours.

3.2 REPAIR AND PROTECTION

- A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.

1. Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible.
- B. Protect construction exposed by or for quality-control service activities.
- C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION

SECTION 01500

MAINTENANCE & PROTECTION OF TRAFFIC

PART 1 - GENERAL

1.1 WORK INCLUDED

This Section covers Requirements for the Maintenance and Protection of Traffic. Requirements shall conform to State of Connecticut Department of Transportation (CTDOT) Standard Specifications for Roads, Bridges and Incidental Construction, Form 817, Article 9.71 as modified herein.

Article 9.71.01 – Description is supplemented by the following:

The Contractor shall maintain and protect traffic as described by the following and as limited in the Special Provision "Prosecution and Progress":

Ocean Avenue

The Contractor shall maintain and protect a minimum of one lane of traffic in each direction, each lane on a compacted gravel travel path not less than 11 feet in width.

Excepted therefrom will be those periods, during the allowable periods, when the Contractor is actively working, at which time the Contractor shall maintain and protect at least an alternating one-way traffic operation, on a compacted gravel travel path not less than 11 feet in width. The length of the alternating one-way traffic operation shall not exceed 300 feet and there shall be no more than one alternating one-way traffic operation within the project limits without prior approval of the Engineer.

Intersecting Roadways

The Contractor shall maintain and protect existing traffic operations.

Excepted therefrom will be those periods, during the allowable periods, when the Contractor is actively working, at which time the Contractor shall be allowed to maintain and protect a minimum of one lane of traffic, on a compacted gravel travel path not less than 11 feet in width.

Commercial and Residential Driveways

The Contractor shall maintain access to and egress from all commercial and residential driveways throughout the project limits. The Contractor will be allowed to close said driveways to perform the required work during those periods when the businesses are closed, unless permission is granted from the business owner to close the driveway during business hours. If a

temporary closure of a residential driveway is necessary, the Contractor shall coordinate with the owner to determine the time period of the closure.

Article 9.71.03 - Construction Method is supplemented as follows:

General

Unpaved travel paths will be permitted for areas requiring full depth reconstruction. The Contractor will be allowed to maintain traffic on compacted gravel for a duration not to exceed 14 calendar days. The unpaved section shall be the full width of the road and perpendicular to the travel lanes. Opposing traffic lane dividers shall be used as a centerline.

The Contractor is required to delineate any raised structures within the travel lanes, so that the structures are visible day and night, unless there are specific contract plans and provisions to temporarily lower these structures prior to the completion of work.

The Contractor shall schedule operations so that pavement removal and roadway resurfacing shall be completed full width across a roadway (bridge) section by the end of a workday (work night), or as directed by the Engineer.

When the installation of all intermediate courses of bituminous concrete pavement is completed for the entire roadway, the Contractor shall install the final course of bituminous concrete pavement.

When the Contractor is excavating adjacent to the roadway, the Contractor shall provide a 3-foot shoulder between the work area and travel lanes, with traffic drums spaced every 50 feet. At the end of the workday, if the vertical drop-off exceeds 3 inches, the Contractor shall provide a temporary traversable slope of 4:1 or flatter that is acceptable to the Engineer.

The Contractor, during the course of active overhead construction work, shall close the lanes directly below the work area for the entire length of time overhead work is being undertaken.

If applicable, when an existing sign is removed, it shall be either relocated or replaced by a new sign during the same working day.

The Contractor shall not store any material on-site which would present a safety hazard to motorists or pedestrians (e.g. fixed object or obstruct sight lines).

The field installation of a signing pattern shall constitute interference with existing traffic operations and shall not be allowed, except during the allowable periods.

Construction vehicles entering travel lanes at speeds less than the posted speed are interfering with traffic, and shall not be allowed without a lane closure. The lane closure shall be of sufficient length to allow vehicles to enter or exit the work area at posted speeds, in order to merge with existing traffic.

Existing Signing

The Contractor shall maintain all existing signs throughout the project limits during the duration of the project. The Contractor shall temporarily relocate signs and sign supports as many times as deemed necessary, and install temporary sign supports if necessary and as directed by the Engineer.

Requirements for Winter

The Contractor shall schedule a meeting with representatives from the City to determine what interim traffic control measures the Contractor shall accomplish for the winter to provide safety to the motorists and permit adequate snow removal procedures. This meeting shall be held prior to October 31 of each year and will include, but not be limited to, discussion of the status and schedule of the following items: lane and shoulder widths, pavement restoration, traffic signal work, pavement markings, and signing.

Signing Patterns

The Contractor shall erect and maintain all signing patterns in accordance with the traffic control plans contained herein. Proper distances between advance warning signs and proper taper lengths are mandatory.

Pavement Markings

During construction, the Contractor shall maintain all pavement markings on paved surfaces on all roadways throughout the limits of the project.

Interim Pavement Markings

The Contractor shall install painted pavement markings, which shall include single centerlines and stop bars, on each intermediate course of bituminous concrete pavement by the end of the work week. The painted pavement markings will be paid under the appropriate items.

If the Contractor will install another course of bituminous concrete pavement within 24 hours, temporary markings are not required.

If an intermediate course of bituminous concrete pavement will be exposed throughout the winter, then Epoxy Resin Pavement Markings should be installed unless directed otherwise by the Engineer.

Final Pavement Markings

The Contractor should install painted pavement markings on the final course of bituminous concrete pavement by the end of the work week. If the painted pavement markings are not installed by the end of the work week.

TRAFFIC CONTROL DURING CONSTRUCTION OPERATIONS

The following guidelines shall assist field personnel in determining when and what type of traffic control patterns to use for various situations. These guidelines shall provide for the safe and efficient movement of traffic through work zones and enhance the safety of work forces in the work area.

TRAFFIC CONTROL PATTERNS

Traffic control patterns shall be used when a work operation requires that all or part of any vehicle or work area protrudes onto any part of a travel lane or shoulder. For each situation, the installation of traffic control devices shall be based on the following:

- Speed and volume of traffic
- Duration of operation
- Exposure to hazards

Traffic control patterns shall be uniform, neat and orderly so as to command respect from the motorist.

In the case of a horizontal or vertical sight restriction in advance of the work area, the traffic control pattern shall be extended to provide adequate sight distance for approaching traffic.

If a lane reduction taper is required to shift traffic, the entire length of the taper should be installed on a tangent section of roadway so that the entire taper area can be seen by the motorist.

Any existing signs that are in conflict with the traffic control patterns shall be removed, covered, or turned so that they are not readable by oncoming traffic.

When installing a traffic control pattern, a Buffer Area should be provided and this area shall be free of equipment, workers, materials and parked vehicles.

Typical traffic control plans 19 through 25 may be used for moving operations such as line striping, pot hole patching, mowing, or sweeping when it is necessary for equipment to occupy a travel lane.

Traffic control patterns will not be required when vehicles are on an emergency patrol type activity or when a short duration stop is made and the equipment can be contained within the shoulder. Flashing lights and appropriate trafficperson shall be used when required.

Although each situation must be dealt with individually, conformity with the typical traffic control plans contained herein is required. In a situation not adequately covered by the typical traffic control plans, the Contractor must contact the Engineer for assistance prior to setting up a traffic control pattern.

PLACEMENT OF SIGNS

Signs must be placed in such a position to allow motorists the opportunity to reduce their speed prior to the work area. Signs shall be installed on the same side of the roadway as the work area. On multi-lane divided highways, advance warning signs shall be installed on both sides of the highway. On directional roadways (on-ramps, off-ramps, one-way roads), where the sight distance to signs is restricted, these signs should be installed on both sides of the roadway.

ALLOWABLE ADJUSTMENT OF SIGNS AND DEVICES SHOWN ON THE TRAFFIC CONTROL PLANS

The traffic control plans contained herein show the location and spacing of signs and devices under ideal conditions. Signs and devices should be installed as shown on these plans whenever possible.

The proper application of the traffic control plans and installation of traffic control devices depends on actual field conditions.

Adjustments to the traffic control plans shall be made only at the direction of the Engineer to improve the visibility of the signs and devices and to better control traffic operations. Adjustments to the traffic control plans shall be based on safety of work forces and motorists, abutting property requirements, driveways, side roads, and the vertical and horizontal curvature of the roadway.

The Engineer may require that the traffic control pattern be located significantly in advance of the work area to provide better sight line to the signing and safer traffic operations through the work zone.

Table I indicates the minimum taper length required for a lane closure based on the posted speed limit of the roadway. These taper lengths shall only be used when the recommended taper lengths shown on the traffic control plans cannot be achieved.

TABLE I – MINIMUM TAPER LENGTHS

POSTED SPEED LIMIT MILES PER HOUR	MINIMUM TAPER LENGTH IN FEET FOR A SINGLE LANE CLOSURE
30 OR LESS	180
35	250
40	320
45	540
50	600
55	660
65	780

SECTION 1. WORK ZONE SAFETY MEETINGS

- 1.a) Prior to the commencement of work, a work zone safety meeting will be conducted with representatives of DOT Construction, Connecticut State Police (Local Barracks), Municipal Police, the Contractor (Project Superintendent) and the Traffic Control Subcontractor (if different than the prime Contractor) to review the traffic operations, lines of responsibility, and operating guidelines which will be used on the project. Other work zone safety meetings during the course of the project should be scheduled as needed.
- 1.b) A Work Zone Safety Meeting Agenda shall be developed and used at the meeting to outline the anticipated traffic control issues during the construction of this project. Any issues that can't be resolved at these meetings will be brought to the attention of the District Engineer and the Office of Construction. The agenda should include:
- Review Project scope of work and time
 - Review Section 1.08, Prosecution and Progress
 - Review Section 9.70, Trafficpersons
 - Review Section 9.71, Maintenance and Protection of Traffic
 - Review Contractor's schedule and method of operations.
 - Review areas of special concern: ramps, turning roadways, medians, lane drops, etc.
 - Open discussion of work zone questions and issues
 - Discussion of review and approval process for changes in contract requirements as they relate to work zone areas

SECTION 2. GENERAL

- 2.a) If the required minimum number of signs and equipment (i.e. one High Mounted Internally Illuminated Flashing Arrow for each lane closed, two TMAs, Changeable Message Sign, etc.) are not available; the traffic control pattern shall not be installed.
- 2.b) The Contractor shall have back-up equipment (TMAs, High Mounted Internally Illuminated Flashing Arrow, Changeable Message Sign, construction signs, cones/drums, etc.) available at all times in case of mechanical failures, etc. The only exception to this is in the case of sudden equipment breakdowns in which the pattern may be installed but the Contractor must provide replacement equipment within 24 hours
- 2.c) Failure of the Contractor to have the required minimum number of signs, personnel and equipment, which results in the pattern not being installed, shall not be a reason for a time extension or claim for loss time.
- 2.d) In cases of legitimate differences of opinion between the Contractor and the Inspection staff, the Inspection staff shall err on the side of safety. The matter shall be brought to

the District Office for resolution immediately or, in the case of work after regular business hours, on the next business day.

SECTION 3. INSTALLING AND REMOVING TRAFFIC CONTROL PATTERNS

- 3.a) Lane Closures shall be installed beginning with the advanced warning signs and proceeding forward toward the work area.
- 3.b) Lane Closures shall be removed in the reverse order, beginning at the work area, or end of the traffic control pattern, and proceeding back toward the advanced warning signs.
- 3.c) Stopping traffic may be allowed:
 - As per the contract for such activities as blasting, steel erection, etc.
 - During paving, milling operations, etc. where, in the middle of the operation, it is necessary to flip the pattern to complete the operation on the other half of the roadway and traffic should not travel across the longitudinal joint or difference in roadway elevation.
 - To move slow moving equipment across live traffic lanes into the work area.
- 3.d) Under certain situations when the safety of the traveling public and/or that of the workers may be compromised due to conditions such as traffic volume, speed, roadside obstructions, or sight line deficiencies, as determined by the Engineer and/or State Police, traffic may be briefly impeded while installing and/or removing the advanced warning signs and the first ten traffic cones/drums only. Appropriate measures shall be taken to safely slow traffic. If required, traffic slowing techniques may be used and shall include the use of Truck Mounted Impact Attenuators (TMAs) as appropriate, for a minimum of one mile in advance of the pattern starting point. Once the advanced warning signs and the first ten traffic cones/drums are installed/removed, the TMAs and sign crew shall continue to install/remove the pattern as described in Section 4c and traffic shall be allowed to resume their normal travel.
- 3.e) The Contractor must adhere to using the proper signs, placing the signs correctly, and ensuring the proper spacing of signs.
- 3.f) Additional devices are required on entrance ramps, exit ramps, and intersecting roads to warn and/or move traffic into the proper travel path prior to merging/exiting with/from the main line traffic. This shall be completed before installing the mainline pattern past the ramp or intersecting roadway.
- 3.g) Prior to installing a pattern, any conflicting existing signs shall be covered with an opaque material. Once the pattern is removed, the existing signs shall be uncovered.

- 3.h) On limited access roadways, workers are prohibited from crossing the travel lanes to install and remove signs or other devices on the opposite side of the roadway. Any signs or devices on the opposite side of the roadway shall be installed and removed separately.

SECTION 4. USE OF HIGH MOUNTED INTERNALLY ILLUMINATED FLASHING ARROW

- 4.a) On limited access roadways, one Flashing Arrow shall be used for each lane that is closed. The Flashing Arrow shall be installed concurrently with the installation of the traffic control pattern and its placement shall be as shown on the traffic control plan. For multiple lane closures, one Flashing Arrow is required for each lane closed. If conditions warrant, additional Flashing Arrows should be employed (i.e.: curves, major ramps, etc.).
- 4.b) On non-limited access roadways, the use of a Flashing Arrow for lane closures is optional. The roadway geometry, sight line distance, and traffic volume should be considered in the decision to use the Flashing Arrow.
- 4.c) The Flashing Arrow shall not be used on two lane, two-way roadways for temporary alternating one-way traffic operations.
- 4.d) The Flashing Arrow board display shall be in the “arrow” mode for lane closure tapers and in the “caution” mode (four corners) for shoulder work, blocking the shoulder, or roadside work near the shoulder. The Flashing Arrow shall be in the “caution” mode when it is positioned in the closed lane.
- 4.e) The Flashing Arrow shall not be used on a multi-lane roadway to laterally shift all lanes of traffic, because unnecessary lane changing may result.

SECTION 5. USE OF TRUCK MOUNTED IMPACT ATTENUATOR VEHICLES (TMAs)

- 5.a) For lane closures on limited access roadways, a minimum of two TMAs shall be used to install and remove traffic control patterns. If two TMAs are not available, the pattern shall not be installed.
- 5.b) On non-limited access roadways, the use of TMAs to install and remove patterns closing a lane(s) is optional. The roadway geometry, sight line distance, and traffic volume should be considered in the decision to utilize the TMAs.
- 5.c) Generally, to establish the advance and transition signing, one TMA shall be placed on the shoulder and the second TMA shall be approximately 1,000 feet ahead blocking the lane. The flashing arrow board mounted on the TMA should be in the “flashing arrow” mode when taking the lane. The sign truck and workers should be immediately ahead of

the second TMA. In no case shall the TMA be used as the sign truck or a work truck. Once the transition is in place, the TMAs shall travel in the closed lane until all Changeable Message Signs, signs, Flashing Arrows, and cones/drums are installed. The flashing arrow board mounted on the TMA should be in the “caution” mode when traveling in the closed lane.

- 5.d) A TMA shall be placed prior to the first work area in the pattern. If there are multiple work areas within the same pattern, then additional TMAs shall be positioned at each additional work area as needed. The flashing arrow board mounted on the TMA should be in the “caution” mode when in the closed lane.
- 5.e) TMAs shall be positioned a sufficient distance prior to the workers or equipment being protected to allow for appropriate vehicle roll-ahead in the event that the TMA is hit, but not so far that an errant vehicle could travel around the TMA and into the work area. For additional placement and use details, refer to the specification entitled “Type ‘D’ Portable Impact Attenuation System”. Some operations, such as paving and concrete repairs, do not allow for placement of the TMA(s) within the specified distances. In these situations, the TMA(s) should be placed at the beginning of the work area and shall be advanced as the paving or concrete operations proceed.
- 5.f) TMAs should be paid in accordance with how the unit is utilized. When it is used as a TMA and is in the proper location as specified, and then it should be paid at the specified hourly rate for “Type ‘D’ Portable Impact Attenuation System”. When the TMA is used as a Flashing Arrow, it should be paid at the daily rate for “High Mounted Internally Illuminated Flashing Arrow”. If a TMA is used to install and remove a pattern and then is used as a Flashing Arrow, the unit should be paid as a “Type ‘D’ Portable Impact Attenuation System” for the hours used to install and remove the pattern, typically 2 hours (1 hour to install and 1 hour to remove), and is also paid for the day as a “High Mounted Internally Illuminated Flashing Arrow”.

SECTION 6. USE OF TRAFFIC DRUMS AND TRAFFIC CONES

- 6.a) Traffic drums shall be used for taper channelization on limited-access roadways, ramps, and turning roadways and to delineate raised catch basins and other hazards.
- 6.b) Traffic drums shall be used in place of traffic cones in traffic control patterns that are in effect for more than a 36-hour duration.
- 6.c) Traffic Cones less than 42 inches in height shall not be used on limited-access roadways or on non-limited access roadways with a posted speed limit of 45 mph and above.
- 6.d) Typical spacing of traffic drums and/or cones shown on the Traffic Control Plans in the Contract are maximum spacings and may be reduced to meet actual field conditions as required.

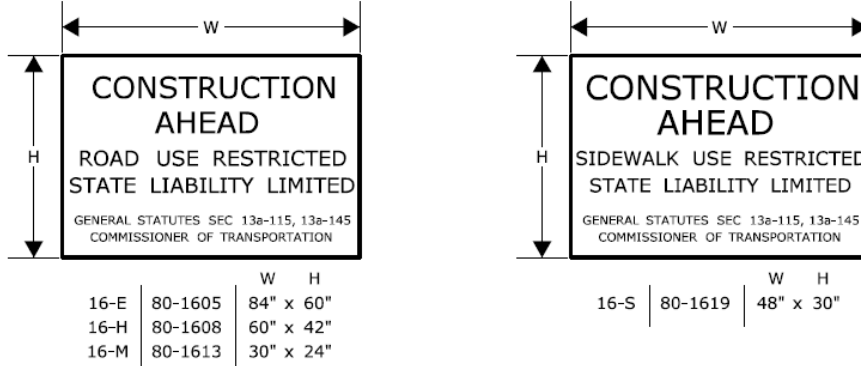
SECTION 7. USE OF (REMOTE CONTROLLED) CHANGEABLE MESSAGE SIGNS (CMS)

- 7.a) For lane closures on limited access roadways, one CMS shall be used in advance of the traffic control pattern. Prior to installing the pattern, the CMS shall be installed and in operation, displaying the appropriate lane closure information (i.e.: Left Lane Closed - Merge Right). The CMS shall be positioned ½ - 1 mile ahead of the lane closure taper. If the nearest Exit ramp is greater than the specified ½ - 1 mile distance, than an additional CMS shall be positioned a sufficient distance ahead of the Exit ramp to alert motorists to the work and therefore offer them an opportunity to take the exit.
- 7.b) CMS should not be installed within 1000 feet of an existing CMS.
- 7.c) On non-limited access roadways, the use of CMS for lane closures is optional. The roadway geometry, sight line distance, and traffic volume should be considered in the decision to use the CMS.
- 7.d) The advance CMS is typically placed off the right shoulder, 5 feet from the edge of pavement. In areas where the CMS cannot be placed beyond the edge of pavement, it may be placed on the paved shoulder with a minimum of five (5) traffic drums placed in a taper in front of it to delineate its position. The advance CMS shall be adequately protected if it is used for a continuous duration of 36 hours or more.
- 7.e) When the CMS are no longer required, they should be removed from the clear zone and have the display screen cleared and turned 90° away from the roadway.
- 7.f) The CMS generally should not be used for generic messages (ex: Road Work Ahead, Bump Ahead, Gravel Road, etc.).
- 7.g) The CMS should be used for specific situations that need to command the motorist's attention which cannot be conveyed with standard construction signs (Examples include: Exit 34 Closed Sat/Sun - Use Exit 35, All Lanes Closed - Use Shoulder, Workers on Road - Slow Down).
- 7.h) Messages that need to be displayed for long periods of time, such as during stage construction, should be displayed with construction signs. For special signs, please coordinate with the Office of Construction and the Division of Traffic Engineering for the proper layout/dimensions required.
- 7.i) The messages that are allowed on the CMS are as follows:

<u>Message No.</u>	<u>Frame 1</u>	<u>Frame 2</u>	<u>Message No.</u>	<u>Frame 1</u>	<u>Frame 2</u>
1	LEFT LANE CLOSED	MERGE RIGHT	9	LANES CLOSED AHEAD	REDUCE SPEED
2	2 LEFT LANES CLOSED	MERGE RIGHT	10	LANES CLOSED AHEAD	USE CAUTION
3	LEFT LANE CLOSED	REDUCE SPEED	11	WORKERS ON ROAD	REDUCE SPEED
4	2 LEFT LANES CLOSED	REDUCE SPEED	12	WORKERS ON ROAD	SLOW DOWN
5	RIGHT LANE CLOSED	MERGE LEFT	13	EXIT XX CLOSED	USE EXIT YY
6	2 RIGHT LANES CLOSED	MERGE LEFT	14	EXIT XX CLOSED USE YY	FOLLOW DETOUR
7	RIGHT LANE CLOSED	REDUCE SPEED	15	2 LANES SHIFT AHEAD	USE CAUTION
8	2 RIGHT LANES CLOSED	REDUCE SPEED	16	3 LANES SHIFT AHEAD	USE CAUTION

For any other message(s), approval must be received from the Office of Construction prior to their use. No more than two (2) displays shall be used within any message cycle.

SERIES 16 SIGNS



THE 16-S SIGN SHALL BE USED ON ALL PROJECTS THAT REQUIRE SIDEWALK RECONSTRUCTION OR RESTRICT PEDESTRIAN TRAVEL ON AN EXISTING SIDEWALK.

SERIES 16 SIGNS SHALL BE INSTALLED IN ADVANCE OF THE TRAFFIC CONTROL PATTERNS TO ALLOW MOTORISTS THE OPPORTUNITY TO AVOID A WORK ZONE. SERIES 16 SIGNS SHALL BE INSTALLED ON ANY MAJOR INTERSECTING ROADWAYS THAT APPROACH THE WORK ZONE. ON LIMITED-ACCESS HIGHWAYS, THESE SIGNS SHALL BE LOCATED IN ADVANCE OF THE NEAREST UPSTREAM EXIT RAMP AND ON ANY ENTRANCE RAMPS PRIOR TO OR WITHIN THE WORK ZONE LIMITS.

THE LOCATION OF SERIES 16 SIGNS CAN BE FOUND ELSEWHERE IN THE PLANS OR INSTALLED AS DIRECTED BY THE ENGINEER.

SIGNS 16-E AND 16-H SHALL BE POST-MOUNTED.

SIGN 16-E SHALL BE USED ON ALL EXPRESSWAYS.

SIGN 16-H SHALL BE USED ON ALL RAMPS, OTHER STATE ROADWAYS, AND MAJOR TOWN/CITY ROADWAYS.

SIGN 16-M SHALL BE USED ON OTHER TOWN ROADWAYS.

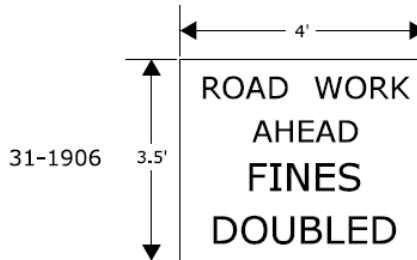
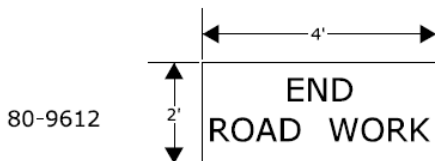
REGULATORY SIGN "ROAD WORK AHEAD, FINES DOUBLED"

THE REGULATORY SIGN "ROAD WORK AHEAD FINES DOUBLED" SHALL BE INSTALLED FOR ALL WORK ZONES THAT OCCUR ON ANY STATE HIGHWAY IN CONNECTICUT WHERE THERE ARE WORKERS ON THE HIGHWAY OR WHEN THERE IS OTHER THAN EXISTING TRAFFIC OPERATIONS.

THE "ROAD WORK AHEAD FINES DOUBLED" REGULATORY SIGN SHALL BE PLACED AFTER THE SERIES 16 SIGN AND IN ADVANCE OF THE "ROAD WORK AHEAD" SIGN.

"END ROAD WORK" SIGN

THE LAST SIGN IN THE PATTERN MUST BE THE "END ROAD WORK" SIGN.



SCALE: NONE

CONSTRUCTION TRAFFIC CONTROL PLAN
REQUIRED SIGNS

NOTES FOR TRAFFIC CONTROL PLANS

1. IF A TRAFFIC STOPPAGE OCCURS IN ADVANCE OF SIGN (A), THEN AN ADDITIONAL SIGN (A) SHALL BE INSTALLED IN ADVANCE OF THE STOPPAGE.
2. SIGNS (AA), (A), AND (D) SHOULD BE OMITTED WHEN THESE SIGNS HAVE ALREADY BEEN INSTALLED TO DESIGNATE A LARGER WORK ZONE THAN THE WORK ZONE THAT IS ENCOMPASSED ON THIS PLAN.
3. SEE TABLE 1 FOR ADJUSTMENT OF TAPERS IF NECESSARY.
4. IF THIS PLAN REMAINS IN CONTINUOUS OPERATION FOR MORE THAN 36 HOURS, THEN TRAFFIC DRUMS SHALL BE USED IN PLACE OF TRAFFIC CONES.
5. ANY LEGAL SPEED LIMIT SIGNS WITHIN THE LIMITS OF A ROADWAY / LANE CLOSURE AREA SHALL BE COVERED WITH AN OPAQUE MATERIAL WHILE THE CLOSURE IS IN EFFECT, AND UNCOVERED WHEN THE ROADWAY / LANE CLOSURE IS RE-OPENED TO ALL LANES OF TRAFFIC.
6. IF THIS PLAN REMAINS IN CONTINUOUS OPERATION FOR MORE THAN 36 HOURS, THEN ANY EXISTING CONFLICTING PAVEMENT MARKINGS SHALL BE ERADICATED OR COVERED, AND TEMPORARY PAVEMENT MARKINGS THAT DELINEATE THE PROPER TRAVELPATHS SHALL BE INSTALLED.
7. DISTANCES BETWEEN SIGNS IN THE ADVANCE WARNING AREA MAY BE REDUCED TO 100' ON LOW-SPEED URBAN ROADS (SPEED LIMIT < 40 MPH).
8. IF THIS PLAN IS TO REMAIN IN OPERATION DURING THE HOURS OF DARKNESS, INSTALL BARRICADE WARNING LIGHTS - HIGH INTENSITY ON ALL POST-MOUNTED DIAMOND SIGNS IN THE ADVANCE WARNING AREA.
9. A CHANGEABLE MESSAGE SIGN SHALL BE INSTALLED ONE HALF TO ONE MILE IN ADVANCE OF THE LANE CLOSURE TAPER.
10. SIGN (P) SHALL BE MOUNTED A MINIMUM OF 7 FEET FROM THE PAVEMENT SURFACE TO THE BOTTOM OF THE SIGN.

TABLE 1 - MINIMUM TAPER LENGTHS

POSTED SPEED LIMIT (MILES PER HOUR)	MINIMUM TAPER LENGTH FOR A SINGLE LANE CLOSURE
30 OR LESS	180' (55m)
35	250' (75m)
40	320' (100m)
45	540' (165m)
50	600' (180m)
55	660' (200m)
65	780' (240m)

METRIC CONVERSION CHART (1" = 25mm)

ENGLISH	METRIC	ENGLISH	METRIC	ENGLISH	METRIC
12"	300mm	42"	1050mm	72"	1800mm
18"	450mm	48"	1200mm	78"	1950mm
24"	600mm	54"	1350mm	84"	2100mm
30"	750mm	60"	1500mm	90"	2250mm
36"	900mm	66"	1650mm	96"	2400mm

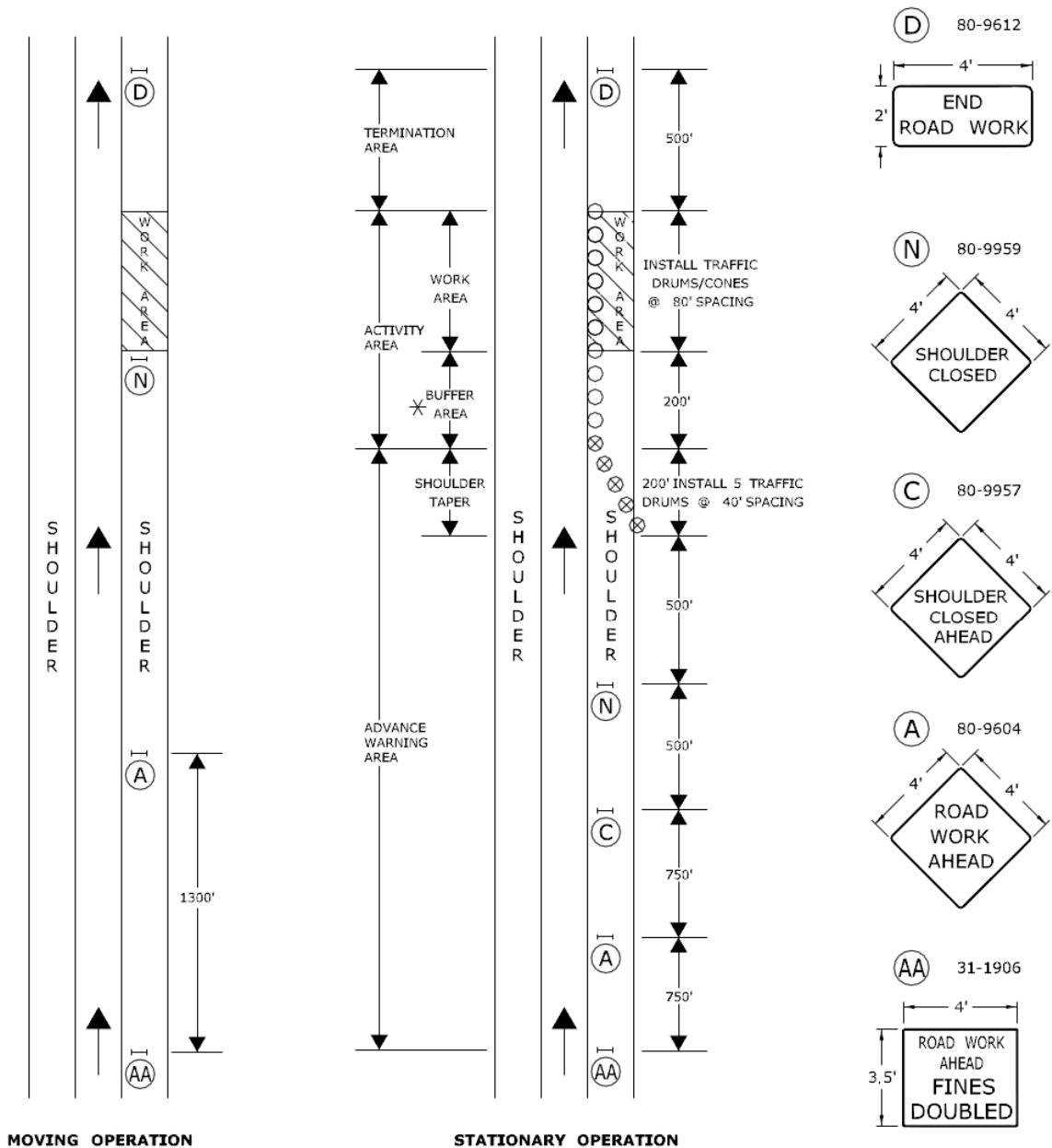


SCALE: NONE

CONSTRUCTION TRAFFIC CONTROL PLAN NOTES

WORK IN SHOULDER AREA - TURNING ROADWAYS / RAMPS

SIGN FACE
70 SQ. FT (MIN.)



- TRAFFIC CONE **OR** TRAFFIC DRUM
- ✱ OPTIONAL ⊗ TRAFFIC DRUM — PORTABLE SIGN SUPPORT
- ◀ HIGH MOUNTED INTERNALLY ILLUMINATED FLASHING ARROW



SCALE: NONE

CONSTRUCTION TRAFFIC CONTROL PLAN

PLAN 9

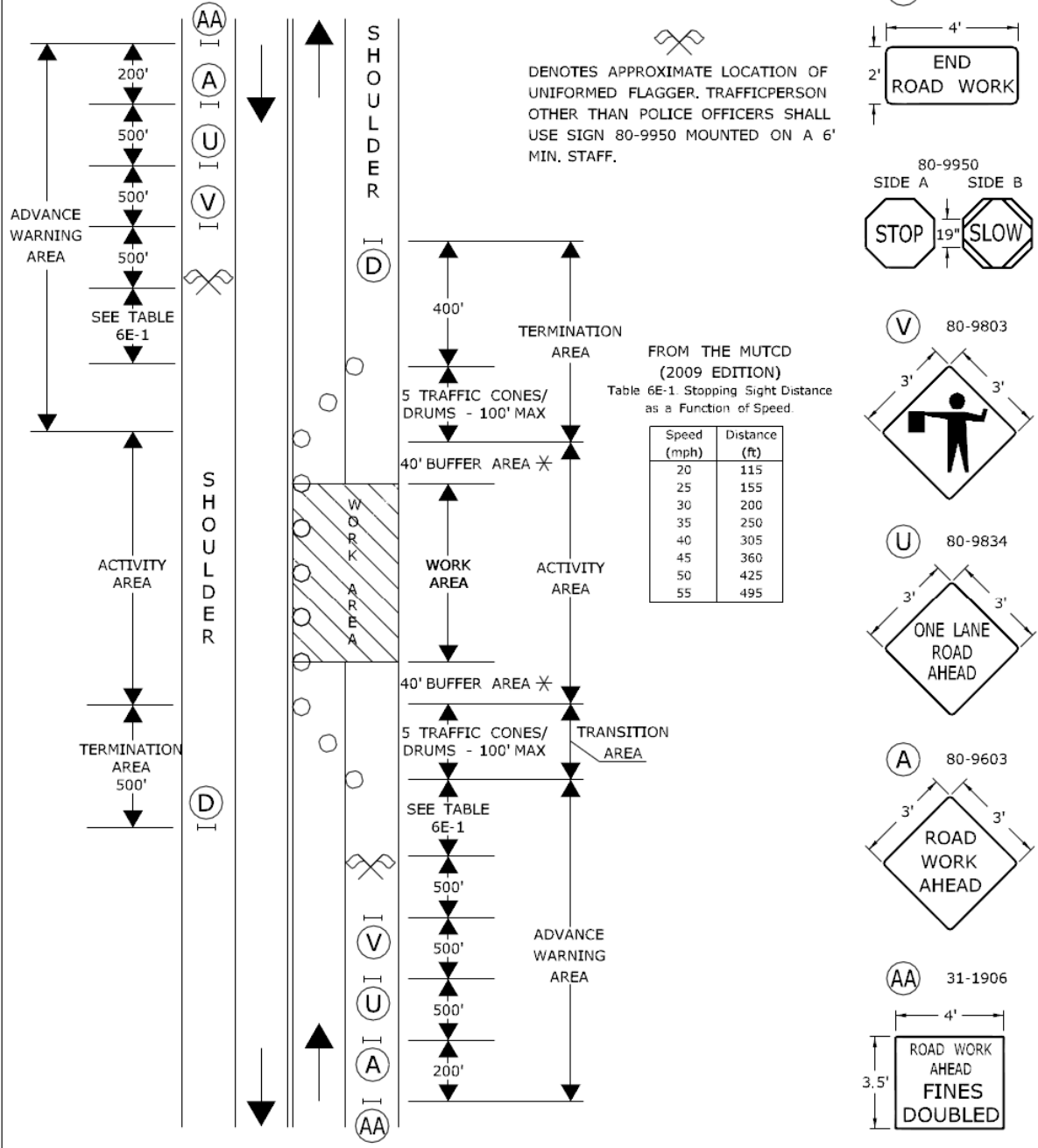
SEE NOTES 1, 2, 4, 8

CONNECTICUT DEPARTMENT OF TRANSPORTATION
BUREAU OF ENGINEERING & CONSTRUCTION

APPROVED *Charles S. Harlow*
Charles S. Harlow
2012.06.05 15:53:0400'
PRINCIPAL ENGINEER

WORK IN TRAVEL LANE AND SHOULDER TWO LANE HIGHWAY ALTERNATING ONE-WAY TRAFFIC OPERATIONS

SIGN FACE
108 SQ. FT (MIN.)



- TRAFFIC CONE OR TRAFFIC DRUM
- ✱ OPTIONAL ✕ TRAFFIC DRUM — PORTABLE SIGN SUPPORT
- ◀ HIGH MOUNTED INTERNALLY ILLUMINATED FLASHING ARROW



CONSTRUCTION TRAFFIC CONTROL PLAN
PLAN 13 - SHEET 1 OF 2
SEE NOTES 1, 2, 4, 6, 7, 8

CONNECTICUT DEPARTMENT OF TRANSPORTATION
BUREAU OF ENGINEERING & CONSTRUCTION

APPROVED *Charles S. Harlow* Charles S. Harlow
2012.06.05 15:55:23-04'00"
PRINCIPAL ENGINEER

WORK IN TRAVEL LANE AND SHOULDER TWO LANE HIGHWAY ALTERNATING ONE-WAY TRAFFIC OPERATIONS

SIGN FACE
108 SQ. FT (MIN.)

HAND SIGNAL METHODS TO BE USED BY UNIFORMED FLAGGERS

THE FOLLOWING METHODS FROM SECTION 6E.07, FLAGGER PROCEDURES, IN THE "MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES," SHALL BE USED BY UNIFORMED FLAGGERS WHEN DIRECTING TRAFFIC THROUGH A WORK AREA. THE STOP/SLOW SIGN PADDLE (SIGN NO. 80-9950) SHOWN ON THE TRAFFIC STANDARD SHEET TR-1220 01 ENTITLED, "SIGNS FOR CONSTRUCTION AND PERMIT OPERATIONS" SHALL BE USED.

A. TO STOP TRAFFIC

TO STOP ROAD USERS, THE FLAGGER SHALL FACE ROAD USERS AND AIM THE STOP PADDLE FACE TOWARD ROAD USERS IN A STATIONARY POSITION WITH THE ARM EXTENDED HORIZONTALLY AWAY FROM THE BODY. THE FREE ARM SHALL BE HELD WITH THE PALM OF THE HAND ABOVE SHOULDER LEVEL TOWARD APPROACHING TRAFFIC.



B. TO DIRECT TRAFFIC TO PROCEED

TO DIRECT STOPPED ROAD USERS TO PROCEED, THE FLAGGER SHALL FACE ROAD USERS WITH THE SLOW PADDLE FACE AIMED TOWARD ROAD USERS IN A STATIONARY POSITION WITH THE ARM EXTENDED HORIZONTALLY AWAY FROM THE BODY. THE FLAGGER SHALL MOTION WITH THE FREE HAND FOR ROAD USERS TO PROCEED.



C. TO ALERT OR SLOW TRAFFIC

TO ALERT OR SLOW TRAFFIC, THE FLAGGER SHALL FACE ROAD USERS WITH THE SLOW PADDLE FACE AIMED TOWARD ROAD USERS IN A STATIONARY POSITION WITH THE ARM EXTENDED HORIZONTALLY AWAY FROM THE BODY. TO FURTHER ALERT OR SLOW TRAFFIC, THE FLAGGER HOLDING THE SLOW PADDLE FACE TOWARD ROAD USERS MAY MOTION UP AND DOWN WITH THE FREE HAND, PALM DOWN.



- TRAFFIC CONE **OR** TRAFFIC DRUM
- * OPTIONAL ⊗ TRAFFIC DRUM — PORTABLE SIGN SUPPORT
- ◀ HIGH MOUNTED INTERNALLY ILLUMINATED FLASHING ARROW



SCALE: NONE

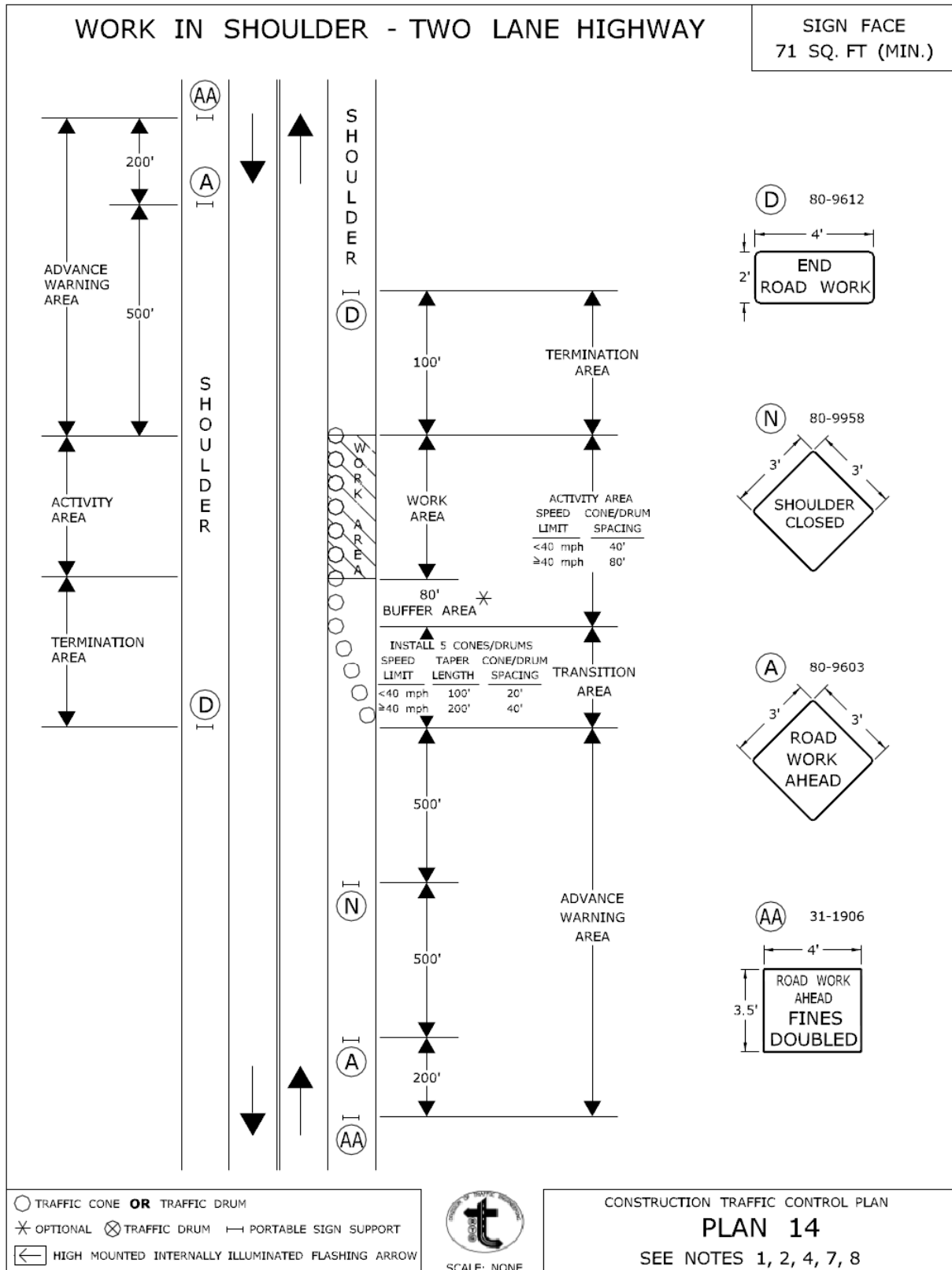
CONSTRUCTION TRAFFIC CONTROL PLAN
PLAN 13 - SHEET 2 OF 2
SEE NOTES 1, 2, 4, 6, 7, 8

CONNECTICUT DEPARTMENT OF TRANSPORTATION
BUREAU OF ENGINEERING & CONSTRUCTION

APPROVED

Charles S. Harlow
PRINCIPAL ENGINEER

Charles S. Harlow
2012.06.05 15:55:45-04'00"



- TRAFFIC CONE **OR** TRAFFIC DRUM
- ✱ OPTIONAL ⊗ TRAFFIC DRUM — PORTABLE SIGN SUPPORT
- ← HIGH MOUNTED INTERNALLY ILLUMINATED FLASHING ARROW



SCALE: NONE

CONSTRUCTION TRAFFIC CONTROL PLAN

PLAN 14

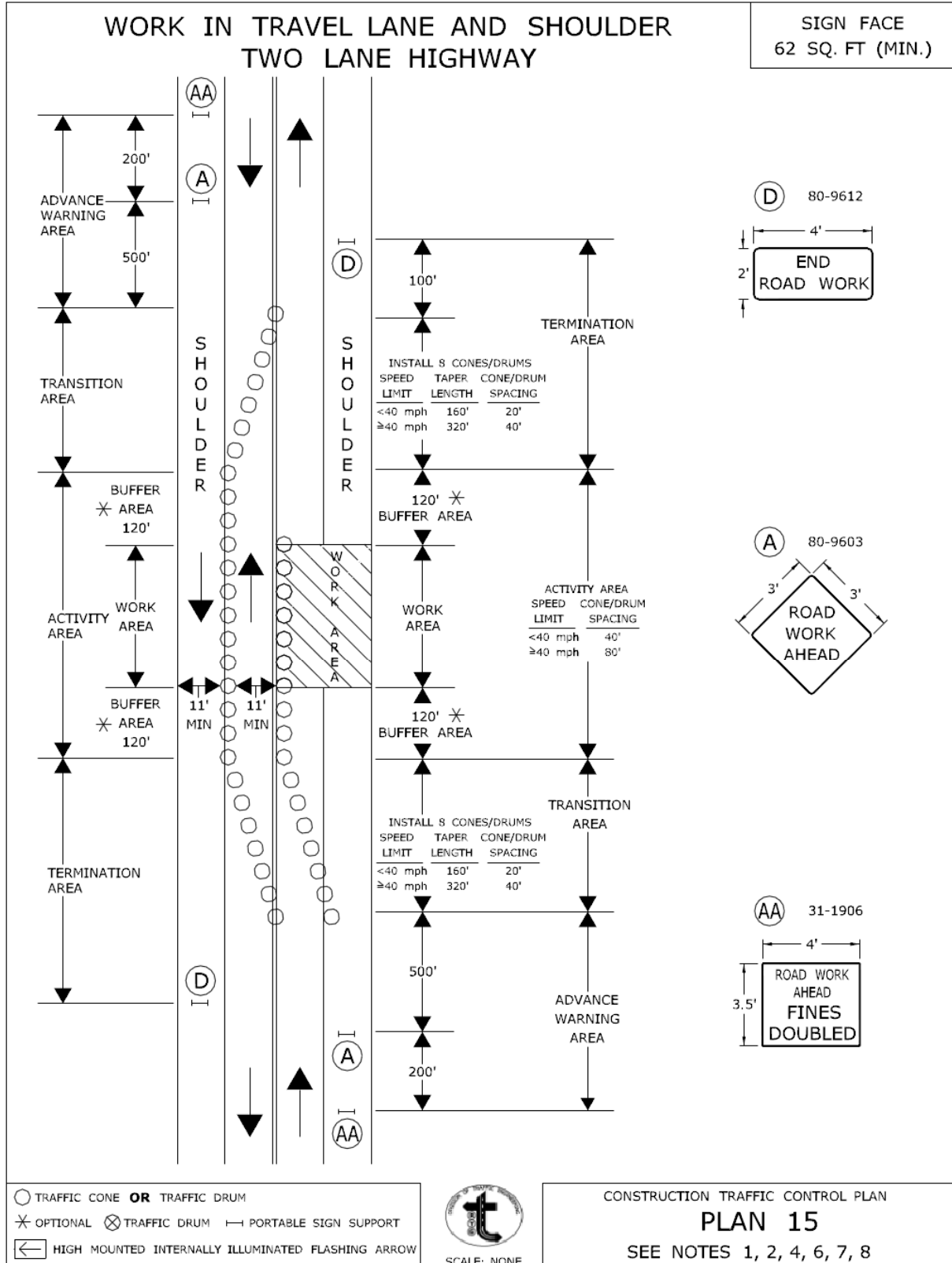
SEE NOTES 1, 2, 4, 7, 8

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APPROVED

Charles S. Harlow
PRINCIPAL ENGINEER

Charles S. Harlow
2012.06.05 15:56:09-04'00"



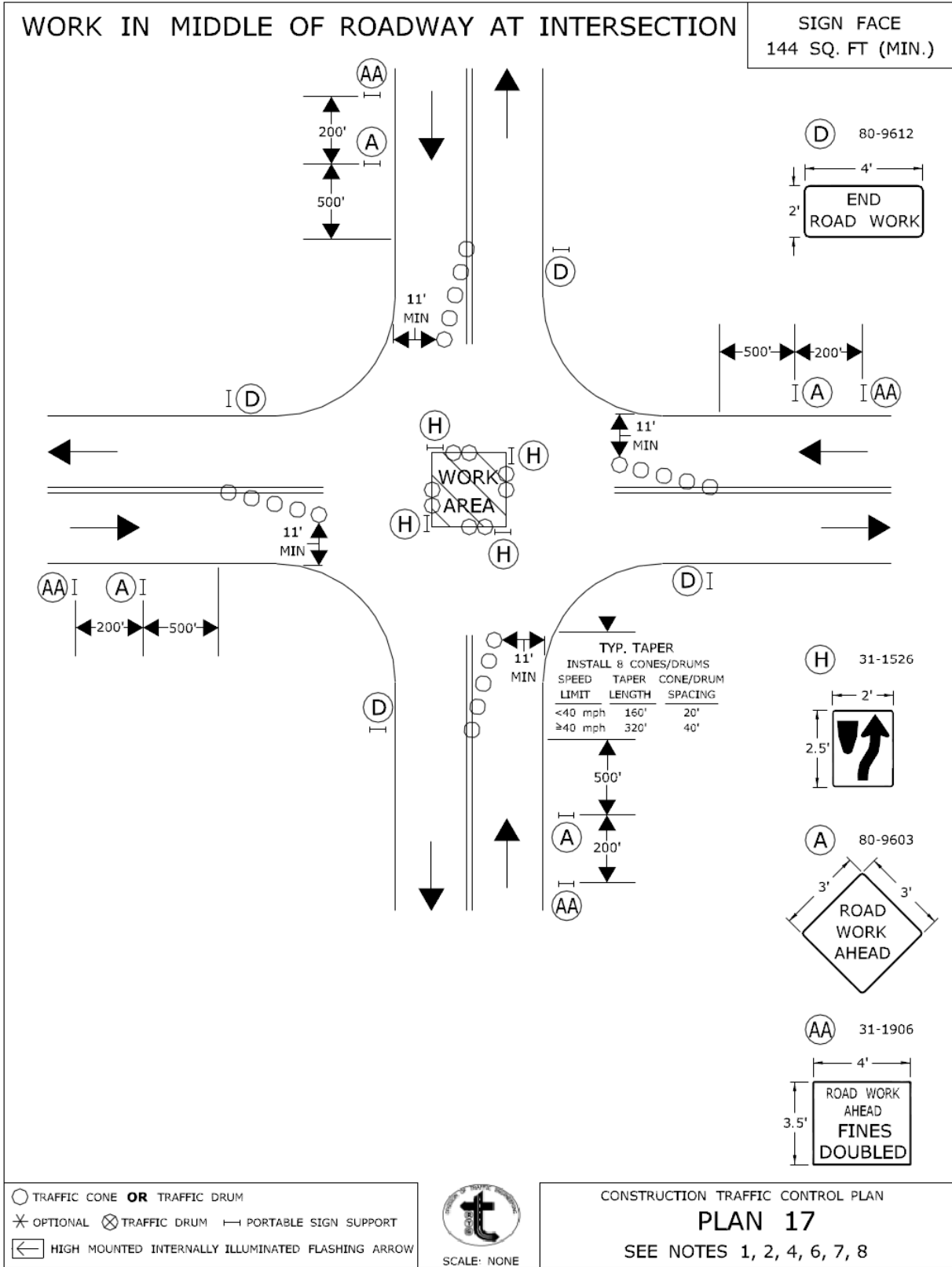
- TRAFFIC CONE **OR** TRAFFIC DRUM
- ✕ OPTIONAL ⊗ TRAFFIC DRUM — PORTABLE SIGN SUPPORT
- ◀ HIGH MOUNTED INTERNALLY ILLUMINATED FLASHING ARROW



CONSTRUCTION TRAFFIC CONTROL PLAN
PLAN 15
SEE NOTES 1, 2, 4, 6, 7, 8

CONNECTICUT DEPARTMENT OF TRANSPORTATION
BUREAU OF ENGINEERING & CONSTRUCTION

APPROVED *Charles S. Harlow* Charles S. Harlow
2012.06.05 15:56:29-04'00"
PRINCIPAL ENGINEER



CONNECTICUT DEPARTMENT OF TRANSPORTATION
 BUREAU OF ENGINEERING & CONSTRUCTION



SCALE: NONE

CONSTRUCTION TRAFFIC CONTROL PLAN
PLAN 17
 SEE NOTES 1, 2, 4, 6, 7, 8

APPROVED *Charles S. Harlow*
 PRINCIPAL ENGINEER
 Charles S. Harlow
 2012.08.05 15:57:16-04'00"

Article 9.71.05 – Basis of Payment is supplemented by the following:

All costs associated with the Maintenance and Protection of Traffic shall be paid for under the item Traffic Control.

SECTION 01550

SIGNAGE (TRAFFIC CONTROL)

PART 1 - GENERAL

1.1 WORK INCLUDED

This Section covers furnishing and installing traffic control signs and other devices.

1.2 SYSTEM DESCRIPTION

The Contractor shall furnish and install all construction signs deemed necessary by and in accordance with the latest edition of Part VI of the Manual on Uniform Traffic Control Devices(MUTCD) as published by the U.S. Department of Transportation.

1.3 TRAFFIC CONTROL PLAN

A traffic control plan shall be created by the Contractor and submitted to the Engineer for approval. All proposed roadway closures must be reviewed and approved by the City of New London Police Department.

PART 2 - PRODUCTS

2.1 TRAFFIC WARNING AND REGULATING DEVICES

Contractor shall provide warning signs, barricades and other devices in accordance with the specifications provided in the MUTCD. Size of signs, lettering, colors, method of support and other factors prescribed in the MUTCD shall be adhered to.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Contractor shall erect barricades, barrier fences, traffic signs, and other traffic control devices as required by the MUTCD, or as directed by the Engineer, to protect the work area from traffic, pedestrians, and animals.
- B. Contractor shall relocate barricades, signs and other devices as necessary as the work progresses.
- C. Unless extended protection is required for specific areas, when the work has been completed, all temporary warning and regulatory devices used by the Contractor shall be removed so that traffic can move unimpeded through the area.

END OF SECTION

SECTION 01562

DUST CONTROL

PART 1 – GENERAL

1.1 SUMMARY

This section of the specification covers the control of dust via calcium chloride or potable water, complete.

1.2 RELATED WORK

A. SECTION 01570, ENVIRONMENTAL PROTECTION

1.3 REFERENCES

A. The following standards form a part of this specification as referenced:

American Society for Testing and Materials (ASTM)

D98 Specification for Calcium Chloride

M144 Requirements for Calcium Chloride, Type I or Type II

1.4 SUBMITTALS: IN ACCORDANCE WITH REQUIREMENTS OF GENERAL SPECIFICATIONS, SUBMIT THE FOLLOWING:

A. The Contractor shall submit shop drawings for approval at least 30 days prior to the beginning of construction.

B. Submit Manufacturer's installation instructions and general recommendations.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Calcium chloride shall be kept in a dry enclosed space.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Calcium Chloride

1. Calcium chloride shall conform to the requirements of AASHTO-M 144, Type I or Type II and the specification for calcium chloride, ASTM D98. The calcium chloride shall be packaged in moisture proof bags or in airtight drums with the

manufacturer, name of product, net weight, and percentage of calcium chloride guaranteed by the manufacturer legibly marked on each container.

2. Calcium chloride failing to meet the requirements of the aforementioned specifications or that which has become caked or sticky in shipment, may be rejected by the Engineer.

PART 3 - EXECUTION

3.1 APPLICATION

- A. Calcium chloride or potable water shall be applied when ordered by the Engineer and only in areas which will not be adversely affected by the application. See Section 01570, ENVIRONMENTAL PROTECTION.
- B. Calcium chloride shall be uniformly applied at the rate of 1½ pounds per square yard or at any other rate as directed by the Engineer. Application shall be by means of a mechanical spreader, or other approved methods. The number and frequency of applications shall be determined by the Engineer.
- C. Potable water shall be applied at the rate necessary to sufficiently moisten the surface without creating standing water or muddy surfaces.

END OF SECTION

SECTION 01570

ENVIRONMENTAL PROTECTION

1. Description
2. Notification
3. Implementation
4. Area of Construction Activity
5. Protection of Water Resources
6. Protecting and Minimizing Exposed Areas
7. Location of Storage Areas
8. Protection of Landscape
9. Clearing and Grubbing
10. Discharge of Dewatering Operations
11. Dust Control
12. Separation and Replacement of Topsoil
13. Baled Hay or Straw
14. Silt Fence
15. Surface Restoration of Cross Country Areas

1. Description

- A. The work covered by this section of the specifications consists of furnishing all labor, materials, tools and equipment and performing all work required for the prevention of environmental pollution during and as a result of construction operations under this contract.
- B. The requirements set forth in this section of the specifications apply to cross-country areas, river and stream crossings, and construction in and adjacent to wetlands, unless otherwise specifically stated.

2. Notification

The Engineer will notify the Contractor in writing of any non-compliance with the foregoing provisions. The Contractor shall, after receipt of such notice, immediately take corrective action. Such notice, when delivered to the Contractor or his authorized representative at the site of the work, shall be deemed sufficient for the purpose. If the Contractor fails to act promptly, the Engineer may order stoppage of all or part of the work until satisfactory corrective action has been taken. No claim for an extension of time or for excess costs or damage incurred by the Contractor as a result of time lost due to any stop work orders shall be made unless it was later determined that the Contractor was in compliance.

3. Implementation

- A. Prior to commencement of work, the Contractor shall meet with representatives of the Engineer to develop mutual understandings relative to compliance of the environmental protection program.

- B. The Contractor shall submit for approval six sets of details and literature fully describing environmental protection methods to be employed in carrying out construction activities within 100 feet of wetlands or across areas designated as wetlands.

4. Area of Construction Activity

Insofar as possible, the Contractor shall confine his construction activities to those areas defined by the plans and specifications. All land resources within the project boundaries and outside the limits of permanent work performed under this contract shall be preserved in their present condition or be restored to a condition after completion of construction at least equal to that which existed prior to work under this contract.

5. Protection of Water Resources

- A. The Contractor shall not pollute streams, lakes or reservoirs with fuels, oils, bitumens, calcium chloride, acids or other harmful materials. It is the Contractor's responsibility to comply with all applicable Federal, State, County and Municipal laws regarding pollution of rivers and streams.
- B. Special measures should be taken to insure against spillage of any pollutants into public waters.

6. Protecting and Minimizing Exposed Areas

- A. The Contractor shall limit the area of land which is exposed and free from vegetation during construction. In areas where the period of exposure will be greater than two (2) months, temporary vegetation, mulching or other protective measures shall be provided as specified.
- B. The Contractor shall take account of the conditions of the soil where temporary cover crop will be used to insure that materials used for temporary vegetation are adaptive to the sediment control. Materials to be used for temporary vegetation shall be approved by the Engineer.

7. Location of Storage Areas

- A. The location of the Contractor's storage areas for equipment and/or materials shall be upon cleared portions of the job site or areas to be cleared as a part of this project, and shall require written approval of the Engineer. Plans showing storage facilities for equipment and materials shall be submitted for approval of the Engineer.
- B. No excavated materials or materials used in backfill operations shall be deposited within a minimum distance of one hundred (100) feet of any watercourse or any drainage facility.

Adequate measures for erosion and sediment control such as the placement of baled hay or straw around the downstream perimeter of stockpiles shall be employed to protect any downstream areas from siltation.

- C. There shall be no storage of equipment or materials in areas designated as wetlands or wetland buffer.
- D. The Engineer may designate a particular area or areas where the Contractor may store materials used in his operations.
- E. Storage areas in cross-country locations shall be restored to pre-construction conditions with the planting of native species of trees and shrubs.

8. Protection of Landscape

- A. The Contractor shall not deface, injure, or destroy trees or shrubs nor remove or cut them without written authority from the Owner. No ropes, cables, or guys shall be fastened to or attached to any existing nearby trees for anchorages unless specifically authorized by the Engineer. Excavating machinery and cranes shall be of suitable type and be operated with care to prevent injury to trees which are not to be removed, particularly overhanging branches and limbs. The Contractor shall, in any event, be responsible for any damage resulting from such use.
- B. Branches, limbs, and roots shall not be cut except by permission of the Engineer. All cutting shall be smoothly and neatly done without splitting or crushing. When there is unavoidable injury to branches, limbs and trunks of trees, the injured portions shall be neatly trimmed and covered with an application of grafting wax or tree healing paint as directed.
- C. Where, in the opinion of the Engineer, trees may possibly be defaced, bruised, injured, or otherwise damaged by the Contractor's equipment or by his blasting or other operations, the Engineer may direct the Contractor to adequately protect such trees by placing boards, planks, poles or fencing around them. Any trees or landscape feature scarred or damaged by the Contractor's equipment or operations shall be restored as nearly as possible to its original condition at the expense of the Contractor. The Engineer will decide what method of restoration shall be used, and whether damaged trees shall be treated and healed or removed and disposed of under the provisions of Section 02230, CLEARING AND GRUBBING.
- D. Cultivated hedges, shrubs, and plants which could be injured by the Contractor's operations shall be protected by suitable means or shall be dug up, balled and temporarily replanted and maintained. After construction operations have been substantially completed, they shall be replanted in their original positions and cared for until growth is re-established. If cultivated hedges, shrubs, and plants are injured to such a degree as to affect their growth or diminish their beauty or usefulness, they shall be replaced by items of a kind and quality at least equal to that existing at the start of the work.

9. Clearing and Grubbing

The Contractor shall clear and grub only on easements obtained by the Owner or the Owner's land and only the area required for construction operations, as approved by the Engineer.

10. Discharge of Dewatering Operations

- A. Any water that is pumped and discharged from the trench and/or excavation as part of the Contractor's water handling shall be filtered by an approved method prior to its discharge into a receiving water or drainage system.
- B. Under no circumstances shall the Contractor discharge water to the areas designated as wetlands. When constructing in a wetlands area, the Contractor shall discharge water from dewatering operations directly to the nearest drainage system, stream, or waterway after filtering by an approved method.
- C. The pumped water shall be filtered through baled hay, a vegetative filter strip or a vegetated channel to trap sediment occurring as a result of the construction operations. The vegetated channel shall be constructed such that the discharge flow rate shall not exceed a velocity of more than 1 foot per second. Accumulated sediment shall be cleared from the channel periodically.

11. Dust Control

- A. During the progress of the work, the Contractor shall conduct his operations and maintain the area of his activities, including sweeping and sprinkling of streets as necessary, to minimize creation and dispersion of dust. If the Engineer decides it is necessary to use calcium chloride for more effective dust control, the Contractor shall furnish and spread the material, as directed. Calcium chloride shall be as specified under Section 01562, DUST CONTROL.
- B. Calcium chloride shall not be used for dust control within a drainage basin or in the vicinity of any source of potable water.

12. Separation and Replacement of Topsoil

Topsoil shall be carefully removed from cross-country areas where excavations are to be made, and separately stored to be used again as directed. The topsoil shall be stored in an area acceptable to the Engineer and adequate measures shall be employed to prevent erosion of said material.

13. Baled Hay or Straw

To trap sediment and to prevent sediment from clogging drainage systems, baled hay or straw shall be used where shown on the drawings. Care shall be taken to keep the bales from breaking apart. The bales should be securely staked to prevent overturning, flotation, or displacement. All deposited sediment shall be removed periodically.

14. Silt Fence

- A. Where indicated on the drawings or where directed by the Engineer, the Contractor shall erect and maintain a temporary silt fence. In areas designated as wetlands, the Contractor shall line the limits of the construction easement with a silt fence. The silt fence shall be used specifically to contain sediment from runoff water and to minimize environmental damage caused by construction.
- B. The silt fence shall consist of a 3-foot wide continuous length sediment control fabric, stitched to a 22-foot wide, continuous length support netting, and stapled to preweathered oak posts installed as shown on the drawings. The oak posts shall be 1½ inches by 1½ inches (minimum dimension) by 48 inches and shall be tapered. The support netting shall be industrial strength polypropylene. The bottom edge of the sediment control fabric shall be buried as shown on the drawings. The sediment control fabric shall conform to the following properties:

<u>Property</u>	<u>Value</u>	<u>Test Method</u>
1. Grab Strength (lbs)	90	ASTM D-4632
2. Elongation (%)	10	ASTM D-4632
3. Puncture Strength (lbs)	50	ASTM D-4632
4. Burst Strength (psi)	200	ASTM D-3786
5. Trapezoid Tear (lbs)	50	ASTM D-4533
6. Equivalent Opening Size (U.S. Sieve)	No. 30	ASTM D-4571
7. Permeability (cm/sec)	0.003	ASTM D-4491
8. Water Flow Rate (gal/min/sf)	10	ASTM D-4491
9. UV Resistance (%)	70	ASTM D-4355

15. Surface Restoration of Cross Country Areas

Plantings detailed in Section 02920, LOAMING AND SEEDING, shall be conducted when construction of the pipeline has been completed within the areas designated. A one year guarantee of maintenance will be required on these plantings to ensure that they establish in the area.

END OF SECTION

SECTION 01740

SITE CLEANUP

1. Description

- A. The Contractor should be familiar with Section 01110 CONTROL OF WORK AND MATERIALS, Section 01140 SPECIAL PROVISIONS, and Section 01570 ENVIRONMENTAL PROTECTION as they pertain to this section.
- B. The Contractor must employ at all times during the progress of his work adequate cleanup measures and safety precautions to prevent injuries to persons or damage to property. The Contractor shall immediately, upon direction by the Engineer provide adequate material, equipment and labor to cleanup and make safe any and all areas deemed necessary, by the Engineer.

2. Daily Cleanup

- A. The Contractor shall clean up, at least daily, all refuse, rubbish, scrap and surplus material, debris and unneeded construction equipment resulting from the construction operations and sweep the area. The site of the work and the adjacent areas affected thereby shall at all times present a neat, orderly and workmanlike appearance.
- B. Upon written notification by the Engineer, the Contractor shall within 24 hours clean up those areas, which in the Engineer's opinion are in violation of this section and the above referenced sections of the specifications.
- C. If in the opinion of the Engineer, the referenced areas are not satisfactorily cleaned up, all other work on the project shall stop until the cleanup is satisfactory.

3. Material or Debris in Drainage Facilities

Where material or debris has washed or flowed into or has been placed in existing watercourses, ditches, gutters, drains, pipes, structures, such material or debris shall be entirely removed and satisfactorily disposed of during progress of the work, and the ditches, channels, drains, pipes, structures, and work shall, upon completion of the work, be left in a clean and neat condition.

4. Removal of Temporary Buildings, Structures, and Equipment

On or before completion of the work, the Contractor shall, unless otherwise specifically directed or permitted in writing, tear down and remove all temporary buildings and structures built by him; shall remove all temporary works, tools and machinery or other construction equipment furnished by him; shall remove all rubbish from any grounds which he has occupied; shall remove silt fences

and hay bales used for trapping sediment; and shall leave the roads and all parts of the property and adjacent property affected by his operations in a neat and satisfactory condition.

5. Restoration of Damaged Property

The Contractor shall restore or replace, when and as directed, any property damaged by his work, equipment or employees, to a condition at least equal to that existing immediately prior to the beginning of operations. To this end, the Contractor shall do as required all necessary highway or driveway, walk and landscaping work. Materials, equipment, and methods for such restoration shall be as approved by the Engineer.

6. Final Cleanup

Before acceptance by the Owner, the Contractor shall perform a final cleanup to bring the construction site to its original or specified condition. This cleanup shall include removing all trash and debris of the premises. Before acceptance, the condition of the site shall be approved by the Engineer.

END OF SECTION

SECTION 01781

PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 SUMMARY

This Section includes administrative and procedural requirements for Project Record Drawings.

1.2 SUBMITTALS

Record Drawings: Comply with the following:

- A. Number of Copies: Submit copies of Record Drawings as follows:
- B. Initial Submittal: Submit one (1) set of marked-up Record Prints. Engineer will initial and date each print and mark whether general scope of changes, additional information recorded, and quality of drafting are acceptable. Engineer will return prints for revisions, organizing into sets, printing, binding, and final submittal.
- C. Final Submittal: Submit two (2) sets of revised Record Prints.

PART 2 – PRODUCTS

2.1 RECORD DRAWINGS

- A. Record Prints: Maintain one set of blue- or black-line white prints of the Contract Drawings and Shop Drawings.
- B. Preparation: Mark Record Prints to show the actual installation. Require individual or entity who obtained record data, whether individual or entity is installer, subcontractor, or similar entity, to prepare the marked-up Record Prints.
 - 1. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
 - 2. Accurately record information in an understandable drawing technique.
 - 3. Record data as soon as possible after obtaining it. Record and check the markup before enclosing concealed installations.
- C. Content: Types of items requiring marking include, but are not limited to, the following:
 - 1. Dimensional ties from underground utilities to permanent objects found on the original drawings and in the field.

2. Locations and depths of underground utilities.
 3. Routing of piping and conduits.
 4. Changes made by Change Order or Construction Change Directive.
 5. Details not on the original Contract Drawings.
 6. Field records for variable and concealed conditions.
 7. Record information on the Work that is shown only schematically.
- D. Mark the Contract Drawings or Shop Drawings, whichever is most capable of showing actual physical conditions, completely and accurately. If Shop Drawings are marked, show cross-reference on the Contract Drawings.
- E. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at the same location.
- F. Mark important additional information that was either shown schematically or omitted from original Drawings.
- G. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.

PART 3 - EXECUTION

3.1 RECORDING AND MAINTENANCE

- A. Recording: Maintain one copy of each submittal during the construction period for Project Record Document purposes. Post changes and modifications to Project Record Documents as they occur; do not wait until the end of Project.
- B. Maintenance of Record Documents and Samples: Store Record Documents and Samples in the field office apart from the Contract Documents used for construction. Do not use Project Record Documents for construction purposes. Maintain Record Documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to Project Record Documents for Engineer's reference during normal working hours.

END OF SECTION

SECTION 02071

GEOTEXTILE FABRICS

PART 1 - GENERAL

1.1 WORK INCLUDED

This Section covers furnishing of all labor, materials, and equipment necessary to install specified geotextile fabrics in locations shown on the drawings and as directed by the Engineer.

1.2 RELATED WORK

A. SECTION 02300, EARTHWORK

B. SECTION 02371, RIPRAP

1.3 SUBMITTALS: IN ACCORDANCE WITH REQUIREMENTS OF GENERAL SPECIFICATIONS, SUBMIT THE FOLLOWING:

Shop drawings or working drawings and material specifications shall be submitted to the Engineer for review for each type of geotextile fabric furnished. General installation practices and installation schedule shall be included.

PART 2 - PRODUCTS

2.1 FILTER/DRAINAGE FABRIC

The filter/drainage fabric shall be composed of continuous-filament fibers bonded together to form a sheet. The fabric shall be an average of 20 mils thick and possess the characteristics of Mirafi 140N as manufactured by Mirafi Inc., Charlotte, N.C.; or approved equal.

PART 3 - EXECUTION

3.1 INSTALLATION

A. GENERAL

Installation of geotextile fabrics shall be strictly in accordance with manufacturer's instructions and specific layout plans and details reviewed by the Engineer.

B. FILTER/DRAINAGE FABRIC:

The filter/drainage fabric shall be installed in the final graded trench bottom prior to placement of the crushed stone bedding and at other locations shown on the drawings or

designated by the Engineer. The drainage fabric in place shall cover the entire trench bottom and trench sides as shown on the drawings. Each width of drainage fabric shall be overlapped in accordance with manufacturer's recommendations, but not less than 2 feet, to prevent intrusion of soil fines into the bedding.

3.2 FINAL INSPECTION AND ACCEPTANCE

- A. Any work found to be unsatisfactory shall be corrected at the Contractor's expense.
- B. The Engineer, at the Contractor's expense, reserves the right to have a manufacturer's representative inspect the installation process at any time during construction.

END OF SECTION

SECTION 02085

POLYVINYL CHLORIDE PIPE AND FITTINGS

PART 1 - GENERAL

1.1 WORK INCLUDED

This section covers the furnishing and installation of Polyvinyl Chloride (PVC) pipe and fittings, as indicated on the drawings and as specified herein.

1.2 RELATED WORK

- A. Section 02252, SUPPORT OF EXCAVATION
- B. Section 02300, EARTHWORK
- C. Section 02518, TRACER TAPE
- D. Section 02631, PRECAST MANHOLES

1.3 REFERENCES

The following standards form a part of these specifications as referenced:

American Society for Testing and Materials (ASTM)

ASTM D2321 Recommended Practice for Underground Installation of Flexible Thermoplastic Sewer Pipe

ASTM D3034 Specification for Type PSM Polyvinyl Chloride (PVC) Sewer Pipe and Fittings

ASTM D3212 Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals

ASTM F679 Specification for Polyvinyl Chloride (PVC) Large Diameter Plastic Gravity Sewer Pipe and Fittings (18" - 27")

1.4 SUBMITTALS: IN ACCORDANCE WITH REQUIREMENTS OF GENERAL SPECIFICATIONS, SUBMIT THE FOLLOWING:

Manufacturer's literature of the materials of this section shall be submitted to the Engineer for review.

PART 2 - PRODUCTS

2.1 MATERIALS

A. PVC Non-pressure Sewer Pipe

1. PVC non-pressure sewer pipe 4-inches through 15-inches diameter shall conform to ASTM D3034, 18-inches through 27-inches diameter to ASTM F679, all with SDR of 35 unless noted, and shall meet the specific requirements and exceptions to the aforementioned specifications which follow.
2. PVC non-pressure sewer pipe shall be furnished in standard lengths.
3. One pipe bell consisting of an integral wall section with a solid cross section rubber ring, factory assembled, shall be furnished with each standard, random and short length of pipe. Rubber rings shall be provided to the requirements of ASTM D3212.
4. The rubber ring shall be retained within the bell of the pipe by a precision formed groove or recess designed to resist fish-mouthing or creeping during assembly of joints.
5. Spigot pipe ends shall be supplied with bevels from the manufacturer to ensure proper insertion. Each spigot end shall have an "assembly stripe" imprinted thereon to which the bell end of the mated pipe will extend upon proper jointing of the two pipes.
6. PVC fittings shall be provided with bell and/or spigot configurations with rubber gasketed joints compatible with that of the pipe. Bend fittings with spigot ends shorter than the pipe recess bells will not be allowed. The shorter spigot end would not allow proper seating of the spigot in the mating bell and would permit undesired contact between the mating bell and the outside of the fitting bell.
7. All pipe delivered to the job site shall be accompanied by independent testing laboratory reports certifying that the pipe and fittings conform to the above-mentioned specifications. In addition, the pipe shall be subject to thorough inspection and tests, the right being reserved for the Engineer to apply such of the tests specified as he may from time to time deem necessary.
8. All cutting of pipe shall be done with a machine suitable for cutting PVC pipe. Cut ends shall be beveled when recommended by the pipe manufacturer.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Except as modified herein, installation of the PVC pipe shall be in accordance with ASTM D2321.
- B. Each pipe length shall be inspected before being laid to verify that it is not cracked. Pipe shall be laid to conform to the lines and grades indicated on the drawings or given by the

Engineer. Each pipe shall be so laid as to form a close joint with the next adjoining pipe and bring the inverts continuously to the required grade.

- C. The pipe shall be supported by compacted crushed stone. Crushed stone shall be as specified under Section 02300, EARTHWORK.
- D. All non-pressure pipe sections shall be installed by qualified individuals using a pipe laser. All pressure pipe shall be installed to the grades indicated on the plans at a constant pitch without bends at the joints.
- E. The pipe shall not be driven down to grade by striking it with a shovel handle, timber, rammer, or other unyielding object. When each pipe has been properly bedded, enough of the backfill material shall be placed and compacted between the pipe and the sides of the trench to hold the pipe in correct alignment.
- F. Before a joint is made, the pipe shall be checked to assure that a close joint with the next adjoining pipe has been maintained and that inverts are matched and conform to the required line and grade.
- G. For pipe placed on crushed stone, immediately after the joint is made, the jointing area shall be filled with suitable materials so placed and compacted that the ends of either pipe will not settle under backfill load.
- H. No pipe or fitting shall be permanently supported on saddles, blocking, or stones.
- I. Branches and fittings shall be laid by the Contractor as indicated on the drawings, and/or as directed by the Engineer. Open ends of pipe and branches shall be closed with PVC caps secured in place with premolded gasket joints or as directed by the Engineer.
- J. All pipe joints shall be made watertight. There shall be no visible leakage at the joints and there shall be no sand, silt, clay, or soil of any description entering the pipeline at the joints. Where there is evidence of water or soil entering the pipeline, connecting pipes, or structures, the defects shall be repaired to the satisfaction of the Engineer.
- K. The Contractor shall build a tight bulkhead in the pipeline where new work enters an existing sewer. This bulkhead shall remain in place until its removal is authorized by the Engineer.
- L. Care shall be taken to prevent earth, water, and other materials from entering the pipe, and when pipe laying operations are suspended, the Contractor shall maintain a suitable stopper in the end of the pipe and also at openings for manholes.

END OF SECTION

SECTION 02230

CLEARING AND GRUBBING

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. The Contractor shall do all required clearing and grubbing as indicated on the drawings or herein specified in the area required for construction operations on the Owner's land or in the Owner's permanent or temporary easements and shall remove all debris resulting there from.
- B. Unless otherwise noted, all areas to be cleared shall also be grubbed.
- C. The Contractor shall not clear and grub outside of the area required for construction operations.

1.2 RELATED WORK

Any trees and shrubs specifically designated by the Owner not to be cut, removed, destroyed, or trimmed shall be saved from harm and injury in accordance with Section 01570, ENVIRONMENTAL PROTECTION.

PART 2 - PRODUCTS: NOT APPLICABLE

PART 3 - EXECUTION

3.1 RIGHT TO WOOD AND LOGS

The Owner shall have the right to cut and remove logs and other wood of value in advance of the Contractor's operations. All remaining logs and other wood to be removed in the course of clearing shall become the property of the Contractor.

3.2 CLEARING

- A. Unless otherwise indicated, the Contractor shall cut or otherwise remove all trees, saplings, brush and vines, windfalls, logs and trees lying on the ground, dead trees and stubs more than 1-foot high above the ground surface (but not their stumps), trees which have been partially uprooted by natural or other causes (including their stumps), and other vegetable matter such as shags, sawdust, bark, refuse, and similar materials.
- B. Except where clearing is done by uprooting with machinery or where stumps are left longer to facilitate subsequent grubbing operations, trees, stumps, and stubs to be cleared shall be cut as close to the ground as practicable but not more than 6-inches above the ground

surface in the case of small trees, and 12-inches in the case of large trees. Saplings, brush and vines shall be cut close to the ground.

3.3 SELECTIVE TRIMMING

- A. The Contractor shall trim all branches that project into the work area to a height of 15-feet above the ground surface. Branches shall be removed using the “Three Cut” method detailed in the plans.

3.4 GRUBBING

- A. Unless otherwise indicated, the Contractor shall completely remove all stumps and roots to a depth of 18-inches, or if the Contractor elects to grind the stumps, they shall be ground to a minimum depth of 6-inches. Stump grinding shall only be done with the approval of the Engineer.
- B. Any depression remaining from the removal of a stump and not filled in by backfilling shall be filled with gravel borrow and/or loam, whichever is appropriate to the proposed ground surface.

3.5 DISPOSAL

All material collected in the course of the clearing and grubbing, which is not to remain, shall be disposed of in a satisfactory manner away from the site or as otherwise approved. Such disposal shall be carried on as promptly as possible and shall not be left until the final clean-up period.

END OF SECTION

SECTION 02240

DEWATERING

PART 1 – GENERAL

1.1 WORK INCLUDED

This section specifies designing, furnishing, installing, maintaining, operating and removing temporary dewatering systems as required to lower and control water levels and hydrostatic pressures during construction; disposing of pumped water; constructing, maintaining, observing and, except where indicated or required to remain in place, removing of equipment and instrumentation for control of the system.

1.2 RELATED WORK

- A. Section 01570, ENVIRONMENTAL PROTECTION
- B. Section 02252, SUPPORT OF EXCAVATION
- C. Section 02300, EARTHWORK

1.3 SYSTEM DESCRIPTION

- A. Dewatering includes lowering the water table and intercepting seepage which would otherwise emerge from the slopes or bottom of the excavation; increasing the stability of excavated slopes; preventing loss of material from beneath the slopes or bottom of the excavation; reducing lateral loads on sheeting and bracing; improving the excavation and hauling characteristics of sandy soil; preventing rupture or heaving of the bottom of any excavation; and disposing of pumped water.
- B. Normal dewatering is defined as using conventional pumps installed in open excavations, ditches, or sumps.

1.4 QUALITY ASSURANCE

- A. The Contractor is responsible for the adequacy of the dewatering systems.
- B. The dewatering systems shall be capable of effectively reducing the hydrostatic pressure and lowering the groundwater levels to a minimum of 2 feet below excavation bottom, unless otherwise directed by the Engineer, so that all excavation bottoms are firm and dry.
- C. The dewatering system shall be capable of maintaining a dry and stable subgrade until the structures, pipes and appurtenances to be built therein have been completed to the extent that they will not be floated or otherwise damaged.

- D. The dewatering system and excavation support (see Section 02252, SUPPORT OF EXCAVATION) shall be designed so that lowering of the groundwater level outside the excavation does not adversely affect adjacent structures, utilities or wells.

PART 2 – PRODUCTS: NOT APPLICABLE

PART 3 – EXECUTION

3.1 DEWATERING OPERATIONS

- A. All water pumped or drained from the work shall be disposed of in a manner which will not result in undue interference with other work or damage to adjacent properties, pavements and other surfaces, buildings, structures and utilities. Suitable temporary pipes, flumes or channels shall be provided for water that may flow along or across the site of the work. All disposal of pumped water shall conform to the provisions of section 01570 ENVIRONMENTAL PROTECTION.
- B. Dewatering facilities shall be located where they will not interfere with utilities and construction work to be done by others.
- C. Dewatering procedures or equipment which cause, or threaten to cause, damage to new or existing facilities shall be expeditiously modified or replaced so as to prevent further damage. The Contractor is responsible for determining the modifications or replacements to be made, which shall be at no additional expense to the Owner. The Contractor shall be responsible for repair of any damage caused by his operations, at no cost to the Owner.

END OF SECTION

SECTION 02252

SUPPORT OF EXCAVATION

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. This section of the specification covers wood sheeting and bracing for support of excavations. The requirements of this section shall also apply, as appropriate, to other methods of excavation support and underpinning which the Contractor elects to use to complete the work.
- B. The Contractor shall furnish and place timber sheeting of the kinds and dimensions required, complying with these specifications, where indicated on the drawings or ordered by the Engineer.

1.2 RELATED WORK

- A. Section 02240, DEWATERING.
- B. Section 02300, EARTHWORK.

1.3 QUALITY ASSURANCE

- A. This project is subject to the Safety and Health regulations of the U.S. Department of labor set forth in 29 CFR, Part 1926. Contractors shall be familiar with the requirements of these regulations.
- B. The excavation support system shall be of sufficient strength and be provided with adequate bracing to support all loads to which it will be subjected. The excavation support system shall be designed to prevent any movement of earth that would diminish the width of the excavation or damage or endanger adjacent structures.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Timber sheeting shall be sound spruce, pine, or hemlock, planed on one side and either tongue and grooved or splined. Timber sheeting shall not be less than nominal 2 inches thick.
- B. Timber and steel used for bracing shall be of such size and strength as required in the excavation support design. Timber or steel used for bracing shall be new or undamaged used material which does not contain splices, cutouts, patches, or other alterations which would impair its integrity or strength.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Work shall not be started until all materials and equipment necessary for their construction are either on the site of the work or satisfactorily available for immediate use as required.
- B. The sheeting shall be securely and satisfactorily braced to withstand all pressures to which it may be subjected and be sufficiently tight to minimize lowering of the groundwater level outside the excavation, as required in Section 02240, DEWATERTING.
- C. The sheeting shall be driven by approved means to the design elevation. No sheeting may be left so as to create a possible hazard to safety of the public or a hindrance to traffic of any kind.
- D. If boulders or very dense soils are encountered, making it impractical to drive a section to the desired depth, the section shall, as directed, be cut off.
- E. The sheeting shall be left in place where indicated on the drawings or ordered by the Engineer in writing. At all other locations, the sheeting may be left in place or salvaged at the option of the Contractor. Steel or wood sheeting permanently left in place shall be cut off at a depth of not less than two feet below finish grade unless otherwise directed.
- F. All cut-off will become the property of the Contractor and shall be removed by him from the site.
- G. Responsibility for the satisfactory construction and maintenance of the excavation support system, complete in place, shall rest with the Contractor. Any work done, including incidental construction, which is not acceptable for the intended purpose shall be either repaired or removed and reconstructed by the Contractor at his expense.
- H. The Contractor shall be solely responsible for repairing all damage associated with installation, performance, and removal of the excavation support system.

END OF SECTION

SECTION 02300

EARTHWORK

PART 1 – GENERAL

1.1 WORK INCLUDED

The Contractor shall make excavations of normal depth in earth for trenches and structures, shall backfill and compact such excavations to the extent necessary, shall furnish the necessary material and construct embankments and fills, and shall make miscellaneous earth excavations and do miscellaneous grading.

1.2 RELATED WORK

- A. Section 01570, ENVIRONMENTAL PROTECTION
- B. Section 02230, CLEARING AND GRUBBING
- C. Section 02240, DEWATERING
- D. Section 02252, SUPPORT OF EXCAVATION
- E. Section 02745, PAVING
- F. Section 02920, LOAMING AND SEEDING

1.3 REFERENCES

American Society for Testing and Materials (ASTM)

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|------|-------|------------------------------------------------------------------------------------------------------------------------------------------------|
| ASTM | C131 | Test Method for Resistance to Degradation of Small Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine. |
| ASTM | C136 | Method for Sieve Analysis of Fine and Coarse Aggregates. |
| ASTM | C330 | Specification for lightweight Aggregate for Structural Concrete. |
| ASTM | D1556 | Test Method for Density of Soil in Place by the Sand Cone Method. |
| ASTM | D1557 | Test Methods for Moisture-density Relations of Soils and Soil Aggregate Mixtures Using Ten-pound (10 lb.) Hammer and eighteen-inch (18") Drop. |
| ASTM | D2922 | Test Methods for Density of Soil and Soil-aggregate in Place by Nuclear Methods (Shallow Depth). |

State of Connecticut Department of Transportation (CTDOT)
Standard Specifications for Roads, Bridges and Incidental Construction, Form 817.

1.4 SUBMITTALS: IN ACCORDANCE WITH REQUIREMENTS OF GENERAL SPECIFICATIONS, SUBMIT THE FOLLOWING

Samples of all materials proposed for the project shall be submitted to the Engineer for review. Size of the samples shall be as approved by the Engineer.

1.5 PROTECTION OF EXISTING PROPERTY

- A. The work shall be executed in such manner as to prevent any damage to facilities at the site and adjacent property and existing improvements, such as but not limited to streets, curbs, paving, service utility lines, structures, monuments, bench marks, observation wells, and other public or private property. Protect existing improvements from damage caused by settlement, lateral movements, undermining, washout and other hazards created by earthwork operations.
- B. In case of any damage or injury caused in the performance of the work, the Contractor shall, at its own expense, make good such damage or injury to the satisfaction of, and without cost to, the Owner. Existing roads, sidewalks, and curbs damaged during the project work shall be repaired or replaced to at least the condition that existed at the start of operations. The Contractor shall replace, at his own cost, existing benchmarks, observation wells, monuments, and other reference points which are disturbed or destroyed.
- C. Buried drainage structures and pipes, observation wells and piezometers, including those which project less than eighteen inches (18") above grade, which are subject to damage from construction equipment shall be clearly marked to indicate the hazard. Markers shall indicate limits of danger areas, by means which will be clearly visible to operators of trucks and other construction equipment, and shall be maintained at all times until completion of project.

1.6 DRAINAGE

The Contractor shall provide, at its own expense, adequate drainage facilities to complete all work items in an acceptable manner. Drainage shall be done in a manner so that runoff will not adversely affect construction procedures nor cause excessive disturbance of underlying natural ground or abutting properties.

1.7 FROST PROTECTION AND SNOW REMOVAL

- A. The Contractor shall, at its own expense, keep earthwork operations clear and free of accumulations of snow as required to carry out the work.
- B. The Contractor shall protect the subgrade beneath new structures and pipes from frost penetration when freezing temperatures are expected.

PART 2 – PRODUCTS

2.1 MATERIAL

A. GRANULAR FILL

Granular fill shall consist of any or a mixture of the following:

1. BROKEN OR CRUSHED STONE

Broken or crushed stone shall consist of sound, tough, durable stone, reasonably free from soft, thin, elongated, laminated, friable, micaceous, or disintegrated pieces, mud, dirt or other deleterious material and shall be sized to meet the requirements of gradation “A” of Form 817.

2. BANK OR CRUSHED GRAVEL

Bank or crushed gravel shall consist of sound, tough, durable particles of crushed or uncrushed gravel, free from soft, thin, elongated or laminated pieces and vegetable or other deleterious substances. It shall meet Grading “A” and the requirements for plasticity and resistance to abrasion indicated in Article M.02.06.

3. RECLAIMED MISCELLANEOUS AGGREGATE

Reclaimed miscellaneous aggregate material shall consist of sound, tough, durable particles of crushed reclaimed waste. It shall be free of soft disintegrated pieces, mud, dirt, glass or other injurious materials and contain no more than 15% by weight of bituminous concrete. It shall meet Grading “A” and the requirements for plasticity and resistance to abrasion indicated in Article M.02.06.

B. SUBBASE

Subbase shall consist of bank or crushed gravel, crusher run stone or reclaimed miscellaneous aggregate.

C. PROCESSED AGGREGATE BASE

Coarse and fine aggregates shall be combined by approved methods so that the resulting materials shall conform to the following gradation requirements:

<u>Square Mesh Sieves</u>	<u>Percent Passing by Weight</u>
Pass 2 ¼”	100
Pass 2”	95-100
Pass ¾”	50-75
Pass ¼”	25-45
Pass #40	5-20
Pass #100	2-12

Coarse and fine aggregates shall meet the requirements of Article 3.04 and M.05.01.

D. CRUSHER RUN STONE

Crusher run stone shall consist of sound tough durable broken stone. It shall be reasonably free from soft, thin, elongated laminated, friable, micaceous, or disintegrated pieces, dirt, mud or other deleterious material. It shall meet Grading "A" and the requirements for plasticity and resistance to abrasion indicated in Article M.02.06.

E. GRANULAR BASE AND SURFACES

Granular base and surface materials shall conform to the requirements as outlined in Article M.02.03 for Granular Base, Rolled Bank Gravel Surface and Traffic Bound Gravel Surface.

F. PERVIOUS STRUCTURE BACKFILL

Pervious structure backfill shall consist of broken or crushed stone, bank or crushed gravel or reclaimed miscellaneous aggregate. It shall meet Grading "B" and the requirements for plasticity and resistance to abrasion indicated in Article M.02.06.

G. FREE DRAINING MATERIAL

Free draining material shall consist of sand, gravel, rock fragments, quarry run stone, or reclaimed miscellaneous aggregate. This material shall not have more than 70% by weight passing the #40 mesh sieve and not more than 10% by weight passing the #200 mesh sieve.

H. SAND

Sand shall consist of clean, inert, hard, durable grains of quartz or other hard, durable rock, free from loam or clay, surface coatings and deleterious materials. The allowable amount of material passing a No. 200 sieve as determined by ASSHTO-T11 shall not exceed 10% by weight. The maximum particle size for sand shall be 3/8 inch.

PART 3 – EXECUTION

3.1 DISTURBANCE OF EXCAVATED AND FILLED AREAS DURING CONSTRUCTION

- A. Contractor shall take the necessary steps to avoid disturbance of subgrade during excavation and filling operations, including restricting the use of certain types of

construction equipment and their movement over sensitive or unstable materials, dewatering and other acceptable control measures.

- B. All excavated or filled areas disturbed during construction, all loose or saturated soil, and other areas that will not meet compaction requirements as specified herein shall be removed and replaced with a minimum 12-inch layer of compacted crushed stone wrapped all around in non-woven filter fabric. Costs of removal and replacement shall be borne by the Contractor.
- C. The Contractor shall place a minimum of 12-inch layer of special bedding materials or crushed stone wrapped in filter fabric over the natural underlying soil to stabilize areas which may become disturbed as a result of rain, surface water runoff or groundwater seepage pressures, all at no additional cost to the Owner. The Contractor also has the option of drying materials in-place and compacting to specified densities.

3.2 EXCAVATION

A. GENERAL

1. The Contractor shall perform all work of any nature and description required to accomplish the work as shown on the Drawings and as specified.
2. Excavations, unless otherwise required by the engineer, shall be carried only to the depths and limits shown on the Drawings. If unauthorized excavation is carried out below required subgrade and/or beyond minimum lateral limits shown on Drawings, it shall be backfilled with gravel borrow and compacted at the Contractor's expense as specified below, except as otherwise indicated. Excavations shall be kept in dry and good condition at all times, and all voids shall be filled to the satisfaction of the Engineer.
3. In all excavation areas, the Contractor shall strip the surficial topsoil layer and underlying subsoil layer separate from underlying soils. In paved areas, the Contractor shall first cut pavement as specified in paragraph 3.2 B.1 of this specification, strip pavement and pavement subbase separately from underlying soils. All excavated materials shall be stockpiled separately from each other within the limits of work.
4. The Contractor shall follow a construction procedure, which permits visual identification of stable natural ground. Where groundwater is encountered, the size of the open excavation shall be limited to that which can be handled by the Contractor's chosen method of dewatering and which will allow visual observation of the bottom and backfill in the dry.
5. The Contractor shall excavate unsuitable materials to stable natural ground where encountered at proposed excavation subgrade, as directed by the Engineer. Unsuitable material includes topsoil, loam, peat, other organic materials, snow, ice, and trash. Unless specified elsewhere or

otherwise directed by the Engineer, areas where unsuitable materials have been excavated to stable ground shall be backfilled with compacted special bedding materials or crushed stone wrapped all around in non-woven filter fabric.

B. TRENCHES

1. Prior to excavation, trenches in pavement shall have the traveled way surface cut in a straight line by a concrete saw or equivalent method, to the full depth of pavement. Excavation shall only be between these cuts. Excavation support shall be provided as required to avoid undermining of pavement. Cutting operations shall not be done by ripping equipment.
2. The Contractor shall satisfy all dewatering requirements specified in Section 02240 DEWATERING, before performing trench excavations.
3. Trenches shall be excavated to such depths as will permit the pipe to be laid at the elevations, slopes and depths of cover indicated on the Drawings. Trench widths shall be as shown on the Drawings or as specified.
4. Where pipe is to be laid in bedding material, the trench may be excavated by machinery to, or just below the designated subgrade provided that the material remaining in the bottom of the trench is not disturbed.
5. If pipe is to be laid in embankments or other recently filled areas, the fill material shall first be placed to a height of at least 12-inches above the top of the pipe before excavation.
6. Pipe trenches shall be made as narrow as practicable and shall not be widened by scraping or loosening materials from the sides. Every effort shall be made to keep the sides of the trenches firm and undisturbed until backfilling has been completed.
7. If, in the opinion of the Engineer, the subgrade, during trench excavation, has been disturbed as a result of rain, surface water runoff or groundwater seepage pressures, the Contractor shall remove such disturbed subgrade to a minimum of 12 inches and replace with crushed stone wrapped in filter fabric. Cost of removal and replacement shall be borne by the Contractor.

C. EXCAVATION NEAR EXISTING STRUCTURES

1. Attention is directed to the fact that there are pipes, manholes, drains, and other utilities in certain locations. An attempt has been made to locate all utilities on the drawings, but the completeness or accuracy of the given information is not guaranteed.
2. As the excavation approaches pipes, conduits, or other underground structures, digging by machinery shall be discontinued and excavation shall be done by means of hand tools, as required. Such manual

excavation, when incidental to normal excavation, shall be included in the work to be done under items involving normal excavation.

3. Where determination of the exact location of a pipe or other underground structure is necessary for properly performing the work, the Contractor shall excavate test pits to determine the locations.

3.3 BACKFILL PLACEMENT AND COMPACTION

A. GENERAL

1. Prior to backfilling, the Contractor shall compact the exposed natural subgrade to the densities as specified herein.
2. After approval of a subgrade by the Engineer, the Contractor shall backfill areas to required contours and elevations with specified materials.
3. The Contractor shall place and compact materials to the specified density in continuous horizontal layers. The degree of compaction shall be based on maximum dry density as determined by ASTM Test D1557, Method C. The minimum degree of compaction for fill placed shall be as follows:

<u>Location</u>	<u>Percent Maximum Density</u>
Below pipe centerline	95
Above pipe centerline	92
Below pavement (upper 3 ft.)	95
Embankments	95
Below pipe in embankments	95
Adjacent to structures	92
Below structures	95

4. The Engineer reserves the right to test backfill for conformance to the specifications and Contractor shall assist as required to obtain the information. Compaction testing will be performed by the Engineer or by an inspection laboratory designated by the Engineer, engaged and paid for by the Owner. If test results indicate work does not conform to specification requirements, the Contractor shall remove or correct the defective Work by recompacting where appropriate or replacing as necessary and approved by the Engineer, to bring the work into compliance, at no additional cost to the Owner. All backfilled materials under structures and buildings shall be field tested for compliance with the requirements of this specification.
5. Where horizontal layers meet a rising slope, the Contractor shall key each layer by benching into the slope.

6. If the material removed from the excavation is suitable for backfill with the exception that it contains stones larger than permitted, the Contractor has the option to remove the oversized stones and use the material for backfill or to provide replacement backfill at no additional cost to the Owner.
7. The Contractor shall remove loam and topsoil, loose vegetation, stumps, large roots, etc., from areas upon which embankments will be built or areas where material will be placed for grading. The subgrade shall be shaped as indicated on the Drawings and shall be prepared by forking, furrowing, or plowing so that the first layer of the fill material placed on the subgrade will be well bonded to the subgrade.

B. TRENCHES

1. Bedding as detailed and specified shall be furnished and installed beneath the pipeline prior to placement of the pipeline. A minimum bedding thickness shall be maintained between the pipe and undisturbed material, as shown on the Drawings.
2. As soon as practicable after pipes have been laid, backfilling shall be started.
3. Unless otherwise indicated on the Drawings, crushed stone or sand shall be placed by hand shovel in 6-inch thick lifts up to a minimum level of 12-inches above the top of pipe. This area of backfill is considered the zone around the pipe and shall be thoroughly compacted before the remainder of the trench is backfilled. Compaction of each lift in the zone around the pipe shall be done by use of power-driven tampers weighing at least 20 pounds or by vibratory compactors. Care shall be taken that material close to the bank, as well as in all other portions of the trench, is thoroughly compacted to densities required.
4. Free draining material shall be placed from the top of the select backfill to the specified material at grade (loam, pavement subbase, etc.). Fill compaction shall meet the density requirements of this specification.
5. Water Jetting:
 - a. Water jetting may be used when the backfill material contains less than 10 percent passing the number 200 sieve, but shall be used only if approved by the Engineer.
 - b. Compaction of backfill placed by water jetting shall conform to the requirements of this specification.
6. If the materials above the trench bottom are unsuitable for backfill, the Contractor shall furnish and place backfill materials meeting the requirements for trench backfill, as shown on the drawings or specified herein.

7. Should the Engineer order crushed stone for utility supports or for other purposes, the Contractor shall furnish and install the crushed stone as directed.
8. In shoulders of streets and road, the top 12-inch layer of trench backfill shall consist of processed gravel for sub-base, satisfying the requirements listed in CTDOT Form 817 granular base M.02.03.

C. BACKFILLING UNDER BUILDINGS AND FOUNDATIONS

Material to be used as structural fill under structures shall be Pervious Structure Backfill or Granular Fill, as shown on the Drawings or as directed by the Engineer. Where granular fill is required to support proposed footings, walls, slabs, and other structures, the material shall be placed in a manner accepted by the Engineer. Compaction of each lift shall meet the density requirements of this specification.

D. BACKFILLING ADJACENT TO STRUCTURES

1. The Contractor shall not place backfill against or on structures until they have attained sufficient strength to support the loads to which they will be subjected. Excavated material approved by the Engineer may be used in backfilling around structures. Backfill material shall be thoroughly compacted to meet the requirements of this specification.
2. Contractor shall use extra care when compacting adjacent to pipes and drainage structures. Backfill and compaction shall proceed along sides of drainage structures so that the difference in top of fill level on any side of the structure shall not exceed two feet (2') at any stage of construction.
3. Where backfill is to be placed on only one side of a structural wall, only hand-operated roller or plate compactors shall be used within a lateral distance of five feet (5') of the wall for walls less than fifteen feet (15') high and within ten feet (10') of the wall for walls more than fifteen feet (15') high.

3.4 DISPOSAL OF SURPLUS MATERIALS

- A. No excavated material shall be removed from the site of the work or disposed of by the Contractor unless approved by the Engineer.
- B. Surplus excavated materials, which are acceptable to the Engineer, shall be used to backfill or to replace other materials unacceptable for use as backfill. Upon written approval of the Engineer, surplus excavated materials shall be neatly deposited and graded so as to make or widen fills, flatten side slopes, or fill depressions; or shall be neatly deposited for other purposes as indicated by the Owner, within its jurisdictional limits; all at no additional cost to the Owner.
- C. Surplus excavated material not needed as specified above shall be hauled away and disposed of by the Contractor at no additional cost to the Owner, at

appropriate locations, and in accordance with arrangements made by him. Disposal of all rubble shall be in accordance with all applicable local, state and federal regulations.

END OF SECTION

SECTION 02324

ROCK EXCAVATION AND DISPOSAL

PART 1 – GENERAL

1.1 WORK INCLUDED

The Contractor shall excavate rock, if encountered to the lines and grades indicated on the drawings or as directed, shall dispose of the excavated material, and shall furnish the required material as specified in Section 02300 EARTHWORK for backfill in place of the excavated rock.

1.2 RELATED WORK

- A. Section 02252, SUPPORT OF EXCAVATION
- B. Section 02300, EARTHWORK
- C. Section 03302, FIELD CONCRETE

1.3 DEFINITIONS

- A. The word “rock,” wherever used as the name of the excavated material or material to be excavated, shall mean only boulders and pieces of concrete or masonry exceeding one (1) cubic yard in volume, or solid ledge rock which, in the opinion of the Engineer, requires for its removal, drilling and blasting, wedging, sledging, barring, or breaking up with a power-operated tool. No soft or disintegrated rock which can be removed by normal earth excavation methods, no loose, shaken, or previously blasted rock or broken stone in rock fillings or elsewhere, and no rock exterior to the maximum limits of measurement allowed, which may fall into the excavation, will be measured or allowed as “rock.”
- B. The word “earth,” wherever used as the name of an excavated material, or material to be excavated shall mean all kinds of material other than rock as above defined.

1.4 QUALITY ASSURANCE

- A. The Contractor shall conform to all municipal ordinances and state and federal laws relating to the transportation, storage, handling, and use of explosives. In the event that any of the above mentioned laws, ordinances, or regulations require a licensed blaster to perform or supervise the work of blasting, said licensed blaster shall, at all times, have his license on the work site and shall permit examination thereof by the Engineer or other officials having jurisdiction.
- B. The Contractor shall procure all permits required for blasting.

1.5 SUBMITTALS

- A. At least two weeks before beginning blasting operations, the Contractor shall submit to the Engineer for record the following data:
 - 1. Name of Contractor or Subcontractor responsible for blasting and monitoring operations and license number.
 - 2. Name, affiliation, and license number of the person or persons who will be directly responsible for designing each blast, supervising the loading of the shot, and firing it.
- B. Copies of all permits required for blasting.
- C. Results of pre-blast survey.
- D. When blasting is in progress, daily reports on blasting operations and blast monitoring results.

1.6 DELIVERY/STORAGE AND HANDLING

Delivery, storage and handling of explosives shall conform to all federal, state and local regulations and permits.

PART 2 – PRODUCTS – NOT APPLICABLE

PART 3 – EXECUTION

3.1 PREPARATION/PRE-BLAST SURVEY

If required, the pre-blast survey shall be conducted in accordance with state regulations and/or local permit requirements.

3.2 EXCAVATION

- A. The Contractor shall excavate rock to the lines and grades indicated on the drawings or as directed by the Engineer. The excavated rock shall be removed and disposed of by the Contractor as specified for surplus excavated materials under Section 02300, EARTHWORK.
- B. Work damaged by blasting shall be repaired or replaced at the Contractor's expense.
- C. If rock is excavated beyond the limits of payment indicated on the drawings, specified, or authorized in writing by the Engineer, the excess excavation, whether resulting from overbreakage or other causes, shall be backfilled, by and at the expense of the Contractor, as specified below:

1. In pipe trenches, excess excavation shall be filled with the required material and compacted in the same manner as specified for the material in the zone around the pipe under Section 02300 EARTHWORK.
 2. In excavations for structures, excess excavation in the rock beneath foundations shall be filled with concrete which shall have a minimum 28-day compressive strength of 3000psi. Other excess excavation shall be filled with Granular Fill compacted to a minimum of 92 percent density (ASTM D1557 Method C) as specified under Section 02300, EARTHWORK.
 3. If the rock below normal depth is shattered due to drilling or blasting operations of the Contractor, and the Engineer considers such shattered rock to be unfit for foundations, the shattered rock shall be removed and the excavation shall be backfilled with concrete as required, except that in pipe trenches crushed stone may be used for backfill, if approved. All such removal and backfilling shall be done by and at the expense of the Contractor.
- D. When directed by the Engineer, the Contractor shall remove all dirt and loose rock from designated areas and shall clean the surface of the rock thoroughly to determine whether seams or other defects exist.
- E. When concrete is to be placed on rock, the rock shall be free of all vegetation, dirt, sand, clay, boulders, scale, excessively cracked rock, loose fragments, water, ice, snow, and other objectionable substances.

3.3 VIBRATION AND AIR BLAST MONITORING

- A. The Contractor shall measure air blast and vibration levels of blasting operations to assure compliance with all applicable regulations and local permits.
- B. Records of each day's air blast and vibration measurements shall be submitted to the Engineer in writing no later than the start of the next day's work. Records shall include, as a minimum:
- Identification of instrument
 - Name of observer
 - Name of interpreter
 - Distance and direction of recording station for the area of detonation
 - Date and exact time of reading
 - Type of ground at recording station
 - Peak particle velocity for all components as well as resultant for all frequencies of vibrations

- Duration of motion with a velocity in excess of one thousandth of an inch per second
- A copy of the photographic record of seismograph readings
- Peak air blast level.

3.4 BLASTING RECORDS

The Contractor shall prepare and submit to the Engineer daily blast reports, including logs of each blast. Reports shall be submitted to the Engineer no later than the start of the next day's work. However, during each day of blasting, the Contractor shall review and shall provide access for the Engineer to review the data from that day's blasting. Reports after each blast shall include at least the following information for each blast:

- Date, time, and location of blast
- Permit number and expiration date
- Amount and type of explosives used by weight and number of cartridges
- Total number of delays used and number of holes used for each delay
- On a diagram of the blast pattern, indicate total number and depth of holes, maximum charge per delay, maximum charge per hole, and corresponding delay number
- An evaluation of the blast indicating areas of significant overbreak, unusual results, and any recommended adjustments for the next blast.

3.5 POST BLASTING INSPECTIONS:

The Contractor shall examine any properties, structures, and conditions where complaints of damage have been received or damage claims have been filed. Advance notice shall be given to all interested parties so that the parties may be present during the final examination. Records of the final examination shall be signed and distributed to the owner of the property, the head of the local fire department, and the Engineer.

END OF SECTION

SECTION 02518

TRACER TAPE

PART 1 - GENERAL

1.1 WORK INCLUDED

This section covers the furnishing, handling and installation of tracer tape, as called for on the drawings.

1.2 SUBMITTALS: IN ACCORDANCE WITH REQUIREMENTS OF GENERAL SPECIFICATIONS, SUBMIT THE FOLLOWING:

- A. Six sets of manufacturer's literature on the materials, colors and printing specified herein, shall be submitted to the Engineer for review.
- B. Tape samples shall also be submitted to the Engineer for review.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

Tracer tape shall be by Lineguard, Inc., Wheaton, IL; Empire Level, Waukesha, WI; Pro-Line Safety Products Co., W. Chicago, IL; or approved equal.

2.2 TRACER TAPE

- A. Tracer tape shall be at least 3-inches wide.
- B. Tracer tape for non-ferrous pipe or conduit shall be constructed of a metallic core bonded to plastic layers. The metallic tracer tape shall be a minimum 5-mil thick and must be locatable at a depth of 18 inches with ordinary pipe locaters.
- C. Tracer tape for ferrous pipe or conduit shall consist of multiple bonded plastic layers. The non-metallic tracer tape shall elongate at least 500% before breaking.
- D. The tape shall bear the appropriate wording such as: "BURIED DRAIN LINE BELOW", or approved equal, continuously repeated every 30 inches to identify the pipe.
- E. Tape colors shall be as follows, as recommended by the American Public Works Association (APWA):

Electric	Red
Gas & Oil	Yellow
Communication	Orange
Water	Blue

Sewer & Drain
Chemical

Green
Red (not APWA)

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Tracer tape shall be installed directly above the pipe or conduit it is to identify, approximately 12 inches below the proposed ground surface.
- B. The Contractor shall follow the manufacturer's recommendations for installation of the tape, as approved by the Engineer.

END OF SECTION

SECTION 02624

HIGH DENSITY POLYETHYLENE PIPE

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. This Section covers furnishing, handling, laying, joining and installation of corrugated high density polyethylene pipe (HDPE) drainage piping, fittings and appurtenances.
- B. The Contractor shall furnish and install the pipeline and appurtenant work as indicated on the Contract Drawings and as specified herein, or as required to produce a complete, proper, and functional installation in accordance with the intent of these Contract Documents.

1.2 RELATED WORK

- A. Section 02071, GEOTEXTILE FABRICS
- B. Section 02300, EARTHWORK
- C. Section 02518, TRACER TAPE

1.3 QUALITY ASSURANCE

- A. All pipe and fittings shall be inspected and tested at the factory as required by the standard specifications to which the material is manufactured. The Contractor shall furnish in duplicate to the Engineer sworn certificates providing evidence of such tests.
- B. The Owner reserves the right to have any or all pipe, fittings, and special castings inspected and/or tested by an independent service at either the manufacturer's plant or elsewhere. Such inspection and/or tests shall be at the Owner's expense.
- C. Deflections in horizontal alignment shall not be permitted at joints without written consent of the Engineer. The corrugated pipe and fittings shall be free of foreign inclusions and visible defects. Ends shall be cut squarely and cleanly so as not to adversely affect joining.
- D. When requested by the Engineer the Contractor shall ensure that a qualified representative of the manufacturer shall be present at the job site for the first day of pipe laying, to assure that proper procedures are followed.
- E. The Engineer shall be notified in advance when the location of an existing pipeline conflicts with the proposed location of the Work.
- F. Pipe and fittings for corrugated pipe shall be products of a single manufacturer.
- G. All piping shall be of the type and size shown on the drawings and described in this section of the Specifications.

1.4 REFERENCES

The following standards form a part of this specification:

American Society for Testing and Materials (ASTM)

ASTM D2737 Polyethylene (PE) Plastic Tubing

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Pipes and fittings shall be carefully handled when loading and unloading. Pipes shall be lifted by hoists or lowered on skidways in such a manner as to avoid shock.
- B. HDPE pipe shall be protected from exposure to sunlight. Such protection shall consist of canvas covering, or other material, as recommended by the manufacturer. Plastic sheets, which may allow excessive temperatures to develop where the pipe is stored, shall not be used.

1.6 SUBMITTALS: IN ACCORDANCE WITH REQUIREMENTS OF GENERAL SPECIFICATIONS, SUBMIT THE FOLLOWING:

Shop drawings shall consist of manufacturer's scale drawings or catalog cuts including descriptive literature and complete characteristics, specifications, and code requirements. Shop drawings shall be submitted for the HDPE pipe, type of joints, fittings, and couplings, in accordance with the specifications.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Pipe shall be homogeneous throughout; free from voids, cracks, and other defects; as uniform as commercially practicable in color, density, and other physical properties.
- B. Pipe surfaces shall be free from nicks, scratches, and other blemishes. The joining surfaces of pipe shall be free from gouges and other imperfections that could cause leakage at the joints.
- C. Fittings shall not reduce the inside open flow area of the pipe. Couplings shall be corrugated to match the corrugations of the oblong pipe and shall provide sufficient strength to assure alignment and prevent separation at the joints.
- D. All joints, couplings and fittings shall be gasketed to create a "soil-tight" joint.
- E. All polyethylene fittings shall have a pressure rating equal to or higher than the pressure rating of the pipe.

2.2 HIGH DENSITY POLYETHYLENE (HDPE) DRAINAGE PIPE

A. GENERAL

1. Drainage pipe shall be HDPE pipe, type N-12, as manufactured by Advanced Drainage Systems, Inc. or approved equal.
2. The corrugated pipe shall have a minimum compressive strength of 3,000 lbs. at 20% deflection when tested in accordance with ASTM D2412 standards.
3. HDPE pipe shall be joined to concrete structures with the use of non-shrink grout conforming to Section 03302, FIELD CONCRETE. Connections to flared end sections shall be secured with a poured collar of concrete encompassing the entire joint. The joint interior shall also be grouted with non-shrink grout. The resulting joint shall be soil tight.

B. HDPE DRAINAGE PIPE – SOLID

1. Drainage pipe shall be corrugated, smooth interior, HDPE pipe, type - Standard Corrugated Pipe, as manufactured by Advanced Drainage Systems, Inc. or approved equal.

PART 3 - EXECUTION

3.1 INSPECTION BEFORE INSTALLATION

- A. Each length of pipe and each fitting shall be carefully inspected prior to being lowered into the trench. All materials not meeting the requirements of these specifications, or otherwise found defective or unsatisfactory by the Engineer, shall be rejected and immediately marked and removed from the project site by the Contractor.
- B. Bedding, sub-bedding, and other trench conditions shall be carefully inspected prior to laying pipe. All conditions shall be made available to the Engineer for inspection.

3.2 PIPE INSTALLATION

- A. Pipe interiors, fitting interiors, and joint surfaces shall be thoroughly cleaned prior to installation. Pipes and fittings shall be maintained clean.
- B. Pipes shall be installed in the locations and to the required lines and grades shown on the drawings and provided in these Specifications, using an approved method of control.
- C. Excavations shall be maintained free of water during the progress of the Work. No pipes shall be laid in water, nor shall there be any joints made up in water.
- D. All non-pressure pipe sections shall be installed by qualified individuals using a pipe laser. All pressure pipe shall be installed to the grades indicated on the plans at a constant pitch without bends at the joints.
- E. The pipe shall not be driven down to grade by striking it with a shovel handle, timber, rammer, or other unyielding object. When each pipe has been properly bedded, enough of

the backfill material shall be placed and compacted between the pipe and the sides of the trench to hold the pipe in correct alignment.

- F. Before a joint is made, the pipe shall be checked to assure that a close joint with the next adjoining pipe has been maintained and that inverts are matched and conform to the required line and grade.
- G. For pipe placed on crushed stone, immediately after the joint is made, the jointing area shall be filled with suitable materials so placed and compacted that the ends of either pipe will not settle under backfill load.
- H. No pipe or fitting shall be permanently supported on saddles, blocking, or stones.
- I. If any defective pipe is discovered after being placed, removal and replacement with sound pipe will be required at no additional cost to the Owner.

END OF SECTION

SECTION 02631

PRECAST MANHOLES AND CATCH BASINS

PART 1 - GENERAL

1.1 WORK INCLUDED

This Section covers all precast manholes and catch basins complete, including, but not limited to, bases, walls, cones, mortar, inverts, frames and covers.

1.2 RELATED WORK

- A. Section 02300, EARTHWORK
- B. Section 02745, PAVING
- C. Section 03302, FIELD CONCRETE

1.3 SYSTEM DESCRIPTION

- A. Precast sections shall conform in shape, size, dimensions, materials, and other respects to the details indicated on the drawings or as ordered by the Engineer.
- B. All manholes and catch basins shall have concrete bases. Concrete bases shall be precast unless otherwise specified. Invert channels shall be formed of brick and mortar upon the base.
- C. Catch basins shall have a 4-foot deep sump unless otherwise specified.
- D. Riser and cone sections shall be precast concrete.

1.4 REFERENCES

The following standards form a part of this specification as referenced:

American Society for Testing and Materials (ASTM)

ASTM A48 Gray Iron Castings

ASTM C32 Sewer and Manhole Brick

ASTM C144 Aggregate for Masonry Mortar

ASTM C207 Hydrated Lime for Masonry Purposes

ASTM C478 Precast Reinforced Concrete Manhole Sections

ASTM C923 Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures and Pipes

ASTM C1244 Standard Test Method for Concrete Sewer Manholes by the Negative Air Pressure (Vacuum) Test.

American Association of State Highway and Transportation Officials (AASHTO)

AASHTO M198 Joints for Circular Concrete Sewer and Culvert Pipe Using Flexible Watertight Gaskets

1.5 SUBMITTALS: IN ACCORDANCE WITH REQUIREMENTS OF GENERAL SPECIFICATIONS, SUBMIT THE FOLLOWING:

- A. Manufacturer literature of the materials of this section shall be submitted to the Engineer for review.
- B. Tests reports as required shall be submitted to the Engineer.

PART 2 - PRODUCTS

2.1 PRECAST CONCRETE SECTIONS

A. All precast concrete sections shall conform to ASTM C478 with the following exceptions and additional requirements:

- 1. The wall thickness of precast sections shall be as designated on the drawings, meeting the following minimum requirements:

<u>Section Diameter (Inches)</u>	<u>Minimum Wall Thickness (Inches)</u>
48	5
60	6
72	7
84	8

- 2. Type II cement shall be used except as otherwise approved.
- 3. Sections shall be steam cured and shall not be shipped until at least five days after having been cast.
- 4. Minimum compressive strength of concrete shall be 4000 psi at 28 days.
- 5. No more than two lift holes may be cast or drilled in each section.
- 6. The date of manufacture and the name or trademark of the manufacturer shall be clearly marked on the inside of each precast section.
- 7. Acceptance of the sections will be on the basis of material tests and inspection of the completed product.

8. Circumferential steel reinforcement in walls and bases shall be a minimum of 0.12 sq. in./lin. ft. for 4-foot diameter sections and 0.17 sq. in./lin. ft. for 5 and 6-foot diameter sections. Reinforcing shall extend into tongue and groove.
- B. Conical reducing sections shall have a wall thickness not less than 5-inches at the bottom and wall thickness of 8-inches at the top. Conical sections shall taper from a minimum of 48-inches diameter to 24 or 30-inches diameter at the top, as shown on the drawings.
- C. Except where insufficient depth of cover dictates the use of a shorter base, bases shall be a minimum of 4 feet in height.
- D. Slab top sections shall conform to the contract drawings, with particular attention focused upon the reinforcing steel.
- E. The tops of the bases shall be suitably shaped by means of accurate ring forms to receive the riser sections.
- F. Precast sections shall be manufactured to contain wall openings of the minimum size to receive the ends of the pipes, such openings being accurately set to conform with line and grade of the sewer or drain. Subsequent cutting or tampering in the field, for the purpose of creating new openings or altering existing openings, will not be permitted except as directed by the Engineer.
- G. The Engineer reserves the right to reject any unsatisfactory precast section and the rejected unit shall be tagged and removed from the job site immediately.
- H. The Engineer may also require the testing of concrete sections as outlined under Physical Requirements in ASTM C478 with the Contractor bearing all testing costs.

2.2 BRICK MATERIALS

- A. Brick shall be sound, hard, and uniformly burned brick, regular and uniform in shape and size, of compact texture, and satisfactory to the Engineer. Bricks shall comply with ASTM C32, for Grade SS, hard brick, except that the mean of five tests for absorption shall not exceed 8 percent by weight.
- B. Rejected brick shall be immediately removed from the work and brick satisfactory to the Engineer substituted.
- C. Mortar shall be composed of portland cement, hydrated lime, and sand in which the volume of sand shall not exceed three times the sum of the volumes of cement and lime. The proportions of cement and lime shall be as directed and may vary from 1:1/4 for dense hard-burned brick to 1:3/4 for softer brick. 117 general, mortar for Grade SS Brick shall be mixed in the volume proportions of 1:1/2:4-1/2; portland cement to hydrated lime to sand.
- D. Cement shall be Type II portland cement as specified for concrete masonry.
- E. Hydrated lime shall be Type S conforming to ASTM C207.
- F. The sand shall comply with ASTM C144 specifications for "Fine Aggregate," except that all of the sand shall pass a No. 8 sieve.

2.3 BELL TRAPS, FRAMES, GRATES, COVERS AND STEPS

- A. Castings shall be of good quality, strong, tough, even-grained cast iron, smooth, free from scale, lumps, blisters, sandholes, and defects of every nature which would render them unfit for the service for which they are intended. Contact surfaces of covers and frame seats shall be machined to prevent rocking of covers.
- B. All castings shall be thoroughly cleaned and may be subject to a careful hammer inspection at the Engineer's discretion.
- C. Castings shall be ASTM A48 Class 30B or better and manufactured in North America.
- D. The surface of the manhole covers shall have a diamond pattern with the cast words "WATER," "DRAIN" or "SEWER," whichever is appropriate.
- E. Manhole frames with 26-inch covers for 24-inch openings shall be 471 pounds minimum by East Jordan Iron Works, Product 00211048A01 or approved equal.
- F. Catch basin grates shall be 36-inches wide and 19 3/8 inches deep, Type A, galvanized. Catch basin frames and grates shall meet the Connecticut Department of Transportation Standard Detail 507-D, 507-E, 507-I, 507-J, and 507-K, as appropriate.
- G. Manhole steps shall conform to ASTM C478 requirements and shall be fabricated of either extruded aluminum or steel reinforced plastic. Steps shall be uniformly spaced at a maximum of 12-inches unless otherwise shown on the drawings.
- H. Catch basin bell traps shall be The Eliminator™ manufactured by Ground Water Rescue, Inc., "Snout" manufactured by Best Management Products, Inc., or approved equal.

PART 3 - EXECUTION

3.1 INSTALLATION

A. PRECAST SECTIONS

- 1. Precast bases shall be supported on a compacted level foundation of crushed stone, as specified in Section 02300 EARTHWORK, at least 6-inches thick, but shall vary to the depth necessary to reach sound undisturbed earth.
- 2. Precast reinforced concrete sections shall be set vertical and with sections in true alignment.
- 3. Butyl rubber joint sealant shall be installed between each concrete section. Catch basin sections do not require joint sealant if so indicated on the drawings.
- 4. All holes in sections used for handling the sections shall be thoroughly plugged with mortar. Mortar shall be one part cement to 1-1/2 parts sand, mixed slightly damp to the touch (just short of "balling"), hammered into the holes until it is dense and an excess of paste appears on the surface, and then finished smooth and flush with the adjoining surfaces.

B. BRICK WORK

1. Bricks shall be moistened by suitable means, as directed, until they are neither so dry as to absorb water from the mortar nor so wet as to be slippery when laid.
2. Each brick shall be laid as a header in a full bed and joint of mortar without requiring subsequent grouting, flushing or filling, and shall be thoroughly bonded as directed.
3. The brick inverts shall conform accurately to the size of the adjoining pipes. Side inverts shall be curved and main inverts (where direction changes) shall be laid out in smooth curves of the longest possible radius which is tangent to the centerlines of adjoining pipe.

C. CASTINGS

1. Cast iron frames, grates and covers shall be as specified. The frames and covers shall be set by the Contractor to conform accurately to the grade of the finished pavement, existing ground surface, or as indicated on the drawings. Frames shall be adjusted to meet the street surface.
2. Cast iron manhole frames and covers not located in paved areas shall be set 6-inches above finished grade, at a height as directed by the Engineer, or as indicated on the drawings. The top of the cone shall be built up with a minimum of 1 course and a maximum of 5 courses of brick and mortar used as headers for adjustment to final grade.
3. Frames shall be set concentric with the top of the concrete section and in a full bed of mortar so that the space between the top of the concrete section or brick headers and the bottom flange of the frame shall be completely filled and made watertight. A thick ring of mortar extending to the outer edge of the concrete shall be placed all around the bottom flange. The mortar shall be smoothly finished to be flush with the top of the flange and have a slight slope to shed water away from the frame.
4. Covers and/or grates shall be left in place in the frames, for safety reasons, except while work is being performed.

D. ACCESSORIES

Accessories shall be installed in accordance with manufacturer's instructions.

3.2 CLEANING

All new structures shall be thoroughly cleaned of all silt, debris and foreign matter of any kind, prior to final inspection.

END OF SECTION

SECTION 02633

REINFORCED CONCRETE PIPE

PART 1 - GENERAL

1.1 WORK INCLUDED:

This Section covers the furnishing and installation of reinforced concrete pipe, complete.

1.2 RELATED WORK:

- A. Section 02300, EARTHWORK
- B. Section 02631, PRECAST MANHOLES AND CATCH BASINS

1.3 QUALITY ASSURANCE:

- A. Acceptance of pipe will be on the basis of plant load-bearing tests, material tests, and inspection of the complete product. The required tests are enumerated herein. The quality of all materials used in the pipe, the process of manufacture, and the finished pipe shall be subject to inspection by the Engineer, at the place of manufacture or on the work site after delivery or at both locations. The pipe will be subject to rejection at any time if it fails to meet the specification requirements, even though sample pipe units may have been accepted as satisfactory at the place of manufacture. Rejected pipe shall be promptly removed from the project site by the Contractor.
- B. All tests shall be made in accordance with the latest applicable ASTM specifications, which are as follows:
 - 1. Reinforcing Steel. Mill test reports, or reports on samples taken from each shipment to the pipe manufacturer, shall be submitted for reinforcing steel to be used on this project stating that the reinforcing meets the specified requirements.
 - 2. Cement. Mill test reports shall be submitted for each shipment to the pipe manufacturer of cement to be used on this project stating that the cement meets the specified requirements. Flyash may be used as specified in ASTM C76.
 - 3. Aggregates. Test reports shall be submitted stating that the aggregates to be used on this project meet the requirements of ASTM C33 except that the requirements for gradation shall not apply. The first report shall be submitted prior to the manufacture of any pipe for this project. Additional tests and reports shall be made monthly thereafter during the production of the pipe.
 - 4. Absorption Tests. Three cores shall be taken from each pipe unit that is to be load tested. The cores shall be taken before the load-bearing tests are performed. All cores shall be tested for absorption. Absorption results shall not exceed the requirements of ASTM C76.
 - 5. Pipe Unit Load-Bearing Tests. A load-bearing test shall be made on one pipe unit of each size and class to be furnished and the report of the test shall be submitted before that size and class of pipe unit is delivered. An additional test will be required for each 200 units of

each size and class of pipe. The load-bearing test shall be performed after the cores for the absorption tests have been taken. Each load-bearing test shall be carried to the specified load to produce the 0.01 inch crack. If the 0.01 inch crack is not formed until the specified load is reached, the pipe unit may be used in the project.

6. Concrete Cylinders. Compression tests shall be made on standard concrete cylinders for the first or test pipe unit and then for every 100 cubic yards of concrete used in pipe manufacture, or for each additional 200 units of pipe, whichever represents the lesser amount of concrete. Four cylinders shall be broken, one each at 7, 14, and 28 days with one cylinder as a spare to be used in the event of an unsatisfactory break. The reports shall be submitted not more than three days after completion of each of the compression tests.
 7. Water Testing. All pipe units shall be water tested at the manufacturer's plant prior to shipment. Test pressures shall be 120% of the internal working pressure for which the pipe is designed, per ASTM C361. Each joint shall be checked during this testing and both pipe units shall be rejected if their joint shows leakage. Moisture appearing on the surface of the pipe in the form of patches or beads adhering to the surface will not be considered leakage.
- C. The Owner may have any or all pipe units inspected or tested, or both, by a lab designated by the Owner. Such additional inspection and/or tests shall be at the Owner's expense and shall be the test results of record.
- D. All pipe units to be tested shall be selected at random by the Owner. Unless otherwise approved, all load-bearing tests on pipe units shall be made in the presence of the Owner.

1.4 REFERENCES:

- A. The following standards form a part of this specification and indicate the minimum standards required:

American Society for Testing and Materials (ASTM)

ASTM C33 Specification for Concrete Aggregates

ASTM C76 Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe

ASTM C361 Reinforced Concrete Low-Head Pressure Pipe

ASTM C655 Reinforced Concrete D-Load Culvert, Storm Drain, and Sewer Pipe

ASTM C924 Standard Practice for Testing Concrete Pipe Sewer Lines by Low Pressure Air Test Method

American Society of Civil Engineers (ASCE)

ASCE Vol. 90 Journal of Sanitary Engineering
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1.5 SUBMITTALS: IN ACCORDANCE WITH THE REQUIREMENTS OF GENERAL SPECIFICATIONS, SUBMIT THE FOLLOWING:

- A. Shop drawings of reinforced concrete pipe, fittings, and gaskets shall be submitted to the Engineer for review.
- B. The Contractor shall submit to the Engineer certified copies in triplicate of test results on each batch of each size and class of pipe, for the materials and for the finished pipe units as described herein. If less than 100 units of a given size and class of pipe are required, the Contractor may submit certified copies of tests made on identical pipe units produced within the past year.
- C. Design calculations and reinforcing configurations for special classes of pipe and certified copies of test results of tests itemized in Subsection 1.03 of this specification shall be submitted to the Engineer for record purposes.
- D. Before shop drawing submittals are processed, the Owner or its agent may elect to visit and inspect the proposed concrete pipe manufacturer's plant.

1.6 DELIVERY/STORAGE

- A. Pipe sections shall not be stored on areas over newly laid pipe or other existing pipelines which might be damaged by the superimposed load. Storage of sections shall be restricted to approved areas.
- B. Prior to installation, gaskets shall at all times be stored in a location with a minimum temperature of 50°F. Any gaskets not meeting the above requirements shall be rejected and promptly removed from the site.

PART 2 - PRODUCTS

2.1 MATERIAL:

A. PIPE:

- 1. The pipe shall be reinforced concrete pipe manufactured by an established manufacturer of good reputation in the industry and in a permanent plant adapted to meet all the design requirements of the pipe.
- 2. Pipes 24 inches in diameter and smaller shall be of the bell and spigot type. Pipes larger than 24 inches may be bell and spigot or tongue and groove.
- 3. The pipe shall have an interior surface which is smooth and even, free from roughness, projections, indentations, offsets, or irregularities of any kind. Pipe shall conform to the latest requirements of ASTM C76 and shall be Wall B or Wall C for the class indicated on the drawings, and with additions and exceptions as follows:
 - a. Type II cement shall be used unless otherwise approved by the Engineer. Admixtures shall not be used except with prior approval of the Engineer.

- b. Elliptical reinforcement will not be permitted. Longitudinal reinforcement shall be continuous. Reinforcement shall have a minimum cover of 3/4 inches.
- c. Absorption shall be as specified under Quality Assurance.
- d. Concrete pipe shall be manufactured by a vibratory process such as a packerhead or Vihy process. Concrete cast in vertical forms shall be dry mix concrete consolidated by internal or external mechanical vibration or both. The vibrating equipment shall be operated at high speed (more than 5,000 rpm) and have a low amplitude. Pipes manufactured by the modified packerhead process shall have a supplementary concrete densification operation that shall assure the attainment of full bond between reinforcement and concrete and also eliminate any displacement of the reinforcement. Additional passes with the revolving packerhead or the use of additional vibrators attached to the platform or exterior forms will not be acceptable.
- e. Pipe units shall have a minimum laying length of 8 feet except as otherwise indicated or approved by the Engineer.
- f. Pipe units shall not be shipped until the concrete has reached its 28 day design strength.
- g. Mortar used for repairs shall have a minimum compressive strength of 4,000 psi at the end of 7 days and 5,000 psi at the end of 28 days for use with reinforced concrete pipe up to Class IV, and a compressive strength of 6,000 psi at the end of 7 days and 7,000 psi at the end of 28 days for use with reinforced concrete Class V pipe when tested in 3-inch by 6-inch cylinders stored in the standard manner. Only those repairs permitted by the above-mentioned ASTM C76 will be allowed.
- h. The date of manufacture, class of pipe unit, size of pipe units, consecutive number of pipe unit, and trademark of the manufacturer shall be clearly and permanently marked on the inside and the outside at one end of each pipe unit.

B. SPECIAL PIPE CLASSES:

- 1. Special pipe classes shall conform to ASTM C655. The class designation at 3500, 4000, 4500 and 5000 refers to the D-load required to produce a 0.01-inch crack.
- 2. All material and testing parameters shall be the same as the standard classed pipe.

C. PIPE JOINTS/GASKETS:

- 1. Pipe joints shall conform to ASTM C361. Pipe joints shall be of the rubber gasket type in which the gaskets are in compression and which will permit both longitudinal and angular movement. The ends shall be designed to confine the gasket when the joint is in its final position. Each unit of pipe shall be provided with proper ends made of concrete formed on machined rings to ensure accurate joint surfaces. The diameters of the joint surface, depended upon to compress the gasket, shall be in accordance with ASTM C361, Section 8. The joint shall be sealed by a rubber gasket so that the joint will remain tight under all conditions of service.
- 2. The gaskets sealing the joint shall be made of natural rubber, synthetic rubber, or a blend of both having a texture to assure a watertight and permanent seal and shall be the product of a

manufacturer having at least five years experience in the manufacturing of rubber gaskets for pipe joints. The gasket shall be of a solid circular cross section having a composition and texture which is resistant to common ingredients of sewerage, industrial wastes, and groundwater and which will endure permanently under the conditions likely to be imposed by this service. The gasket shall conform to Section 6.9 Rubber Gaskets C361.

PART 3 - EXECUTION

3.1 INSTALLATION:

- A. Pipe unit shall be so laid as to form a close joint with the next adjoining pipe and bring the inverts continuously to the required grade.
- B. Each pipe unit shall be handled into its position in the trench only in such manner and by such means, as the Engineer approves as satisfactory. The Contractor will be required to furnish approved devices to permit shall be laid to the lines and grades indicated on the drawings or given by the Engineer. Each pipe satisfactory supports of all parts of the pipe unit when it is lifted.
- C. The Contractor shall take all necessary precautions to prevent flotation of the pipe in the trench.
- D. Where so indicated on the drawings, the pipe shall be supported by compacted crushed stone, concrete cradle or envelope or any other bedding material as specified or as shown on the plans. Crushed stone shall be as specified under Section 02300 EARTHWORK.
- E. When each pipe unit has been properly bedded, enough of the backfill material shall be placed and compacted between the pipe and the sides of the trench to hold the pipe in correct alignment.
- F. Where a concrete cradle or envelope is used, the pipe shall be laid on concrete saddles and braced, so as to provide both vertical and lateral support for the pipe while the cradle or envelope is being placed. The location, dimensions and class of concrete required for cradle or envelope are indicated on the drawings.
- G. After the pipe units are aligned in the trench and are ready to be jointed, all joint surfaces shall be cleaned. Immediately before jointing the pipe, the groove shall be lubricated in accordance with the manufacturer's recommendation. Each pipe unit shall then be carefully pushed into place without damage to pipe or gasket. Suitable devices shall be used to force the pipe together so that they will fit with a minimum open recess inside and outside and have tightly-sealed joints. Care shall be taken not to use such force as to wedge apart and split the groove ends. Joints shall not be "pulled" or "cramped" without approval of the Engineer.
- H. Immediately after the pipe units are put together, the position of the gasket in the joint shall be inspected using an approved feeler gage furnished by the Contractor, to be sure it is properly put together and is tight. Joints where the gasket is damaged or not properly positioned shall be pulled apart and remade using a new gasket.
- I. Details of gasket, attachment, and joint formation shall follow the directions of the manufacturers of the joint material and of the pipe, all subject to review by the Engineer.
- J. No pipe or fitting shall be permanently supported on saddles, blocking or stones.

- K. At all times when pipe laying is not actually in progress, the open ends of pipe shall be closed by temporary watertight plugs or by other approved means. If water is in the trench when work is resumed, the plug shall not be removed until all danger of earth or other materials entering the pipe has passed.

3.2 REPAIR OF PIPE:

Chipped, gouged or damaged pipe shall be repaired if the defects affect the structural integrity of the pipe. Surface imperfections need not be repaired. The pipe shall be repaired by an authorized representative of the pipe manufacturer following a repair procedure approved by the Engineer. The repaired pipe will be inspected by the Engineer prior to being used on the project.

END OF SECTION

SECTION 02745

PAVING

PART 1 - GENERAL

1.1 WORK INCLUDED

The Contractor shall furnish all labor, materials and equipment and shall replace the pavements as indicated on the drawings and as herein specified.

1.2 RELATED WORK

- A. Section 00890, PERMITS
- B. Section 01562, DUST CONTROL
- C. Section 02300, EARTHWORK
- D. Section 02631, PRECAST MANHOLES AND CATCH BASINS

1.3 SYSTEM DESCRIPTION

The types of pavement systems to be utilized on this project are as follows:

- TYPE 1. TEMPORARY TRENCH PAVEMENT
- TYPE 2. BINDER COURSE PAVEMENT
- TYPE 3. TOP COURSE PAVEMENT
- TYPE 4. BITUMINOUS DRIVEWAY
- TYPE 5. RECLAMATION/RECYCLING

PAVEMENT SCHEDULE

- A. TYPE 1. TEMPORARY TRENCH PAVEMENT

Pipe trenches shall be paved with temporary trench pavement as soon as practicable after installation of individual pipe line segments, but no later than by Friday at 5 p.m. of the week the work is completed.

- B. TYPE 2. BINDER COURSE PAVEMENT

Binder course pavement shall be placed following reclamation of existing asphalt and subbase, incorporation of calcium chloride additive to reclaimed material, and grading of subbase according to the plans and specifications.

- C. TYPE 3. TOP COURSE PAVEMENT

Top course pavement shall be installed following placement of the binder course pavement according to the plans and specifications.

D. TYPE 4. BITUMINOUS DRIVEWAY

Bituminous driveways shall be paved with a top course pavement following removal and disposal of existing subbase and pavement, and placement of the new subbase according to the plans and specifications.

E. TYPE 7. RECLAMATION/RECYCLING

Areas shall be reclaimed from curb to curb, as indicated in the drawings, or as directed by the Engineer, and fine graded as required to provide a smooth, dense, and uniform base for placement of the binder course and top course as specified herein. Where underground utilities are to be installed in areas to be reclaimed, the contractor shall complete installation of the utilities prior to reclamation.

Utility trenches must be uniformly graded and compacted and shall be paved with temporary trench binder course pavement, minimum 2 inches thick, as soon as practicable after installation of individual pipe line segments or before the end of each week.

Permanent pavement shall be installed only with the approval of the Engineer.

1.4 REFERENCES

The following standards form a part of these specifications and indicate the minimum standards required:

American Society for Testing and Materials (ASTM)

ASTM D1557 Test for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10 Pound Rammer and 18-Inch Drop

State of Connecticut Department of Transportation (CT DOT)
Standard Specifications for Roads, Bridges and Incidental Construction, Form 817

816 3.02 Rolled Granular Base

816 3.04 Processed Aggregate Base

816 4.01 Cement Concrete

816 4.06 Bituminous Concrete

816 12.09 Painted Pavement Markings

Federal Specifications

SS-S-164 Sealing Compound, Hot Poured Type, for Joints in Concrete

SS-S-1401C Sealants, Joint, Non-Jet-Fuel-Resistant, Hot Applied, for Portland Cement and Asphalt Concrete Pavement

1.5 SUBMITTALS: IN ACCORDANCE WITH REQUIREMENTS OF GENERAL SPECIFICATIONS, SUBMIT-THE FOLLOWING:

Complete job mix formula shall be submitted to the Engineer at least two weeks before any of the work of this section is to begin.

PART 2 - PRODUCTS

2.1 ROLLED GRANULAR BASE

- A. Rolled Granular Base shall consist of sound tough durable particles of bank or crushed gravel, or reclaimed miscellaneous aggregate, or mixtures thereof with the resultant uniform blend containing no more than 15 percent by weight of bituminous concrete.
- B. Gradation requirements for rolled granular base shall be as specified in Section 02300, EARTHWORK and Section M.02.03 of Form 817.

2.2 LIQUID CALCIUM CHLORIDE

- A. Liquid calcium chloride used for subbase stabilization shall be Liquidow Technical Grade Calcium Chloride 38% Solution as distributed by Occidental Chemical Corporation, Dallas, TX, or approved equal.

2.3 BITUMINOUS CONCRETE PAVEMENT

- A. Bituminous concrete pavements shall consist of SuperPave Design Level I S0.375 & S0.5 and Class 2 Bituminous Concrete or as required in the Contract Documents.
- B. Bituminous concrete mixtures shall be within the composition limits, in accordance with M.04.03 of Form 817.
- C. The joint sealant shall be a hot poured rubberized emulsified asphalt sealant meeting the requirements of Federal Specifications SS-S-1401 or SS-S-164.
- D. The tack coat shall be an asphalt emulsion, RS-1 if required, conforming to AASHTO M 140.

2.4 PAVEMENT MARKINGS

- A. Pavement markings shall conform to the requirements of Section 12.10.03, Form 817.
- B. The mixture of the marking material shall be within the composition limits for reflectorized pavement markings as described in Form 817 as follows:
 - 1. Epoxy Resin Pavement Markings – M.07.22.

- C. Application of the glass beads to be used as reflector material on the striping shall conform to Section M.07.30 of Form 817.
- D. The markings shall be 4-inches wide as shown on the drawings.

PART 3 - EXECUTION

3.1 GENERAL

Paving courses required for the project shall be as shown on the drawings and as specified herein. Pavement thicknesses specified are measured in compacted inches. If a pavement course thickness exceeds 2-1/2 compacted inches, the course shall be installed in multiple lifts with each lift not exceeding 2-1/2 compacted inches in thickness.

3.2 GRAVEL SUBBASE

- A. The existing pavement and 12-inches of the existing subbase course shall be removed before placement and grading of the proposed gravel base course.
- B. The gravel subbase to be placed under pavement shall consist of 12-inches of gravel evenly spread and thoroughly compacted.
- C. The gravel shall be spread in layers not more than 4-inches thick, compacted measure. All layers shall be compacted to not less than 95 percent of the maximum dry density of the material as determined by ASTM D1557 Method C at optimum moisture content.

3.3 TEMPORARY BITUMINOUS PAVEMENT

- A. Where specified and directed by the Engineer and after placement of the gravel subbase, the Contractor shall place temporary bituminous pavement above the trench, between the edges of the existing pavement. It shall consist of Class 4 Bituminous Concrete Pavement, minimum 2-inches thick, in accordance with Section M.04.03 of Form 816.
- B. The temporary pavement shall be repaired as necessary to maintain the surface of the pavement until replaced by permanent pavement. When so directed by the Engineer, the Contractor shall remove the temporary pavement and install or regrade the subbase for installation of permanent pavement.

3.4 RECLAIMING/RECYCLING

A. RECYCLING

The existing bituminous pavement shall be reclaimed, with a self propelled reclamation machine, weighing in excess of ten (10) tons, to a depth of fifteen (15) inches. Equipment such as road planers or cold milling machines which are designed to mill or shred the existing bituminous pavement rather than crush or fracture it, and ripping or pushing machines such as motorgraders or bulldozers which are not capable of producing a uniform blend of pavement and base and are incapable of creating heat through friction, will not be acceptable. All material shall be scarified and crushed to two and one half (2-1/2) inches

and blended into a homogeneous mass, utilizing the asphalt from the existing pavement, which is heated by the cutting drum, as a stabilizing agent, bonding the material together and waterproofing the base.

B. INCORPORATION OF CALCIUM CHLORIDE

Following removal of excess material, the calcium chloride solution shall be applied to the reclaimed subbase material at a rate of ± 1.0 gallons per cubic yard. The calcium chloride shall then be thoroughly mixed into the subbase by making at least two additional passes with the reclamation machine.

C. FINE GRADING

The reclaimed material shall be shaped and graded to the lines and elevations as directed by the Engineer. The entire roadway surface shall be graded as required to provide for a binder course and top course curb to curb pavement, as shown on the drawings, while leaving a 6-inch curb reveal (if required) and a crown at the centerline of the road with a $2\% \pm$ slope to the curbs. All intersections with side streets, driveways and sidewalks shall be graded so as to provide a smooth transition to the finished paved surface. All excess material shall be removed and disposed of at the Contractor's expense in accordance with state regulations. If the Owner so directs, the Contractor shall deliver the excess material to a local point, at no additional cost. The reclaimed surface shall be compacted to a dense consolidated mass by rolling with a roller weighing not less than (10) ten tons. The finished surface shall be tested for smoothness and accuracy of grade and if any portions are found to lack the required grade these areas shall be reclaimed, recompacted and otherwise manipulated as the Engineer may direct until the required smoothness and accuracy are obtained. The finished surface shall be such that it will not vary more than one quarter (1/4) of an inch from a ten (10) foot straight edge applied to the surface, parallel to or at right angles to the center line.

3.5 PERMANENT BITUMINOUS PAVEMENT

The bituminous paving mixture, equipment, methods of mixing and placing, and the precautions to be observed as to weather, condition of base, etc., shall be in accordance with Section 4.06 of Form 817.

A. BASE COURSE AND BINDER COURSE PAVEMENT

1. Immediately prior to installing the base and/or binder course, the trimmed edges shall be made stable and unyielding, free of loose or broken pieces and all edges shall be thoroughly broomed clean. Contact surfaces of trench sides, curbing, manholes, catch basins, or other appurtenant structures in the pavement shall be painted thoroughly with a uniform coating of asphalt emulsion (tack coat), just before any mixture is placed against them.
2. The binder course shall be repaired as necessary to maintain the surface of the pavement until placement of the permanent top course. If required, the Contractor shall place a leveling course before placing the permanent top course.

B. TOP COURSE PAVEMENT

1. Top course or surface treatment shall be placed over the trench or full width as shown on the drawings or as specified.
2. Prior to placement of the top course or surface treatment, the entire surface over which the top course or surface treatment is to be placed shall be broom cleaned and tack coated.
3. Top course or surface treatment pavement placed over trenches may be feathered to meet existing paved surfaces, if approved by the Engineer.
4. Prior to placing full width top course or surface treatment pavements, keyways shall be cut in all intersecting streets.

3.6 PAVEMENT PLACEMENT

- A. Unless otherwise permitted by the Engineer for particular conditions, only machine methods of placing the pavement shall be used. The equipment for spreading and finishing shall be mechanical, self-powered pavers, capable of spreading and finishing the mixture true to line, grade, width and crown. The mixtures shall be placed and compacted only at such times as to permit proper inspection and checking by the Engineer.
- B. After the paving mixtures have been properly spread, initial and intermediate compaction shall be obtained by the use of steel wheel rollers having a weight of not less than 240 pounds per inch width of tread.
- C. Final rolling of the top course or surface treatment pavement shall be performed by a steel wheel roller weighing not less than 285 pounds per inch width of tread at a mix temperature and time sufficient to allow for final smoothing of the surface and thorough compaction.
- D. Immediately after placement of top course or surface treatment pavement, all joints between the existing and new top course or surface treatment pavements shall be sealed with hot poured rubberized asphalt sealant meeting the requirements of Federal Specification SS-S-1401 or SS-S-164.
- E. Where there is no backing for the edges of the curb-to-curb pavement, the Contractor shall provide a gravel transition. The gravel transition shall be installed immediately after the pavement is placed, shall be feathered and extend a minimum of 18 inches, and shall be compacted using the same equipment as for pavement compaction. The gravel shall be uniformly graded material with a maximum size of 3/8 to 1/2 inch.
- F. When directed by the Engineer, the Contractor shall furnish and install additional paving to provide satisfactory transition for driveways and walkways impacted by a new curb-to-curb pavement installation. The transition installation will be considered incidental to the curb-to-curb pavement installation.

3.7 ADDITIONAL PAVING

- A. If the Engineer determines that the existing bituminous concrete pavement on local streets is thicker than the permanent pavement specified herein, the Contractor may be required to

install additional bituminous concrete of appropriate class to obtain the depth of the existing pavement.

- B. If for the installation of full width paving, the Engineer determines that the existing road surface requires additional leveling pavement, then the Contractor shall install additional bituminous concrete of appropriate class to bring the section to proper line and cross section. Additional paving required to restore the proper line and cross section of binder course installed by the Contractor which has become rough and uneven shall be furnished and installed at the expense of the Contractor.

3.8 DRIVEWAYS AND SIDEWALKS

- A. Pavement binder course, top course, and gravel sub-base thickness shall be as shown on the drawings. All thicknesses are compacted thicknesses.
- B. Adjacent concrete work, slate work, sidewalks, structures, etc. shall be protected from stain and damage during the entire operation. Damaged or stained areas shall be replaced or repaired to equal their original condition.
- C. All joints between binder and top course shall be staggered a minimum of 6-inches.
- D. After final rolling, no vehicular traffic of any kind shall be permitted on the pavement until it has cooled and hardened sufficiently to prevent distortion and loss of fines, and in no case less than 6 hours.
- E. Smoothness of all areas of the finished surface shall not vary more than ¼-inch when tested with a 16 foot straight-edge, applied both parallel to and at right angles to the centerline of the paved area. At building entrances, curbs, and other locations where an essentially flush transition is required, pavement elevation tolerance shall not exceed plus or minus 1/8-inch. Irregularities exceeding these amounts, or which retain water on the surface, shall be corrected by removing the defective work and replacing or repairing it to the satisfaction of the Engineer.

3.9 RAISING AND ADJUSTING CASTINGS

- A. In areas of permanent top course paving, existing municipally-owned catch basin and manhole castings and valve boxes shall be raised to the proper grade where directed by the Engineer.
- B. Castings owned by private utilities shall be raised by their own forces. The Contractor shall be responsible for coordinating this work.
- C. The method of adjusting these castings shall be as follows: Cut around catch basin or manhole castings a minimum of 8-inches from casting. Excavate and if required rebuild up to 12-inches of masonry below the bottom of the casting. Backfill with suitable material and compact to bottom of casting. Place high, early strength cement or bituminous concrete collar, as directed, to approximately 1 ½-inches below the raised casting grade. Masonry work shall conform to Section 02631, PRECAST MANHOLES AND CATCH BASINS.
- D. In some areas, raising of castings may not be required. Where directed by the Engineer, castings not to be raised shall have at least 12-inches of bituminous concrete pavement

chipped and removed around the casting. New bituminous concrete pavement shall be placed and compacted around such castings to approximately 1 ½-inches below the top of the casting. The overlay course shall then be sloped down to the level of the casting.

- E. The method of raising valve boxes shall be as follows: Cut around valve box a minimum of 8-inches from valve box. Excavate as required and raise the valve box. Pour high early strength cement or bituminous concrete collar, as directed, to approximately 1 ½-inches below the top of the valve box.
- F. Castings which need to be raised or adjusted to complete permanent curb to curb paving shall be done immediately prior to paving.

3.10 PAVEMENT MARKINGS

- A. The Contractor shall install pavement markings as shown on the drawings, as specified, and as directed by the Engineer, no sooner than 48 hours after completion of permanent pavement.
- B. When directed by the Engineer, the Contractor shall provide temporary markings at no additional cost to the Owner.

END OF SECTION

SECTION 02771

CURBING

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. This section covers furnishing and installation of bituminous concrete curb, and granite stone curbing where required, as shown on the Drawings and herein specified.
- B. This section also covers replacement of curbing removed during construction.

1.2 RELATED WORK

- A. Required earthwork is specified under Section 02300, EARTHWORK.
- B. Section 02745, PAVING
- C. Section 02775, SIDEWALK CONSTRUCTION AND REPLACEMENT

1.3 REFERENCES

The following standards form a part of these specifications, as referenced:

State of Connecticut Department of Transportation
Standard Specifications for Roads, Bridges and Incidental Construction, Form 817

1.4 SUBMITTALS: IN ACCORDANCE WITH REQUIREMENTS OF GENERAL SPECIFICATIONS, SUBMIT THE FOLLOWING:

Shop drawings, showing dimensions of typical curb sections, shall be submitted to the Engineer for review.

PART 2 - PRODUCTS

2.1 BITUMINOUS CONCRETE CURB

Bituminous concrete curb shall conform to Section 8.15 of the latest edition of Form 817. Bituminous concrete shall be Class 3.

2.2 GRANITE STONE CURB

Granite stone curb shall conform to Subsection M.12.06.1 of the latest edition of Form 817.

PART 3 – EXECUTION

3.1 BITUMINOUS CONCRETE CURB

- A. Installation and replacement of bituminous concrete curbs shall be in accordance with Section 8.15 of the latest edition of Form 817. The curbing shall have a 6-inch reveal unless otherwise directed by the Engineer.
- B. Unless modified herein, installation shall conform to Section 8.15 and 4.06 for Form 817.
- C. When indicated on the plans, or as directed, drainage openings shall be made through the curb at the elevations and of the size required.

3.2 GRANITE STONE CURB

- A. Installation and replacement of granite stone curbs shall be in accordance with Section 8.13 of the latest edition of Form 817 and all amendments thereto. The curbing shall have a reveal as shown on the drawings or as otherwise directed by the Engineer.
- B. Unless modified herein, installation shall conform to Section 8.13.03 of Form 817.
- C. When indicated on the plans, or as directed, drainage openings shall be made through the curb at the elevations and of the size required.

END OF SECTION

SECTION 02775

SIDEWALK CONSTRUCTION AND REPLACEMENT

PART 1 - GENERAL

1.1 WORK INCLUDED

The Contractor shall furnish all labor, materials, equipment and incidentals required to construct new or replacement bituminous or cement concrete sidewalks where directed or where existing sidewalks are disturbed by the Contractor, as shown on the drawings and described herein. The Contractor shall also furnish all materials and install wheelchair ramps where shown on the drawings or as directed by the Engineer.

1.2 RELATED WORK

A. Section 02300, EARTHWORK

1.03 SYSTEM DESCRIPTION:

A. BITUMINOUS AND CEMENT CONCRETE SIDEWALKS AND WHEELCHAIR RAMPS

1. Except as otherwise indicated, bituminous and cement concrete sidewalks and wheelchair ramps shall be constructed in accordance with the requirements of Section 9.21, Concrete Sidewalks, or Section 9.22, Bituminous Concrete Sidewalk, of the latest edition of the State of Connecticut Department of Transportation Standard Specifications for Roads, Bridges and Incidental Construction Form 817, and all amendments thereto.
2. Wheel chair ramps shall be installed in new sidewalks at intersections in accordance with the Connecticut Building Code ICC/ANSI A117.1-98 and all amendments thereto. When curbs or sidewalks are constructed or reconstructed on one side of the street, curb cuts shall also be installed on the opposite sides of the street, where there is a pedestrian path of travel. Curb cuts shall be located within the crosswalk and/or the pedestrian path of travel.
3. Water boxes, manhole frames, and all other castings shall be carefully set to the proposed finished grade.

PART 2 - PRODUCTS

2.1 BITUMINOUS CONCRETE SIDEWALKS AND WHEELCHAIR RAMPS

A. Bituminous concrete sidewalks and wheelchair ramps shall consist of Class 2 Bituminous Concrete.

- B. Bituminous concrete shall conform to the requirements of Section M.04.

2.2 CEMENT CONCRETE SIDEWALKS AND WHEELCHAIR RAMPS

- A. Cement concrete sidewalks shall be constructed with air entrained Cement Concrete with a minimum compressive strength of 4,000 psi at 28 days.
- B. Cement concrete shall conform to the requirements of Section M.03.01, Class F Concrete.

PART 3 - EXECUTION

3.1 BITUMINOUS CONCRETE SIDEWALKS AND WHEELCHAIR RAMPS

- A. The subgrade for the bituminous concrete sidewalks and wheelchair ramps shall be shaped parallel to the proposed surface of the sidewalks and shall be thoroughly rolled and tamped. All depressions occurring shall be filled with suitable material and again rolled or tamped until the surface is smooth and hard in order for a gravel foundation to be placed upon it.
- B. The bituminous concrete sidewalk shall be a minimum of 2 ½ compacted inches thick, laid in two equal courses. The sidewalk pitch shall be 3/16 inch per foot of width or shall match the existing sidewalk.

3.2 CEMENT CONCRETE SIDEWALKS AND WHEELCHAIR RAMPS

- A. Concrete for sidewalks and wheelchair ramps shall be a minimum of 5 inches thick.
- B. The subgrade for the walk or driveway shall be shaped to a true surface conforming to the proposed slope of the walk, thoroughly rolled at optimum moisture content, and tamped with a power roller weighing not less than one ton and not more than 5 tons. All depressions occurring shall be filled with suitable material and again rolled or tamped until the surface is smooth and hard.
- C. After the subgrade has been prepared as hereinbefore specified, a subbase of gravel borrow at optimum moisture content shall be placed, thoroughly rolled by a power roller, and tamped. The gravel borrow shall be a minimum of 6 inches in thickness.
- D. The forms for sidewalks shall be smooth, free from warp, strong enough to resist springing out of shape, and deep enough to conform to the thickness of the proposed walk. All mortar or dirt shall be completely removed from forms that have been previously used. The forms shall be well staked, thoroughly braced, and set to the established lines with their upper edge conforming to the grade of the finished walk. The finished walk shall have sufficient pitch from the outside to the edge of the walk to provide for surface drainage. This pitch shall be 1/4 of an inch per foot unless otherwise directed by the Engineer. Before the concrete is placed, the subbase for sidewalks shall be thoroughly dampened until it is moist throughout but without puddles of water.
- E. Concrete shall be conveyed from the place of mixing to the place of deposit in such a manner that no mortar will be lost, and the composition of the mix shall be uniform, showing neither excess nor lack of mortar in any one place. The consistency shall be such

that water will float to the surface under heavy tamping. The concrete shall be placed as close to its final position as practicable and thoroughly consolidated, with precautions taken not to overwork it while it is still plastic. The concrete shall be thoroughly spaded along the forms or screeds to eliminate voids and honeycombs at the edges. Retempering of concrete will not be permitted.

- F. Concrete shall be placed in alternate slabs not exceeding 30 feet in length. Slabs shall be separated by transverse preformed expansion joint filler ½ inch thick.
- G. Finishing of the concrete surface shall be done by experienced and competent cement finishers as soon as is practicable. Finishing shall be delayed until all bled water and water sheen has left the surface and the concrete has begun to stiffen. The concrete surface shall be finished as directed with a steel trowel or wood float to give a smooth, uniform and attractive surface finish and uniformly scored into block units or areas of not more than 36 square feet. Following this, the Contractor shall draw a fine nylon push broom lightly over the surface to produce a non-slip surface. Application of neat cement to the surface to hasten hardening is prohibited.
- H. The Contractor shall protect the newly placed concrete surface against vandalism and marking or defacing and must stand ready to replace any blocks which, in the opinion of the Engineer, are excessively marked or defaced, at no additional cost to the Owner. When completed the walks shall be kept moist and protected from traffic and weather for at least 3 days.
- I. Insulating blankets or other adequate protection must be provided where temperatures of 40°F or lower occur during placing of concrete and during the early curing period. The minimum temperature of fresh concrete after placing and for the first 3 days shall be maintained above 55°F. In addition to the above requirements, an additional 3 days of protection from freezing shall be maintained. Concrete pours shall not occur when the ambient temperature is below 35°F.
- J. Damp Burlap or other adequate protection must be provided where temperatures of 80°F or higher occur during placing of concrete and during the early curing period. The maximum temperature of fresh concrete after placing and for the first 3 days shall be maintained below 90°F. Concrete pours shall not occur when the ambient temperature exceeds 90°F.
- K. See section 03302 "Field Concrete" for additional concrete placement requirements.

END OF SECTION

SECTION 02920

LOAMING AND SEEDING

PART 1 - GENERAL

1.1 WORK INCLUDED

This section covers all labor, materials, and equipment necessary to do all loaming, seeding and related work as indicated on the drawings and as herein specified. All lawns disturbed by the Contractor's operations shall be repaired as herein specified.

1.2 QUALITY ASSURANCE

A. For a particular source of loam, the Engineer may require the Contractor to send approximately 10 pounds of loam to an approved testing laboratory and have the following tests conducted:

1. Organic concentration
2. pH
3. Nitrogen concentration
4. Phosphorous concentration
5. Potash concentration

B. These tests shall be at the Contractor's expense. Test results, with soil conditioning and fertilizing recommendations shall be forwarded to the Engineer.

1.3 SUBMITTALS: IN ACCORDANCE WITH REQUIREMENTS OF GENERAL SPECIFICATIONS, SUBMIT THE FOLLOWING:

A. Information detailing the seed mixes, fertilizers, mulch material, slope protection material (if required) and origin of loam shall be submitted to the Engineer for review.

B. Test results shall be submitted to the Engineer for review.

PART 2 - PRODUCTS

2.1 MATERIALS

A. LOAM

1. Loam shall be a natural, fertile, friable soil, typical of productive soils in the vicinity, obtained from naturally well-drained areas, neither excessively acid nor alkaline, and containing no substances harmful to grass growth. Loam shall not be delivered to the site in frozen or muddy condition and shall be reasonably free of stumps, roots, heavy or stiff clay, stones larger than 1 inch in diameter, lumps, coarse sand, noxious weeds, sticks, brush or other litter.

2. The loam shall contain not less than 4 percent nor more than 20 percent organic matter as determined by the loss of weight by ignition of oven-dried samples. Test samples shall be oven-dried to a constant weight at a temperature of 230 degrees F.

B. LIME

Lime shall be standard commercial ground limestone containing at least 50 percent total oxides (calcium oxide and magnesium oxide), and 50 percent of the material must pass through a No. 100 mesh sieve with 98 percent passing a No. 2 mesh sieve.

C. FERTILIZER

Fertilizer shall be commercial fertilizer, 10-10-10 fertilizer mixture containing at least 40 percent of organic nitrogen. It shall be delivered to the site in the original sealed containers, each showing the manufacturer's guaranteed analysis. Fertilizer shall be stored so that when used it will be dry and free flowing. No fertilizer shall be used which has not been marketed in accordance with State and Federal Laws, relating to fertilizers.

D. MULCH

Materials to be used in mulching shall conform to the following requirements:

1. Hay Mulch - Hay Mulch shall consist of mowed and properly cured grass, clover or other acceptable plants. No salt hay shall be used.
2. Straw Mulch - Straw Mulch shall consist of stalks or stems of grain after threshing.
3. Fiber Mulch - Fiber Mulch shall consist of biodegradable, dyed-wood, cellulose-fiber mulch; nontoxic; free of plant-growth or germination inhibitors; produced from clean, whole uncooked wood, formed into resilient bundles having a high degree of internal friction, a pH range of 4.5 to 6.5, and shall be dry when delivered to the project.
4. Nonasphaltic Tackifier - Nonasphaltic Tackifier shall consist of colloidal tackifier recommended by fiber mulch manufacturer for slurry application; nontoxic and free of plant-growth or germination inhibitors.

E. SEED

1. Seed shall be of an approved mixture, the previous year's crop, clean, high in germinating value, a perennial variety, and low in weed seed. Seed shall be obtained from a reliable seed company and shall be accompanied by certificates relative to mixture purity and germinating value.
2. Grass seed for lawn areas shall conform to the following requirements:

	Proportion by Weight	Germination Purity	Minimum Purity
Chewing's Fescue	30%	70%	97%
Kentucky 31 Fescue	30%	90%	98%
Kentucky Blue Grass	20%	80%	85%
Domestic Rye Grass	20%	90%	98%

3. Grass seed for cross-country areas, slopes and other areas not normally mowed shall conform to the following requirements:

	Proportion by Weight	Germination Minimum	Purity Minimum
Creeping Red Fescue	50%	85%	95%
Kentucky 31	30%	85%	95%
Domestic Rye	10%	90%	98%
Red Top	5%	85%	92%
Ladino Clover	5%	85%	96%

PART 3 - EXECUTION

3.1 SURFACE PREPARATION

- A. The top 6-inches of existing soil shall be removed where indicated on the drawings and the area rough graded.
- B. After approval of rough grading, loam shall be placed on areas affected by the Contractor's operations. Loam shall be at least 6 inches compacted thickness or as directed by the drawings.
- C. Lime shall be applied to bring the pH to 6.5 or, without a soil test, at the rate of 2-3 tons of lime per acre.
- D. Fertilizer shall be applied according to the soil test, or without a soil test, at the rate of 1000 pounds per acre.
- E. Loam shall be worked a minimum of 3 inches deep, thoroughly incorporating the lime and fertilizer into the soil. The loam shall then be raked until the surface is finely pulverized and smooth and compacted with rollers, weighing not over 100 pounds per linear foot of tread, to an even surface conforming to the prescribed lines and grades.

3.2 SEEDING

- A. Seeding shall be done when weather conditions are approved as suitable, in the periods between April 1 and May 30 or August 15 to October 1, unless otherwise approved.

- B. If there is a delay in seeding, during which weeds grow or soil is washed out, the Contractor shall remove the weeds or replace the soil before sowing the seed, without additional compensation. Immediately before seeding is begun, the soil shall be lightly raked.
- C. Seed shall be sown at the approved rate, on a calm day by spray machine method. Other types of seeding methods will not be approved for use.
- D. The surface shall be kept moist by a fine spray until the grass shows uniform germination over the entire area. Whenever poor germination occurs in areas larger than 3 sq. ft., the Contractor shall reseed, roll, and water as necessary to obtain proper germination.
- E. The Contractor shall water, weed, cut and otherwise maintain and protect seeded areas as necessary to produce a dense, healthy growth of perennial lawn grass.
- F. If there is insufficient time in the planting season to complete the fertilizing and seeding, permanent seeding may be left until the following planting season, at the option of the Contractor or on order of the Engineer. In that event, a temporary cover crop shall be sown. This cover crop shall be cut and watered as necessary until the beginning of the following planting season, at which time it shall be plowed or harrowed into the soil, the area shall be fertilized and the permanent seed crop shall be sown as specified.

3.3 PLACING MULCH

- A. Mulch shall be uniformly spread over certain selected seeded areas at the minimum rate of 1,500 pounds per acre unless otherwise directed. It shall be placed by spraying from an approved spraying machine having pressure sufficient to cover the entire area in one operation.

3.4 SEEDING AND MULCHING BY SPRAY MACHINE

- A. The application of lime, fertilizer, grass seed and mulch must be accomplished in one operation by the use of an approved spraying machine. The materials shall be mixed with water in the machine and kept in an agitated state in order that the materials may be uniformly suspended in the water. The spraying equipment shall be so designed that when the solution is sprayed over an area the resulting deposits of lime, fertilizer, grass seed and mulch shall be equal to the specified quantities.
- B. A certified statement shall be furnished, prior to start of work, to the Engineer by the Contractor as to the number of pounds of limestone, fertilizer, grass seed and mulch per 100 gallons of water.
- C. This statement should also specify the number of square yards of seeding that can be covered with the solution specified above. If the results of the spray operation are unsatisfactory, the Contractor will be required to abandon this method and to apply the lime, fertilizer, grass seed and mulch by other methods.
- D. Hay and straw mulch shall be applied after the application of the lime, fertilizer and grass seed.

3.5 HYDROSEEDING

- A. Mix specified seed, fertilizer, and fiber mulch in water, using equipment specifically designed for hydroseed application. Continue mixing until uniformly blended into homogeneous slurry suitable for hydraulic application.
- B. Mix slurry with nonasphaltic tackifier.
- C. Apply slurry uniformly to all areas to be seeded in a one-step process. Apply mulch at a minimum rate of 1,500-lb/acre dry weight but not less than the rate required to obtain specified seed-sowing rate.

3.6 INSPECTION AND ACCEPTANCE

At the beginning of the planting season following that in which the permanent grass crop is sown, the seeded areas will be inspected. Any section not showing dense, vigorous growth at that time shall be promptly reseeded by the Contractor at his own expense. The seeded areas shall be watered, weeded, cut and otherwise maintained by the Contractor until the end of that planting season, when they will be accepted if the sections show dense, vigorous growth.

END OF SECTION

SECTION 03302

FIELD CONCRETE

PART 1 - GENERAL

1.1 WORK INCLUDED

This Section covers concrete and all related items necessary to place and finish the concrete work.

1.2 RELATED WORK

- A. Section 02300, EARTHWORK
- B. Section 02631, PRECAST MANHOLES AND CATCH BASINS

1.3 REFERENCES

- A. The following standards form a part of this specification:

American Concrete Institute (ACI)

ACI 304 Recommended Practice for Measuring, Mixing, Transporting, and Placing Concrete

ACI 305 Recommended Practice for Hot Weather Concreting

ACI 306 Recommended Practice for Cold Weather Concreting

ACI SP-66ACI Detailing Manual

ACI 318 Building Code Requirements for Reinforced Concrete

American Society for Testing and Materials (ASTM)

ASTM A615 Deformed and Plain Billet-Steel Bars for Concrete Reinforcement

ASTM C33 Concrete Aggregates

ASTM C94 Ready-Mixed Concrete

ASTM C143 Test for Slump of Portland Cement Concrete

ASTM C150 Portland Cement

ASTM C260 Air Entraining Admixtures for Concrete

ASTM C494 Chemical Admixtures for Concrete

1.4 SUBMITTALS: IN ACCORDANCE WITH REQUIREMENTS OF GENERAL SPECIFICATIONS, SUBMIT THE FOLLOWING:

Statement of materials constituting the design of mixes for each size aggregate as required by ASTM C94 shall be submitted to the Engineer within one week following award of the Contract.

PART 2 - PRODUCTS

2.1 CONCRETE

- A. All concrete, reinforced or nonreinforced shall have a 28-day compressive strength of 3,000 psi unless otherwise noted on the design drawings. A minimum of 5.5 sacks of cement per cubic yard and a maximum water cement ratio of 6.9 gallons per sack shall be used.
- B. Concrete shall conform to ASTM C94. The Contractor shall be responsible for the design of the concrete mixtures. Slump shall be a maximum of 4-inches and a minimum of 2-inches, determined in accordance with ASTM C143.
- C. Admixtures shall be as specified in subsection 2.5. No additional admixtures shall be used unless approved by the Engineer.
- D. No additional water, except for the amount indicated by the design mix shall be added to the concrete without the prior permission of the Engineer.

2.2 REINFORCING

Reinforcing as shown on the plans or as directed by the Engineer, shall conform to ACI 318 and ASTM A615 and shall be detailed in accordance with ACI SP-66. All Steel reinforcing bars shall be grade 60.

2.3 CEMENT

The cement shall be an approved brand of American manufactured Portland Cement, Type II conforming to the applicable requirements of ASTM C150.

2.4 AGGREGATES

- A. Except as otherwise noted, aggregate shall conform to the requirements of ASTM C33.
- B. Maximum size aggregate shall be $\frac{3}{4}$ -inch.

2.5 ADMIXTURES

- A. All concrete (unless otherwise directed) shall contain an air entraining agent. Air entrained concrete shall have air content by volume of 4 to 8 percent for $\frac{3}{4}$ -inch aggregate.
- B. Air entraining agent shall be in accordance with ASTM C260 and shall be Darex AEA, as manufactured by W.R. Grace & Company; Placewel (air entraining Type), as manufactured

by Johns Manville; Sika AER as manufactured by Sika Chemical Company; or an approved equal product.

- C. Water reducing agent shall be WRDA, as manufactured by W.R Grace & Company; Placewel (non-air entraining Type), as manufactured by Johns Manville; Sika Plastiment as manufactured by Sika Chemical Company; or an approved equal product.
- D. Water reducing agent-retarder shall be "Daratard," as manufactured by W.R. Grace & Company; Sika Plastiment as manufactured by Sika Chemical Company; or an approved equal product.

2.6 WATER

Water for concrete shall be potable, free of deleterious amounts of oil, acid, alkali, organic matter and other deleterious substances.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Before placing concrete, forms and the space to be occupied by the concrete shall be thoroughly cleaned, and reinforcing steel and embedded metal shall be free from dirt, oil, mill scale, loose rust, paint or the material which would tend to reduce the bond.
- B. Earth, concrete, masonry, or other water permeable material against which concrete is to be placed shall be thoroughly saturated with water immediately before concrete is placed.
- C. No concrete shall be placed until the consolidation of the ground and the arrangement and details of forms and reinforcing have been inspected and approved by the Engineer.

3.2 FILL CONCRETE

- A. Fill concrete shall be placed in those locations as indicated on the design drawings. Fill concrete shall consist of materials as previously specified, with a minimum 28-day compressive strength of 3,000 psi.
- B. Before fill concrete is placed, the following procedures shall be used to prepare surfaces; all dirt, scum and laitance shall be removed by chipping and washing. The clean, roughened base surface shall be saturated with water, but shall have no free water on the surface. A coat of 1:2 cement-sand grout, approximately 1/8-inch thick, shall be well scrubbed into the thoroughly dampened concrete base. The concrete fill shall be placed immediately, before grout has dried or set.
- C. Fill concrete shall be brought to lines and grades as shown on the design drawings.

3.3 CONCRETE PLACING DURING COLD WEATHER

- A. Concrete shall not be placed on frozen ground, and no frozen material or material containing ice shall be used. Materials for concrete shall be heated when temperature is below 40°F, or is expected to fall to below 40°F, within 73 hours, and the concrete after placing shall be protected by covering, heat, or both.
- B. All details of Contractor's handling and protecting of concrete during freezing weather shall be subject to the approval and direction of the Engineer. All procedures shall be in accordance with provisions of ACI 306.

3.4 CONCRETE PLACING DURING HOT WEATHER

- A. Concrete just placed shall be protected from the direct rays of the sun and the forms and reinforcement just prior to placing, shall be sprinkled with cold water. The Contractor shall make every effort to minimize delays which will result in excessive mixing of the concrete after arrival on the job.
- B. During periods of excessively hot weather (90°F or above), ingredients in the concrete shall be cooled insofar as possible and cold mixing water shall be used to maintain the temperature of the concrete at permissible levels all in accordance with the provisions of ACI 305. Any concrete with a temperature above 90°F, when ready for placement, will not be acceptable, and will be rejected.

3.5 FIELD QUALITY CONTROL

- A. Concrete inspection and testing shall be performed by the Engineer or by an inspection laboratory, designated by the Engineer, engaged and paid for by the Owner. Testing equipment shall be supplied by the laboratory, and the preparation of samples and all testing shall be performed by the laboratory personnel. Full assistance and cooperation, concrete for samples, and such auxiliary personnel and equipment as needed shall be provided by the Contractor.
- B. At least 4 standard compression test cylinders shall be made and tested and 1 slump test from each day's placement of concrete. A minimum of four compression test cylinders shall be made and tested for each 100 cubic yards of each type and design strength of concrete placed. One cylinder shall be tested at 7 days, and two at 28 days. The fourth cylinder from each set shall be kept until the 28 day test report on the second and third cylinders in the same set has been received. If the average compressive strength of the two 28 day cylinders do not achieve the required level, the Engineer may elect to test the fourth cylinder immediately or test it after 56 days. If job experience indicates additional cylinder tests or other tests are required for proper control or determination of concrete quality, such tests shall be made.
- C. The Engineer shall have the right to reject concrete represented by low strength tests. Rejected concrete shall be promptly removed and replaced with concrete conforming to the specification. The decision of the Engineer as to whether substandard concrete is to be accepted or rejected shall be final.

END OF SECTION