

June 25, 2014
State Project No. 34-313
F.A.P. No. 0841 (095)

I-84 Interchanges 5 & 6 Improvements
City of Danbury

INDEX TO SPECIAL PROVISIONS

Note: This index has been prepared for the convenience of those using this contract with the sole express purpose of locating quickly the information contained herein; and no claims shall arise due to omissions, additions, deletions, etc., as this index shall not be considered part of the contract.

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**June 25, 2014
F.A.P. No. 0841 (95)
State Project No. 34-313**

**Interchanges 5 & 6 Improvements
City of Danbury**

The State of Connecticut, Department of Transportation, Standard Specifications for Roads, Bridges and Incidental Construction, Form 816, 2004, as revised by the Supplemental Specifications dated January 2014 (otherwise referred to collectively as "ConnDOT Form 816") is hereby made part of this contract, as modified by the Special Provisions contained herein. . The State of Connecticut Department of Transportation's "Construction Contract Bidding and Award Manual" ("Manual"), May 14, 2010 edition or latest issue, is hereby made part of this contract. If the provisions of this Manual conflict with provisions of other Department documents (not including statutes or regulations), the provisions of the Manual will govern. The Manual is available upon request from the Transportation Manager of Contracts. The Special Provisions relate in particular to the I-84 Interchanges 5 & 6 Improvements in the City of Danbury.

CONTRACT TIME AND LIQUIDATED DAMAGES

In order to minimize the hazard, cost and inconvenience to the traveling public, pollution of the environment and the detriment to the business area, it is necessary to limit the time of construction work, which interferes with traffic as specified in Article 1.08.04 of the Special Provisions.

There will be two assessments for liquidated damages and they will be addressed in the following manner:

1. For this contract, an assessment per day for liquidated damages, at a rate of _____ Dollars per day shall be applied to each calendar day the work runs in excess of the _____ allowed calendar days for the contract.
2. For this contract, an assessment per hour for liquidated damages shall be applied to each hour, or any portion thereof, in which the Contractor interferes with normal traffic operations during the restricted hours given in Article 1.08.04 of the Special Provisions. The liquidated damages shall be as shown in the following tables entitled "Liquidated Damages Per Hour" for each hour, or any portion thereof, in which the Contractor interferes with normal traffic operations during the restricted hours.

For the purpose of administering this contract, normal traffic operations are considered interfered with when:

1. Any portion of the travel lanes or shoulders is occupied by any personnel, equipment, materials, or supplies including signs.

2. The transition between the planes of pavement surfaces is at a rate of one inch in less than fifteen feet longitudinally.

_____ (xxx) calendar days from the initial Notice to Proceed are allowed for the completion of this project and the liquidated damages charge to apply shall be as shown in the below tables.

LIQUIDATED DAMAGES PER HOUR

Route I-84 Eastbound 3 Lane Section		
If Working Periods Extends Into	1 Lane Closure	2 Lane Closure
1st Hour of Restrictive Period	\$ 500	\$ 500
2 nd Hour of Restrictive Period	\$ 500	\$ 10,000
3rd Hour or any Subsequent Hour of Restrictive Period	\$ 500	\$ 40,000

Route I-84 Westbound 3 Lane Section		
If Working Periods Extends Into	1 Lane Closure	2 Lane Closure
1st Hour of Restrictive Period	\$ 500	\$ 25,000
2nd Hour of Restrictive Period	\$ 30,000	\$ 100,000
3rd Hour or any Subsequent Hour of Restrictive Period	\$ 50,000	\$ 100,000

The above liquidated damages apply to those hours shown on the Limitation of Operations charts designated with a “2”, “3” or “E”.

For those hours on the Limitation of Operations charts designated with a "2", the liquidated damages shown above for "1 Lane Closure" shall apply when only one lane is open to traffic.

For each hour shown on the Limitation of Operations charts designated with an "E", liquidated damages of \$500 shall apply for each hour, or part thereof, if all available shoulder widths are not available to traffic.

Liquidated damages in the amount of \$500 shall apply for each hour, or part thereof, that the Contractor interferes with existing traffic operations on any ramps or turning roadways during the non-allowable hours.

CONTRACT TIME AND LIQUIDATED DAMAGES

In order to minimize the hazard, cost and inconvenience to the traveling public, pollution of the environment and the detriment to the business area, it is necessary to limit the time of construction which interferes with traffic as specified in Article 1.08.04 of the Special Provisions and Item No. 1132001A Relocate Incident Management System.

IMS Equipment Installations

Equipment Operations/VMS Operations

For this Contract, an assessment per day for liquidated damages, at a rate of Two Thousand Dollars (\$2,000) per day shall be applied to each calendar day that the Incident Management System (IMS) equipment are not operational. The IMS equipment included in this Contract are the following:

- Existing CCTV Camera Site No. 148 (I-84 WB at Exit 6)
- Existing Portable VMS 214 (I-84 WB at Exit 6)

Response Time

For this Contract, an assessment per day for liquidated damages, at a rate of One Thousand Dollars (\$1,000) shall be applied for repairs that are not commenced more than 8 hours after notification to each CCTV Cameras, Traffic Flow Monitor and/or Variable Message Sign (VMS) Site failure.

The contractor shall refer to the “Notice to Contractor – IMS Installation Qualifications”, Section 1.08 – Prosecution and Progress, Item No. 1132001A Relocate Incident Management System and Item No. 11122250A Equipment Operations special provisions for terms and conditions.

NOTICE TO CONTRACTOR – UTILITY GENERATED SCHEDULE

The attached project specific utility work schedule was provided to the Connecticut Department of Transportation (Department) by the utility companies regarding their identified work on this project.

The utility scheduling information is provided to assist the Contractor in scheduling its activities. However, the Department does not ensure its accuracy and Section 1.05.06 of the Standard Specifications still is in force.

The utility scheduling information shall be incorporated into the Contractor's pre-award schedule in accordance with the Department's Bidding and Award Manual and Section 1.05.08 of the Contract.

After award, the Contractor shall conduct a utility coordination meeting or meetings to obtain contemporaneous scheduling information from the utilities prior to submitting its baseline schedule to the Department in accordance with Section **(1.05.08 – Schedules and Reports)** of the Contract.

The Contractor shall incorporate the contemporaneous utility scheduling information into its baseline schedule submittal. The baseline schedule shall include Contractor predecessor and successor activities to the utility work in such detail as acceptable to the Engineer.

rev. 5/20/2013		UTILITY WORK SCHEDULE	
CTDOT Project Number:	34-313	Town:	Danbury
Project Description:	Utility Relocation for Bridge improvement		
CTDOT Utilities Engineer:			
Phone:		Email:	
Utility Company:	Comcast		
Prepared By:	Mark Rohssler	Date Prepared:	4/20/2014
Phone:	860-883-6026	Email:	mark_Rohssler@cable.comcast.co
Scope of Work			
<p>The following is a description of all utility work planned to be completed in conjunction with the CTDOT project. The narrative describes all work to be carried out by the utility or its contractor, including temporary and permanent work required by the project as well as any additional utility infrastructure work the utility intends on performing within the project limits during the construction of the project.</p>			
<p>Excavate and relocate conduits on Tamarack Ave, Franklin St Ext and Kohanza St. Pull new cables and fiber thru conduits and splice over as needed. Wreck out old cable and fiber. Work schedule will be dependent on the relocation of CL&P utilities and will take 10 working days time time period at each location after the completion of CL&P relocation at each location</p>			
Special Considerations and Constraints			
<p>The following describes the limiting factors that must be planned for in the scheduling and performance of the utility work. For example, restrictions on cut-overs, outages, limitations on customer service interruptions (e.g. nights, weekends, holidays), seasonal and environmental shutdown periods, long lead material procurements, etc..</p>			

rev. 5/20/2013		UTILITY WORK SCHEDULE	
CTDOT Project Number:	34-313	Town:	Danbury
Project Description:	I-84 Interchanges 5 & 6 Improvements		
CTDOT Utilities Engineer:	Craig Wallace		
Phone:	860-594-2696	Email:	Craig.Wallace@ct.gov
Utility Company:	Yankee Gas		
Prepared By:	Joel Szarkowicz	Date Prepared:	4/18/2014
Phone:	203-854-6458	Email:	joel.szarkowicz@nu.com
Scope of Work			
<p>The following is a description of all utility work planned to be completed in conjunction with the CTDOT project. The narrative describes all work to be carried out by the utility or its contractor, including temporary and permanent work required by the project as well as any additional utility infrastructure work the utility intends on performing within the project limits during the construction of the project.</p>			
<p>North St - STA 306+00 to STA 310+08: Install 455' of 8" plastic gas main. Retire 350' of 6" cast iron gas main. Replace/relocate known gas services. Second Ave - STA 40+07 to STA 43+28: Install 318' of 6" plastic gas main. Retire 315' of 4" cast iron gas main. Replace or tie over services to existing customers. Second Ave - STA 43+28: Relocate 6" steel gas main in area of proposed drainage. Second Ave - STA 43+28 to STA 46+79: Install 355' of 4" steel gas main. Retire 370' of 4" steel gas main. Replace or tie over services to existing customers. Padanaram Ave - STA 10+86: Relocate 4" steel gas main in proposed drainage area. Walnut St - STA 20+63: Relocate 4" plastic gas main in proposed drainage area. Relocate gas service to #116 in area. Padanaram Rd - STA 326+94: Retire 2" plastic gas service stub. Additionally, Yankee Gas is currently reviewing the feasibility of performing additional cast iron gas main replacement work within the project limits, pending project design and internal financial approval for calendar year 2015.</p>			
Special Considerations and Constraints			
<p>The following describes the limiting factors that must be planned for in the scheduling and performance of the utility work. For example, restrictions on cut-overs, outages, limitations on customer service interruptions (e.g. nights, weekends, holidays), seasonal and environmental shutdown periods, long lead material procurements, etc..</p>			
<p>Yankee Gas wishes to avoid main replacement work during heating season (November 1 to April 15). The proposed work increases the risk of customer outages and potentially restricts gas flow in the area during the heating season.</p>			

UTILITY WORK SCHEDULE

CTDOT Project Number: 34-313

Utility Company: Yankee Gas

Prepared By: Joel Szarkowicz

Total Calendar Days: 0

Schedule

The following schedule identifies each major activity of utility work in sequential order to be performed by the utility or its contractor. The location of each activity of work is identified by the baseline stationing on the CTDOT plans. All activities identify the predecessor activity which must be completed before a utility work activity may progress. The duration provided is the number of calendar days required to complete the utility work activity based on historical information and production rates.

Location (Station to Station)	Description of Utility Work Activity	Predecessor Activity	Duration (calendar days)
306+00 - 310+08	Install 8" plastic gas main. Reconnect/replace gas services. Retire 6" cast iron main.	Installed in conjunction with Second Ave (40+07 - 43+28) gas main work.	15 days
40+07 - 43+28	Install 6" plastic gas main. Reconnect/replace gas services. Retire 4" cast iron gas main.	Relocate fire hydrant before gas work commences.	10 days
43+28	Install 6" steel gas main to relocate around/under proposed drainage structures in Rowan St.	Work in conjunction with Second Ave (43+28 - 46+79) gas main work.	3 days
43+28 - 46+79	Install 4" steel gas main. Reconnect/replace gas services. Retire existing 4" steel gas main.		10 days
10+86	Install 4" steel offset under proposed drainage. Relocate nearby gas service as required.		3 days
20+63	Install 4" plastic offset under proposed drainage. Relocate nearby gas service as required.		3 days
326+94	Retire 2" plastic gas service stub at main.		1 day
		Note: Due to direct conflicts, all North St/Second Ave work must be completed before commencement of drainage work in the area.	

NOTICE TO CONTRACTOR – INSTALLATION QUALIFICATIONS

All management, construction, installation, and inspection services shall be performed by individuals who have performed the same job function on at least two previously completed construction and installation communication projects of comparable size and complexity.

Approval of ITS Equipment Installer:

Each Contractor or Subcontractor performing the work involved with the installation of Intelligent Transportation System (ITS) equipment related to the Incident Management System shall provide references and resumes of staff that shall meet the following requirements:

Satisfactory completion of at least three (3) projects in the last three (3) years that includes the installation of each of the ITS equipment identified below.

- 100 mm Multiduct Conduit
- Pullboxes
- Camera Lowering Devices
- Camera Assemblies
- Traffic Management System Cabinets (TMSC)
- Traffic Flow Monitors (TFM) and TFM Poles
- Variable Message Signs (VMS) and VMS Controller Cabinets

The Contractor shall provide a list of each ITS project which the Contractor has performed, including a description of each project, the location of each project, inclusive dates of when the work was performed on each project, and a contact reference for each project listed.

This document shall be submitted to ConnDOT for review and approval before any Incident Management System project work may proceed.

Approval of Fiber-Optic Cable Installation, Splicing and Testing:

Each Contractor or Subcontractor performing the work involved with installing, splicing and testing of cable and electronic communication systems and installing detection and video systems, shall provide references and resumes of staff that are assigned to work on this project shall meet the following requirements:

Satisfactory completion of at least three (3) fiber-optic based communication projects in the last three years. Experience shall be in related fiber optic systems for installers involving single-mode cables in excess of 10 kilometers.

The Contractor shall provide a list of each fiber-optic based communications project and/or intelligent transportation system project which the Contractor has performed, including a

description of each project, the location of each project, inclusive dates of when the work was performed on each project, and a contact reference for each project listed. Each of the referenced projects shall include completing a minimum of three (3), multifiber, single-mode, optical fiber cable fusion splices, and installation of at least 25 optical connectors on single-mode optical fibers. As a minimum, the contact reference shall include an individual's name, training certificates (including updated licenses), title, and current telephone number.

This document shall be submitted to ConnDOT for review and approval before any Incident Management System project work may proceed.

Approval of ITS Systems Integrator:

The Prime Contractor or qualified proposed ITS Systems Integrator Subcontractor performing the work described in these Special Provisions which are involved with supplying, installing, configuring and testing of electronic communication systems and video systems for the Incident Management System shall provide a printed document (nine copies) that contains the proposed ITS Systems Integrator's experience in the areas noted below, as well as references and resumes for staff proposed to perform the project work. The document should clearly indicate how the proposed ITS Systems Integrator meets the following requirements:

- Experience involving at least seven (7) ITS system integration projects with overall system responsibility and accountability, each employing at least 8 camera sites used for highway transportation purposes. A minimum of 7 years experience in ITS system integration.
- Design and installation of at least 200 point-to-point optical digital video links used for highway transportation purposes.
- A minimum of two (2) projects using video matrix switchers with a minimum size of 240 inputs and 64 outputs of analog video used for highway transportation purposes.
- Installation of video compression equipment involving at least ten sites, comprising video compression algorithms including but not limited to: H.261, MPEG1, MPEG2, MPEG4, and MJPEG used for highway transportation purposes.
- Experience using various applicable test equipment including: Fiber Optic Spectrum Analyzer, OTDR, BERT, Protocol Analyzer, and Oscilloscope.
- Installation of a minimum of 40 digital video encoder and decoder devices.
- Ability to respond within 2 hours travel by car to Central Office located at ConnDOT, 2800 Berlin Turnpike, Newington CT.
- Provision of 24x7x365 maintenance available with technicians fully trained in ITS related equipment.

- Demonstrate a general working knowledge of specifications RS-170 and RS-250C.
- Demonstrate a general working knowledge of communications protocols utilized in the CCTV industry.
- Demonstrate a general working knowledge of physical communications interfaces such as RS-232, RS-422, RS-485, RS-530, and RS-449.
- Demonstrate extensive working knowledge of Ethernet physical topologies TCP/IP routing schemes, metro ring and link aggregation protocols, VLAN configurations, and Quality of Service configuration and setup.
- Have working experience in configuring Nortel Sonet equipment.

The document for the ITS Equipment Installer, Fiber-Optic Cable Installation, Splicing and Testing Qualifications and ITS Systems Integrator shall be submitted for approval within ten (10) days of the Contract Award to:

Mr. Harold J. Decker
Connecticut Department of Transportation
Bureau of Engineering and Highway Operations
2800 Berlin Turnpike P.O. Box 317456
Newington, Connecticut 06131-7546

These requirements shall apply to the following contract item installations:

- Optical Fiber Cable, Single Mode, Loose Buffered Tube Cable, 6-Fiber, 12-Fiber, 36 Fiber and 72-Fiber
- Fiber Optic Cable Splice Closures
- Repair Fiber Optic Cable
- Traffic Management System Cabinets
- Traffic Management System Mini-Hub Cabinets
- Video equipment, including cameras and mountings
- Modify Existing Operations Center Control System
- Modify Existing Mini-hub Cabinet
- Optical Video/Data Transmitter and Receiver
- 10/100 Ethernet Switch
- Terminal Server
- Port Sharing Device
- Ethernet Media Converter
- Video and Graphics Wall Equipment

- Multi-Channel Fiber Optic Video Multiplexer/Demultiplexer
- Modify Existing Main Fiber Hub
- Single Mode Fiber Optic Directional Coupler
- Traffic Flow Monitor
- 10/100 Ethernet Router

The Contractor shall not start work on the Incident Management System until the Contractor receives approval from the Office of Highway Operations.

The Incident Management System shall be maintained in normal working operation at all times.

In the event that the Contractor needs to remove an Incident Management System device from service, the Contractor shall notify Mr. Robert Kennedy at the Newington Operations Center (860) 594-3458 at least ten (10) working days prior to any scheduled work operation. An Incident Management System device shall consist of CCTV Cameras, Traffic Management System Cabinets (TMSC), Mini-Hub cabinets, Traffic Flow Monitors (TFM), Variable Message Signs (VMS), Highway Advisory Radio (HAR) site equipment and fiber optic cable including any associated fiber optic communications plant equipment.

All Project related scheduled work that will require the downtime of the Incident Management System, such as the splicing of the fiber optic trunkline cable, shall be performed on a non-holiday weekend as specified in Section 1.08 Prosecution and Progress - Incident Management System and as approved by Mr. Robert Kennedy, Newington Operations Center. The scheduled work performed on the approved non-holiday weekend shall be completed in a fifteen (15) hour work window. The Contractor shall identify the work that will be performed during this work window as well as a list of the approved staff to be performing work on the Incident Management System. Any deviation in the fifteen (15) hour work window must be approved by the Newington Operations Center staff.

Prior to the scheduled start of work on the Incident Management System, the Contractor shall contact the Bridgeport Operations Center to determine if there are any on-going incidents on the highway system. The Incident Management System will not be removed from service until any on-going incidents on the highway system are cleared and approval is granted by the Newington Operations Center staff.

All Contractor personnel involved in the placing, splice preparation and splicing of fiber optic cable shall meet or exceed the above referenced installation qualifications and shall be approved by the Office of Highway Operations. Under no circumstance will unqualified, unapproved Contractor personnel be allowed to work on the Incident Management System.

All Contractor personnel involved in terminating communication cables for the above listed items shall meet or exceed the above referenced installation qualifications and shall be approved by the Office of Highway Operations.

NOTICE TO CONTRACTOR – USE OF STATE POLICE OFFICERS

The Department will reimburse services of State Police Officers as a direct payment to the Department of Emergency Services and Public Protection. Payment for State Police Officers utilized by the Contractor for its convenience, not approved by the Engineer, is the responsibility of the Contractor. No separate payment item for State Police Officers is included in this contract.

Any costs associated with coordination and scheduling of State Police Officers will be included under the cost of Item No. 0971001A – Maintenance and Protection of Traffic.

NOTICE TO CONTRACTOR - UTILITY SPECIFICATIONS

The contractor is hereby notified that all utility specifications contained elsewhere herein shall be made a part of this contract, and that the contractor shall be bound to comply with all requirements of such specifications. The requirements and conditions set forth in the subject specifications shall be binding on the contractor just as any other specification would be.

**NOTICE TO CONTRACTOR - CONNECTICUT DEPARTMENT OF
TRANSPORTATION DISCLAIMER**

Connecticut Department of Transportation bidding and other information and documents which are obtained through the Internet or other sources, not authorized by the Department, are not to be construed to be official information for the purposes of bidding or conducting other business with the Department.

It is the responsibility of each bidder and all other interested parties to obtain all bidding related information and documents from authorized official sources of the Department, such as, the Department of Administrative Services (DAS) State Contracting Portal and Bid Express (bidx.com).

Persons and/or entities which reproduce and/or make such information available by any means are not authorized by the Department to do so and may be liable for claims resulting from the dissemination of unofficial, incomplete and/or inaccurate information.

NOTICE TO CONTRACTOR - SERVICE CONNECTIONS (UTILITIES)

The Contractor is hereby notified that certain conditions pertaining to the installation of new telephone service and/or electrical service for the Traffic Management System Cabinets, Traffic Management System Mini-Hub Cabinet and Variable Message Sign Cabinet are required, as part of this contract.

Unless otherwise approved by the Engineer, the responsibilities for utility services for the IMS Service Cabinet shall be as follows:

POWER:

CL&P to provide electrical service cable from the service source, either utility pole or underground structure, to meter socket on Service Cabinet. The Contractor shall install 75 mm RMC Conduit to the base of the pole with approved conduit covers. CL&P will install the conduit riser and pull the service conductors through the installed conduit to the meter socket.

The Contractor shall contact the utility representatives listed on the plans in advance of the start of construction at each site.

TELEPHONE:

AT&T is to provide telephone conductors from the service source, either utility pole or underground structure, to an Auxiliary Termination Cabinet on the PVMS 214/CCTV 148 Service Cabinet. The Contractor will install conduit and conduit risers with an entrance fitting (weatherhead) on the custodial utility pole with pull string for AT&T personnel to install the conductors. The Contractor is responsible for coordinating the field installation for relocated telephone and T1 Circuit service. The Contractor shall meet the telephone representative at the sites to ensure installation is complete and operational. The Contractor shall notify Robert Kennedy, Highway Operations at 860-594-3458 when the telephone installation is complete.

NOTICE TO CONTRACTOR - SECTION 4.06 AND M.04 MIX DESIGNATION EQUIVALENCY

Sections 4.06 and M.04 have been replaced in their entirety with the Special Provisions included as part of this contract. These Special Provisions reflect changes in mix designations for various types of hot-mix asphalt (HMA). The following table is to be used to associate mix designations noted on the plans with that in the contract specifications and related documents. Mix designations on each row are equivalent and refer to a single mix, which shall be subject to the requirements of the Special Provisions replacing Sections 4.06 and M.04.

Mix Designation Equivalency Table

Official Mix Designation	Equivalent Mix Designation (a)	Equivalent Mix Designation (b)
(c)	Superpave 1.5 inch	Superpave 37.5 mm
HMA S1	Superpave 1.0 inch	Superpave 25.0 mm
HMA S0.5	Superpave 0.5 inch	Superpave 12.5 mm
HMA S0.375	Superpave 0.375 inch	Superpave 9.5 mm
HMA S0.25	Superpave 0.25 inch	Superpave 6.25 mm
(d)	Superpave #4	Superpave #4
Bituminous Concrete Class 1	N/A*	N/A*
Bituminous Concrete Class 2	N/A*	N/A*
Bituminous Concrete Class 3	N/A*	N/A*
Bituminous Concrete Class 4	N/A*	N/A*
Bituminous Concrete Class 12	N/A*	N/A*

(a) This mix designation is generally included with projects where the English measurement system is used. The mix designation may contain both the English measurement system designation and the SI (metric) measurement system designation, one of which would be in parenthesis.

(b) This mix designation is generally included with projects where the SI (metric) measurement system is used. The mix designation may contain both the English measurement system designation and the SI measurement system designation, one of which would be in parenthesis.

(c) This mix is no longer in use except by contract-specific Special Provision; if this mix is called for in the Plans but no such Special Provision is included for this contract a suitable substitute must be approved by the Engineer.

(d) This mix is no longer in use except by contract-specific Special Provision; if this mix is called for in the Plans but no such Special Provision is included for this contract a suitable substitute must be approved by the Engineer.

* N/A = Not applicable; mix designation has not changed.

NOTICE TO CONTRACTOR - SUPERPAVE DESIGN LEVEL INFORMATION

Hot-Mix Asphalt (HMA) and Polymer-Modified Asphalt (PMA) constructed according to the Superpave mix-design system is required to attain a Superpave Design Level and is required to use a Performance Graded (PG) binder. The Superpave Design Levels required for this project are listed in Table 1. The required PG binder is indicated for each mix with an “X” in the appropriate box in Table 1.

TABLE 1 – Superpave Design Level and Performance Graded (PG) Binder

Mix Designation	PG Binder		Route 37	Route 84 Ramps	Second Avenue	Route	Route
	PG 64-22	PG 76-22	<u>Danbury</u>	<u>Danbury</u>	<u>Danbury</u>	_____	_____
	PG 64-22	PG 76-22	Design Level	Design Level	Design Level	Design Level	Design Level
HMA S0.25	-	-	-	-	-	-	-
HMA S0.375	-	-	-	-	-	-	-
HMA S0.5	-	-	-	-	2	-	-
HMA S1	X	-	3	3	-	-	-
PMA S0.25	-	-	-	-	-	-	-
PMA S0.375	-	-	-	-	-	-	-
PMA S0.5	-	X	3	3	-	-	-
PMA S1	-	X	-	-	-	-	-

Note: Please note that PMA mix designations typically use PG 76-22 and HMA mix designations use PG 64-22.

NOTICE TO CONTRACTOR - TRAFFIC DRUMS AND TRAFFIC CONES

Traffic Drums and 42-inch (1 m) Traffic Cones shall have four six-inch (150 mm) wide stripes (two - white and two - orange) of flexible bright fluorescent sheeting.

The material for the stripes shall be one of the following, or approved equal:

- 3M Scotchlite Diamond Grade Flexible Work Zone Sheeting, Model 3910 for the white stripes and Model 3914 for the orange stripes,
- Avery Dennison WR-7100 Series Reboundable Prismatic Sheeting, Model WR-7100 for the white stripes and Model WR-7114 for the orange stripes.

NOTICE TO CONTRACTOR - NCHRP 350 REQ. FOR WORK ZONE TRAFFIC CONTROL DEVICES

CATEGORY 1 DEVICES (traffic cones, traffic drums, tubular markers, flexible delineator posts)

Prior to using the Category 1 Devices on the project, the Contractor shall submit to the Engineer a copy of the manufacturer's self-certification that the devices conform to NCHRP Report 350.

CATEGORY 2 DEVICES (construction barricades, construction signs and portable sign supports)

Prior to using Category 2 Devices on the project, the Contractor shall submit to the Engineer a copy of the Letter of Acceptance issued by the FHWA to the manufacturer documenting that the devices (both sign and portable support tested together) conform to NCHRP Report 350 (TL-3).

Specific requirements for these devices are included in the Special Provisions.

Information regarding NCHRP Report 350 devices may be found at the following web sites:

FHWA: http://safety.fhwa.dot.gov/roadway_dept/road_hardware/index.htm

ATSSA: <http://www.atssa.com/resources/NCHRP350Crashtesting.asp>

NOTE: The portable wooden sign supports that have been traditionally used by most contractors in the State of Connecticut do NOT meet NCHRP Report 350 criteria and shall not be utilized on any project advertised after October 01, 2000.

CATEGORY 3 DEVICES (Truck-Mounted Attenuators & Work Zone Crash Cushions)

Prior to using Category 3 Devices on the project, the Contractor shall submit to the Engineer a copy of the Letter of Acceptance issued by the FHWA to the manufacturer documenting that the devices conform to NCHRP Report 350.

NOTICE TO CONTRACTOR – EXISTING IMS

The Contractor is herein made aware of existing Incident Management System (IMS) conduit and appurtenances including co-located Portable Variable Message Sign (PVMS) and CCTV Camera Sites are located in the vicinity of the project area.

The Contractor will be responsible for locating, verifying the location of and protecting all IMS below and above the ground. Prior to the start of construction, the Contractor shall contact “Call Before You Dig” and all utility within the towns along the project corridor. The Contractor shall also contact Mr. Robert Kennedy of ConnDOT Highway Operations at 860-594-3458 to mark out IMS conduit and appurtenances.

NOTICE TO CONTRACTOR - GENERAL PERMIT FOR STORMWATER DISCHARGE

This notice is provided to summarize some of the requirements of the Connecticut Department of Energy and Environmental Protection's General Permit for the Discharge of Stormwater and Dewatering Wastewaters associated with Construction Activities (Permit) issued on August 21, 2013, effective October 01, 2013. In no way, does this Notice alleviate the Contractor from understanding and complying with all the requirements and conditions of the Permit.

The Stormwater Pollution Control Plan (SWPCP) addresses pollution caused by soil erosion and sedimentation during construction as well as the long term post-maintenance use of the facility after construction is completed. The Contractor and all subcontractors will be required to sign a certified statement to comply with all applicable conditions of the SWPCP. There will be no additional payment for the Contractor to sign the certification statement and no additional payment for the Contractor to comply with the conditions of the SWPCP.

Erosion and Sedimentation Controls - Structural Measures:

When construction activities will result in the disturbance of a total of 1 acre or more of land regardless of phasing, the Connecticut Department of Transportation (Department) will incorporate a Stormwater Registration and SWPCP as part of the Contract documents in order to insure compliance with all conditions of this Permit. The Permit's 'Construction activities' means activities including but not limited to clearing and grubbing, grading, excavation, and dewatering.

Unless specifically outlined in the Contract Plans and/or SWPCP, the Contractor is not allowed to disturb more than two (2) acres of erodible material per discharge point at any one time regardless of phasing. If the Contractor elects to deviate from the Contract Plans and/or SWPCP to disturb more than two (2) acres of erodible material per discharge point at any one time regardless of phasing, the Contractor must provide a sequenced staging plan outlining the proposed disturbed activities. In all cases, the Contractor must meet the following conditions:

- *If the area of disturbance is maintained less than two (2) acres per discharge point*, the Contractor may disturb additional areas if and only if the previously disturbed areas are temporarily or permanently stabilized immediately using acceptable measures such as the standard controls which are provided in the SWPCP or as shown on the Contract Plans.
- *If the construction activities create an area of disturbance between (2) acres and (5) acres per discharge point*, the Contractor must submit to the Engineer a revised SWPCP for review and approval. The SWPCP must include locations of the temporary sedimentation trap per discharge point with a capacity to contain 134 cubic yards per acre of material in accordance with the 2002 Connecticut Guidelines for Erosion and Sediment Control (Guidelines). The Contractor shall provide an inspection and maintenance plan for the temporary sedimentation trap as part of the amended SWPCP.

- *If the area of disturbance has a potential to reach more than five (5) acres per discharge point,* the Contactor must submit to the Engineer a revised SWPCP for review and approval. The SWPCP must include locations of the temporary sediment basin designed and installed in accordance with the Guidelines. The Contractor shall provide an inspection and maintenance plan for the temporary sediment basin as part of the amended SWPCP.

Other Controls – Washout Areas:

Unless specifically outlined in the Contract Plans and/or SWPCP, the Contractor will be required to identify a designated washout area(s) to collect concrete, paint and other materials from applicators, containers, vehicles and equipment. There shall be no surface discharge of washout wastewaters from this area. In addition to the above, the following conditions must be met:

- Washout shall be conducted outside of any buffers and at least 50 feet from any stream, wetland or sensitive resource.
- Washout shall be conducted in an entirely self-contained system.
- Designated washout areas are to be clearly flagged.
- All washwater is to be directed into a container or pit designed that no overflows can occur during a rainfall event or snowmelt.
- Hardened concrete is considered “Waste Disposal” and is to be removed from the project and disposed of at an approved facility.

Routine Inspections:

At a minimum, the Contractor along with a qualified inspector (provided by the permittee) shall inspect, at minimum, the following: disturbed areas of the construction activity that have not been finally stabilized; all erosion and sedimentation control measures; all structural control measures; soil stockpile areas; washout areas and locations where vehicles enter or exit the site at least once a week and within 24 hours at the end of a storm event that is equal to or exceeds 0.5 inches. If a potential source of pollution is identified, pollution preventive measures shall be implemented within 24 hours and the SWPCP must be amended within three calendar days.

Keeping Plans Current:

If the Contractor requires a modification to the SWPCP, it shall be in accordance with the Guidelines and the 2004 Connecticut Stormwater Quality Manual or amended. The Department shall approve or reject the modification to the SWPCP and notify the Contractor in writing as to any revisions or additional information required for approval. No damage for delays will be granted to the Contractor based on time taken by the Department to review the Contractor’s proposal, or to apply for or secure the Permit amendment, modification or revision as per Section 1.10 - Environmental Compliance, of the Standard Specifications for Roads, Bridges, and Incidental Construction Form 816 and any Supplements thereto.

Date 01/29/14

At no time shall the Contractor proceed with the proposed SWPCP amendment, modification, or revision unless the Engineer approves, in writing, the Contractor's request. The permittee shall amend the SWPCP whenever there is a change in Contractors or subcontractors at the site, or a change in design, construction, operation, or maintenance at the site which has the potential for the discharge of pollutants. In all cases as described above, the amended SWPCP shall adhere to and comply with Section 1.10 - Environmental Compliance, of the Standard Specifications for Roads, Bridges and Incidental Construction Form 816 and any Supplements thereto. No additional payment will be made for any Permit amendment, modification, or revision which alters the Contract Plans, SWPCP, and/or estimated quantities as a result of the Department's approval of the modifications to the Contract by the Contractor. Changes or variations to the Contract Plans and/or SWPCP by the Contractor shall not result in any additional cost to the State.

In order for the Contractor to meet the requirements set forth in the SWPCP, the Contractor shall comply with additional erosion and sedimentation control provisions included in the project or as identified in the Guidelines.

NOTICE TO CONTRACTOR – BEST MANAGEMENT PRACTICE REQUIREMENTS FOR WORKING IN A PUBLIC WATERSHED, WELL HEAD PROTECTION AREA, AQUIFER PROTECTION AREA (APA) AND/OR SOLE SOURCE AQUIFER AREA (SSA)

The Contractor is hereby notified that the location of the project occurs within a public watershed, well head protection area, APA, and/or SSA. The Contractor is hereby notified that the location of 34-313 occurs within one of these sensitive areas. The protected areas encompass the area of contribution and recharge for the protected resource, as depicted on the attached graphics. Please note that the attached graphics are not intended for public viewing and is not subject to requests under the Freedom of Information Act. As a result of this location, special requirements must be followed for cleaning machinery, storage of materials, and servicing/fueling equipment.

1. All Contractors and their employees must be informed of the sensitive area that they are working in. No pollutants may be discharged that could have adverse effects on the public drinking water supply. Any fuel or other hazardous chemical spills must be reported immediately to the DEEP Oil and Chemical Spills Unit at (860) 424-3338, the Department of Public Health's Drinking Water Division at 860-509-7333, and The Danbury Water Department at 203-797-4539.
2. Contractors must adhere to specialized cleanup procedures while working within the watershed, well head protection area, APA and/or SSA. No cleaning of any machinery shall be performed within one hundred feet (100') of any water body within the sensitive area.
 - a. Specifically for cleanup associated with the pavers and material transfer vehicles (MTV), the Contractor must move the machine off line onto a tarp. The tarp must be in an acceptable condition so as to prevent liquids and solids from passing through to the ground beneath. The cleanup area shall have oil absorbent pads placed on the tarp. The pavers and MTV shall be cleaned over the absorbent pads in a manner that will allow the pads to collect any liquids that are used for cleanup.
 - b. Specifically for cleanup associated with dump trucks, a liquid tight five gallon pail shall be placed at each corner of the dump body below the lower hinges to capture any materials generated during the cleanup.
3. All materials generated during the cleanup procedures shall be removed off-site at the end of each day and disposed of in a manner consistent with all applicable laws and regulations. These materials shall not be buried outside of the roadway limits.
4. Servicing and fueling of equipment shall be conducted outside of a public watershed area, APA, SSA, and/or well head protection area.
 - a. If equipment cannot be serviced and refueled outside of the watershed area, well head protection area, APA, or SSA then the Contractor shall utilize the proper spoils handling areas that are identified on the plans.

- b. Servicing and fueling of equipment is not permitted within a 500 foot radius of a non-community well and within a 1000 foot radius of a community well.
 - c. Any fuel and/or hazardous materials that must be kept within these sensitive areas during working hours shall be stored in an enclosed spill proof container.
 - d. Spill containment systems must be utilized during fueling operations, and shall be manufactured by Sentry Lite Berms, Collapse-a-tainer, or approved equal. It shall have a minimum capacity of 80-gallons and shall be made of plastic or vinyl which is inert to all fuel types.
 - e. Fuel spill remediation kits shall be stored on-site so that spills may be contained and cleaned quickly.
5. Construction staging and laydown areas are prohibited within a watershed area, APA, and/or well head protection area. The Contractor shall submit to the Engineer the desired location of trailer(s), construction staging/laydown areas, containment systems, and sedimentation control systems for review and approval prior to the start of construction.
6. Millings may be re-used as asphalt material. Disposal of excess millings must be performed off-site in a manner consistent with all applicable laws and regulations. At no time can millings be dumped or buried outside of the roadway limits.

NOTICE TO CONTRACTOR - ENVIRONMENTAL INVESTIGATIONS

Environmental site investigations have been conducted that involved the sampling and laboratory analysis of soil, and sediment collected from various locations and depths within the project limits. The results of these investigations indicated the presence of polycyclic aromatic hydrocarbons (PAH), total lead and leachable lead at concentrations exceeding the applicable Connecticut Department of Energy and Environmental Protection (CTDEEP) Remediation Standard Regulations (RSRs) in soil within the project corridor. The contamination was detected in soils ranging from 1 to 4 feet below grade. In addition, low concentrations of ETPH, volatile organic compounds (VOCs), and PAHs were detected in soils and sediment within the project corridor.

The CTDEEP groundwater classification beneath the project corridor located to the north of Interstate 84 (I-84) is "GA". The groundwater classification beneath the project corridor located to the south of I-84 is "GB". Groundwater was not encountered during the Task 210 Subsurface Site Investigation Report (SSIR) conducted within the project corridor.

Based on these findings, seven (7) Areas of Environmental Concern (AOEC's) for soil have been designated within the proposed project limits where compounds were present at concentrations exceeding the numeric criteria.

In addition, eleven (11) "Low Level" Areas of Environmental Concern (LLAOEC's) for soil exist within the proposed project limits, where the compounds were detected at concentrations below the numeric criteria. Also, one (1) "Low Level" Area of Environmental Concern for Sediment (LLAOEC-SED) exists within the proposed project limits, where compounds were detected at concentrations below the numeric criteria. The presence of the compounds at these concentrations will not require material-handling measures beyond those required for normal construction operations. The presence of these compounds at these concentrations will require the disposition of soils and sediment excavated from these areas to be restricted as described herein. Material excavated from within the LLAOEC's and LLAOEC-SED that cannot be reused within the Project limits will require disposal at an approved treatment/disposal facility in accordance with Item No. 0202315A - Disposal of Controlled Materials or Item No. 0020763A – Disposal of Sediments.

The Contractor is hereby notified that controlled materials requiring special management or disposal procedures will be encountered during various construction activities conducted within the project limits. Therefore, the Contractor will be required to implement appropriate health and safety measures for all construction activities to be performed within the AOEC's. These measures shall include, but are not limited to, air monitoring, engineering controls, personal protective equipment and decontamination, equipment decontamination and personnel training. **WORKER HEALTH AND SAFETY PROTOCOLS WHICH ADDRESS POTENTIAL AND/OR ACTUAL RISK OF EXPOSURE TO SITE SPECIFIC HAZARDS IS SOLELY THE RESPONSIBILITY OF THE CONTRACTOR.**

All suitable material excavated within the AOEC's may be utilized as fill/backfill within its originating AOEC and all suitable material excavated from within the LLAOEC's shall be utilized as fill/backfill within the project limits, in accordance with the following conditions: (1) such soil is deemed to be structurally suitable for use as fill by the Engineer; (2) such soil is not placed below the water table; 3) the CTDEEP groundwater classification of the area where the soil is to be reused as fill does not preclude said reuse; and (4) such soil is not placed in an area subject to erosion. Soils within the LLAOEC's are to be reused on-site prior to the use of other soils and/or fill such that no excess soils requiring off-site disposal are generated from the LLAOEC's.

The Sections which shall be reviewed by the Contractor include, but are not limited to, the following:

- Item No. 0101000A - Environmental Health and Safety
- Item No. 0101128A - Securing, Construction and Dismantling of a Waste Stockpile and Treatment Area
- Item No. 0101130A – Environmental Work – Solidification
- Item No. 0101117A - Controlled Materials Handling
- Item No. 0202315A - Disposal of Controlled Materials
- Item No. 0202318A - Management of Reusable Controlled Material
- Item No. 0020763A – Disposal of Sediments

The Contractor is alerted to the fact that a Department environmental consultant will be on site for excavation activities within the AOEC's, to collect soil and sediment samples (if necessary), and to observe site conditions for the State. **The WSA on the plans is to be used exclusively for temporary stockpiling of excavated materials from within project AOEC(s) and excess excavated materials from within the project LLAOEC's and LLAOEC-SED for determination of disposal classification.**

Information pertaining to the results of the environmental investigations discussed can be found in the documents listed below. These documents shall be available for review at the Office of Contracts, 2800 Berlin Turnpike, Newington, Connecticut.

- Task 110: Corridor Land Use Evaluation, Interstate 84 Improvements, Interchange 6, Danbury, Connecticut, Prepared by: Maguire Group Inc., Dated: October 1, 2003

- Task 110: Corridor Land Use Evaluation Addendum, Interstate 84 Improvements, Interchange 6, Danbury, Connecticut, Prepared by: Maguire Group, Inc., Dated: December 10, 2003
- Task 110: Corridor Land Use Evaluation, Interstate Improvements, Interchange 5 & 11, Danbury & Newtown, Connecticut, Prepared by: Maguire Group, Inc., Dated: October 6, 2003
- Task 210: Subsurface Site Investigation Report, Interstate 84 Improvements at Interchange 6, Danbury, Connecticut, Prepared by: Tetra Tech Rizzo, Dated November 5, 2008
- Task 210: Subsurface Site Investigation Report, Interstate 84 – Interchanges 5 & 6 Improvements, Danbury, Connecticut. Prepared by: Connecticut. CDR Maguire Inc., Dated: October 30, 2013.

NOTICE TO CONTRACTOR – HAZARDOUS MATERIALS INVESTIGATIONS

A limited hazardous materials site investigation has been conducted at Bridge No. 01185 and Bridge No. 01190, I-84 Interchanges in Danbury, Connecticut. The scope of inspection was limited to the representative components projected for impact.

The results of the investigation indicated the presence of lead based paint (LBP) on structural steel/metal bridge components scheduled for impact. No lead was identified on the painted concrete abutments.

Results obtained from TCLP waste stream sampling and analysis for leachable lead in the paint associated with the metal/structural steel, characterized the paint waste stream as **RCRA Hazardous waste (>5.0mg/l).**

All steel and metal generated from work tasks (painted or not) shall be segregated and recycled as scrap metal at a scrap metal recycling facility. The recycling of scrap metal (regardless of lead paint concentration) is exempt from USEPA RCRA and CTDEEP Hazardous Waste Regulation.

Hard grey caulking (C2) in various joints of the concrete abutments and wing walls was found to contain asbestos at Bridge No. 01185 and Bridge No. 01190. Flexible grey caulking (C1), although negative for asbestos, is inseparable from the hard grey caulking (C2) and shall therefore be consider positive for asbestos. Tar asphalt expansion joint materials at both bridges were found not to be asbestos containing materials (ACM).

Potential universal waste (UW) and Connecticut Regulated Waste (CRW) halogen mercury light fixtures were also identified on the underside of Bridge No. 01185 and Bridge No. 01190 above the roadways but are not expected to be impacted.

No bird guano accumulations were observed in accessible areas of either bridge.

The Contractor is hereby notified that these hazardous materials requiring special management or disposal procedures will be encountered during various construction activities conducted within the project limits. The Contractor will be required to implement appropriate health and safety measures for all construction activities impacting these materials. These measures shall include, but are not limited to, air monitoring, engineering controls, personal protective equipment and decontamination, equipment decontamination and personnel training. **WORKER HEALTH AND SAFETY PROTOCOLS WHICH ADDRESS POTENTIAL AND/OR ACTUAL RISK OF EXPOSURE TO SITE SPECIFIC HAZARDS ARE SOLELY THE RESPONSIBILITY OF THE CONTRACTOR.**

The Department, as Generator, will provide an authorized representative to sign all manifests and waste profile documentation required by disposal facilities for disposal of hazardous materials.

The Sections which shall be reviewed by the Contractor include, but are not limited to, the following:

- Item No. 0020903A – Lead Compliance for Miscellaneous Exterior Tasks
- Item No. 0020801A – Asbestos Abatement

The Contractor is alerted to the fact that a Department environmental consultant may be on site for abatement and related activities, to collect environmental samples (if necessary), and to observe site conditions for the State.

Information pertaining to the results of the limited hazardous materials investigation discussed can be found in the document listed below. This document shall be available for review at the Office of Contracts, 2800 Berlin Turnpike, Newington, Connecticut.

- HazMat Inspection Letter, Bridge Nos. 01185 & 01190, I-84 Interchanges, Danbury, CT, TRC Environmental Corporation, May 30, 2014.

NOTICE TO CONTRACTOR - TRAFFIC SIGNALS

The Contractor is hereby notified that certain conditions pertaining to the installation of new signals and maintenance of traffic signal operations are required when relevant, as part of this contract.

Qualified/Unqualified Workers

U.S. Department of Labor

Occupational Safety & Health Administration (OSHA) www.osha.gov

Part Number 1910

Part Title Occupational Safety & Health Administration

Subpart S

Subpart Title Electrical

Standard Number 1910.333

Title Selection and use of work practices

Completion of this project will require Contractor employees to be near overhead utility lines. All workers and their activities when near utility lines shall comply with the above OSHA regulations. In general, unqualified workers are not allowed within 10 feet of overhead, energized lines. It is the contractor's responsibility to ensure that workers in this area are qualified in accordance with OSHA regulations.

The electric distribution company is responsible to provide and install all necessary anchors and guy strands on utility poles. It is the Contractors responsibility to coordinate with the utility company to ensure proper placement of the anchor. The Contractor will also reimburse the utility company the full cost for the installation of the anchor and guy.

This project includes countdown pedestrian signals. The countdown display is allowed only during the flashing don't walk time of the pedestrian movement.

The Controller Unit (CU) shall conform to the current City of Danbury Standards.

Under Maintenance and Protection of Traffic (M&PT) and Temporary Signalization the Contractor is required to keep in operation the following: all vehicle and pedestrian signals including necessary support structures; all vehicle and pedestrian detection; the pre-emption system; and coordination to the master, if in a system.

Existing or new span poles or utility poles cannot be double loaded without proper guying.

The contractor will be held liable for all damage to existing equipment resulting from his or his subcontractor's actions.

Vehicle detection material such as loop detector sawcut, conduit, and lead-in cables that is damaged during construction shall be repaired or replaced within 24 hours unless the Engineer determines otherwise. Loop detector sawcut, cable, and conduit replacements will be paid for under the applicable contract item, as listed below:

- Trenching and Backfilling
- Conduit
- Loop detector Sawcut
- 2 Conductor No. 14 Cable.

A credit will be deducted from monies due the Contractor for all maintenance calls responded to by Department of Transportation personnel.

See standard, "TR-1111_01, Loop Vehicle Detector and Sawcut", sheet. The saw cut installation procedure has changed. When loops are installed in two or more adjacent lanes, the inside lane loops are set back 1 foot (0.3 m) to allow a straight cut from the corner of the curb.

Special provision for Item # 1111451A – LOOP DETECTOR SAW CUT has been revised to reflect the new requirements for loop sealant.

All existing traffic appurtenances, in particular steel span poles, controller cabinets and pedestals shall be removed from the proposed roadway prior to excavation. The Contractor shall work with the utility companies to either relocate or install all traffic signal appurtenances prior to the roadway reconstruction.

The Contractor must install permanent or temporary spans in conjunction with utility company relocations. He then must either install the new signal equipment and controller or relocate the existing equipment.

The 30 Day Test on traffic control equipment, as specified in Section 10.00, Article 10.00.10 - TESTS, will not begin until the items listed below are delivered to the Department of Transportation, Traffic Signal Lab in Rocky Hill.

- Four (4) sets of cabinet wiring diagrams. Leave one set in the controller cabinet.
- All spare load switches and flash relays.

The following notes apply to projects which include Optical or Siren Pre-emption:

- Pre-emption is to operate through the internal pre-emption of the signal controller.
- If not present in a controller cabinet the contractor shall install the following items:
 - Pre-emption disconnect switch.
 - Pre-emption termination panel with “D” harness.
 - Pre-emption test pushbuttons.
- Contractor must provide a chart, or print out of the program steps and settings.
- Detector locations are for illustration only. Exact locations shall be determined by the Manufacturer or his designated representative. Detector cables are to be installed continuous between each detector and the auxiliary equipment cabinet.

Mast arm assemblies and foundations have new specifications and are to be designed based on The latest AASHTO Standards. Refer to new Specifications and Typical Detail Sheets.

All Mast Arm mounted signs are to be fixed mounted. Method of mounting must be submitted to the City of Danbury Traffic Engineering Department for approval prior to installation unless otherwise noted.

Prior to the start of fabrication of steel mast arm assemblies, the contractor shall, in the field, verify the location of the foundations, and establish and verify all elevations, dimensions, and longitudinal grades. The contractor shall submit a cross section for each mast arm assembly in accordance with the special provisions of Article 1.05.02, prior to the submission of the shop drawings.

The contractor is advised that signal appurtenances (mast arms, span poles, pedestals and controllers) when in or adjacent to sidewalks, shall be field located to provide a free path of not less than 4 ft. (1.2 meters).

NOTICE TO CONTRACTOR – ILLUMINATION

The Contractor is hereby notified that certain conditions pertaining to the installation of new conduit, pull boxes and vaults in the vicinity of Illumination light standard poles, direct burial illumination cable, illumination conduit and pull boxes are required as part of this contract.

The contractor will be responsible for locating, verifying the location and protecting all utilities below and above ground. Prior to the start of construction, the Contractor shall contact “Call Before You Dig” and all utilities within the towns along the project corridor. The Contractor shall also Contact Mr. Augusto Granzuna of ConnDOT District 1 Electrical at 860-566-3156 and Mr. David Moriarty of ConnDOT District 4 Electrical at 203-264-9596 to request a mark out of the underground illumination conduit and appurtenances.

In areas adjacent to the existing illumination circuitry, the Contractor is required to hand excavate. Any damage caused to the illumination cable will be the responsibility of the Contractor, and will be replaced by the Contractor at his own expense, as directed by the Engineer. Mark out of the illumination will not relieve the Contractor of responsibility.

SECTION 1.02 – PROPOSAL REQUIREMENTS AND CONDITIONS

Article 1.02.04 – Examination of Plans, Specifications, Special Provisions and Site of Work:

Replace the third sentence of the last paragraph with:

The Department cannot ensure a response to inquiries received later than ten (10) days prior to the original scheduled opening of the related bid.

SECTION 1.05 -- CONTROL OF THE WORK

Article 1.05.02 - Plans, Working Drawings and Shop Drawings: Amend as follows:

Subarticle 1.05.02 (2) is supplemented by the following:

Incident Management System (IMS) Items:

When required by the contract documents or when ordered by the Engineer. The Contractor shall prepare and submit nine (9) sets of catalog cuts and or shop drawings for IMS including all conduit, cable and service cabinet foundation and related equipment to the Highway Operations Section for approval before fabrication or order.

Please forward to:

Mr. John F. Korte
Connecticut Department of Transportation
Highway Operations
2800 Berlin Turnpike
P.O. Box 317546
Newington, Connecticut 06131-7546

SECTION 1.05 - CONTROL OF THE WORK

Article 1.05.02 - Plans, Working Drawings and Shop Drawings
is supplemented as follows:

Subarticle 1.05.02 - (2) is supplemented by the following:

Traffic Signal Items:

When required by the contract documents or when ordered by the Engineer, The Contractor shall prepare and submit catalog cuts, working drawings and/or shop drawings for all traffic signal items to the Division of Traffic Engineering for approval before fabrication. The packaged set of catalog cuts, working drawings and/or shop drawings shall be submitted either in paper (hard copy) form or in an electronic portable document format (.pdf). The package submitted in paper form shall include one (1) set. Catalog cuts shall be printed on ANSI A (8 ½" x 11"; 216 mm x 279mm; letter) sheets. Working drawings and shop drawings shall be printed on ANSI B (11" x 17"; 279 mm x 432 mm; ledger/tabloid) sheets.

Please mail to:

Abdul Mohammed, P.E.
City Traffic Engineer
City of Danbury
155 Deer Hill Avenue
Danbury, Connecticut 06810
(203) 797-4643

The packaged set submitted in an electronic portable document format (.pdf) shall be in an individual file with appropriate bookmarks for each item. The electronic files for catalog cuts shall be created on ANSI A (8 ½" x 11"; 216 mm x 279mm; letter) sheets. Working drawings and shop drawings shall be created on ANSI B (11" x 17"; 279 mm x 432 mm; ledger/tabloid) sheets.

Please send the pdf documents via email to:

A.Mohamed@ci.danbury.ct.us

One copy of approved documents shall be mailed to ConnDOT Electrical Unit at:

Lisa N. Conroy, P.E.
Transportation Supervising Engineer
Connecticut Department of Transportation
Division of Traffic Engineering – Electrical
2800 Berlin Turnpike
P.O. Box 317546
Newington, Connecticut 06131-7546
(860) 594-2985

SECTION 1.06 - CONTROL OF MATERIALS

Article 1.06.01 - Source of Supply and Quality is amended as follows:

Add the following:

Traffic Illumination Items:

For the following items the Contractor shall submit a complete description of the item, together with eight (8) copies of shop drawings, cuts and other descriptive literature which completely illustrates such items presented for formal approval. Such approval shall not change the requirements for a certified test report and materials certificate as may be called for.

Conductors
Luminaires
Light Standards
Foundations
Handholes
Conduit
Cable in Duct
Junction Boxes
Temporary Illumination Materials

Required catalog cuts for all items listed above shall be submitted in one package at the same time. All approvals or disapprovals and comments will be returned in one package.

When required by the contract documents or when ordered by the Engineer, the Contractor shall prepare and submit (8) sets of catalog cuts and/or shop drawings for all illumination items in one package at the same time to the following for approval prior to ordering or fabrication.

Mr. Jon H. Andrews
Connecticut Department of Transportation
Facilities Electrical
2800 Berlin Turnpike
P.O. Box 317546
Newington, Connecticut 06131-7546

Article 1.06.07 - Certified Test Reports, and Materials Certificate:

Add the following

Traffic Illumination Items:

1) For the materials in the following items, a Certified Test Report will be required confirming their conformance to the requirements set forth in these plans or specifications or both. Should the consignee noted on a Certified Test Report be other than the Prime Contractor, then Materials Certificates shall be required to identify the shipment.

- Light Standards
- Conductors
- Cable in Duct
- Anchor Bolts
- Aerial Cable
- Temporary Illumination Unit

2) For materials in the following items, a Materials Certificate will be required confirming their conformance to the requirements set forth in these plans or specifications or both.

- Light Standards
- Conductors
- Cable in Duct
- Anchor Bolts
- Aerial Cable
- Temporary Illumination Unit
- Luminaires
- Conduit

3) For aluminum light standards and aluminum luminaire bracket arms, the following requirements shall apply:

- Welding design and fabrication shall conform to the latest edition of the ANSI/AWS D1.2, Structural Welding Code – Aluminum.
- For base connection welds, fabrication inspection and testing shall be performed as necessary prior to assembly, during assembly, during welding, and after welding to ensure that materials and workmanship meet the requirements of the contract documents. Fabrication inspection and testing is the responsibility of the contractor. Verification inspection and testing is the prerogative of the Engineer (ConnDOT).
- Non Destructive testing for aluminum shall be as follows: A random 25 percent of all base connection welds shall be inspected in accordance with ASTM E-165 Standard Practice for Liquid Penetrant Inspection Method.

SECTION 1.06 - CONTROL OF MATERIALS

General:

The Special Provisions contain the description of various items which must be submitted to the Engineer by the Contractor for review and approval. These items are in addition to other requirements described in the Specifications. Where conflicts exist, these Special Provisions shall govern. Unless otherwise noted, the Contractor shall provide nine (9) complete copies of all required submissions.

The State will complete its review of the material within 28 days from the date of receipt of the submission. The State shall advise the Contractor, in writing, as to the acceptability of the material submitted. The State reserves the right to return the Contractor's submission without review comments or submittal determination for approval or rejection where the submittal does not provide sufficient information for determination. The State may determine that the item is approved in which case no further submittal is required by the Contractor, approved – resubmit for record where the contract shall supply any outstanding information to make the material approved, or the item may be partially or totally rejected in which case the Contractor shall be required to modify or clarify the submittal as required by the State and resubmit the item within fifteen (15) days. At this time, the review and approval cycle described above shall begin again. Approval by the Engineer of equipment and materials lists, catalog cuts, and/or shop drawings shall not relieve the Contractor of any responsibility under the Contract for the successful completion of the work in conformity with the requirements of the Special Provisions.

Article 1.06.01 - Source of Supply and Quality is amended as follows:

Delete the last paragraph and replace with the following:

Incident Management System (IMS) Items:

For the following items required for the Incident Management System, the Contractor shall submit a complete description of the item, together with nine (9) copies of shop drawings, cuts, data sheets and other descriptive literature which completely illustrates such items presented for formal approval. Such approval shall not change the requirements for a certified test report, and materials certificate as may be called for.

Approval of the Shop Drawings and catalog cuts shall not change the requirements for a certified test report, materials certificate and certificate of compliance as may be called for.

Shop drawings shall be submitted on 8-1/2 inch by 11 inch sheets or on 22 inch by 36 inch standard plan sheets. Shop drawings and data sheets shall be required for, but not limited to the following

- Structural supports
- Surface Mounted Conduit and Appurtenances
- Conduit, pulling tape, supports, brackets, hangers, clamps and any hardware involved with the supports and including complete fabrication details.
- Field fastener details including chemical and mechanical anchors
- Hand holes and covers
- Pullboxes and pullbox covers
- Fiber Optic Modems
- Camera Assembly. Schematics of the wiring between the camera and the equipment cabinet shall also be provided.
- Camera power supply
- Camera Video Cables, Data Cables, Power Cables and Connectors
- Traffic Flow Monitors
- Cast Iron Handhole Cover
- Cast Iron Junction Box
- Fiberglass Junction Box
- Traffic Management System Cabinets
- Traffic Management System Mini-hub Cabinets
- Auxiliary Termination Cabinets
- Transformers
- Steel CCTV Poles
- Camera Lowering Device Assembly
- Remote Control Flashing Lights
- Service Cabinets
- Meter Sockets
- Conductors
- Fiber Optic Cable
- Fiber Patch Cords
- Fiber Optic Connectors
- Fiber Optic Splice Enclosures
- Optical Fiber Termination Patch Panels
- Optical Video/Data Transmitter
- Optical Video/Data Receiver
- Network Customer Service Unit
- Video encoders and de-coders
- Surge Panels
- Ethernet switch
- Ethernet Port Sharing Device
- Cat 6 Cable
- CCTV Coax Cable
- Coax Cable Connectors
- CCTV Twisted Pair cable
- CCTV Twisted pair connectors

- _ RJ 45 and RJ 48 Connectors
- _ Modify Existing Operations Center Control System including all materials, schematics, diagrams and drawings.
- _ Motorists Aid Variable Message Signs, cabinets, cables, diagrams, schematics etc.

Required catalog cuts for all items listed above shall be submitted in one package at the same time. All approvals or disapprovals and comments will be returned in one package.

Please forward to:

Mr. John F. Korte
Connecticut Department of Transportation
Highway Operations Section
2800 Berlin Turnpike
P.O. Box 317546
Newington, Connecticut 06131-7546

Article 1.06.05 - Shipping Materials: Add the following:

All vehicles transporting materials on highways and bridges in the State shall comply with all the vehicle regulations of the Connecticut General Statutes and regulations of Connecticut State Agencies as they apply to vehicle length, width, height and weight.

Any vehicle, either loaded or unloaded, will not be allowed to travel across any bridge or on any highway when such vehicle exceeds the legal limits or posted limits of such bridge or highway without a permit. The owner of the vehicle must apply to the Department for a permit for such travel, as provided in the statutes.

The General Statutes include the following limitations:

Vehicle Width (Section 14-262(a)(1)) - The width of a vehicle and combination vehicle and trailer, including its load, is limited to 2590 mm, without a permit.

Vehicle Length (Section 14-262(c)) - The length of the semitrailer portion of a tractor-trailer unit, including its load, is limited to 14 630 mm, without a permit.

Vehicle Height (Section 14-264) - The height of a vehicle, with its load, is limited to 4110 mm, without a permit.

Vehicle Weight (Section 14-267a(b)(7)) - The gross vehicle weight (weight of vehicle including its load) is limited to 36 280 kg on 5 axles for vehicles with a 15 540 mm wheelbase, without a permit.

Axle Weights of Vehicles (Section 14-267a) – For the above five axle vehicle, weight on a single axle may not exceed 10 160 kg or in the case of axles spaced less than 1828 mm apart, 8160 kg.

On Department projects, in accordance with the Commissioner’s policy, any member or component, either temporary or permanent, that measures 36 570 mm or less and weighs no greater than 54 430 kg, is transportable via an authorized permit route established by the Department provided the individual axle weights on the vehicle and trailer transporting the member or component do not exceed 9070 kg.

Members and components, shown in the contract documents, that exceed the above length and weight limits have been reviewed by the Department’s Oversize and Overweight Permits Section and are transportable via an authorized permit route established by the Department provided the individual axle weights on the vehicle and trailer transporting the member or component do not exceed 9070 kg.

All permits to transport materials are subject to shipping times established by the Department’s Oversize and Overweight Permits Section.

Applications for permits, required to transport materials, shall be submitted a minimum of two weeks prior to their required use, to the Department's Oversize and Overweight Permits Sections.

Article 1.06.07 - Certified Test Reports and Materials Certificate: Add the following:

Incident Management System (IMS) Items:

1) For the materials in the following Incident Management System items, a Materials Certificate will be required confirming their conformance to the requirements set forth in these plans or specifications or both.

- Structural Steel (Poles and Sign Supports)
- Structural Tubing
- Galvanizing (certifying compliance with ASTM)
- Zinc Rich Primer
- Neoprene Gasket
- Polyurethane Sealant
- Grounding Rods
- Copper Wire
- Rigid Metal Conduit
- Anchor Bolts
-

- Conduit hangers, supports, clamps
- Handholes
- Cast Iron Junction Box
- Pull Box
- Pull Box Cover
- Lowering Device Assembly
- Fiber Optic Cable
- Fiber Optic Cable Connectors

2) For the materials in the following Incident Management System items, a Certified Test Report will be required confirming their conformance to the requirements set forth in these plans or specifications or both.

- Anchor Bolt and Hardware
- Structural Steel (Poles and Sign Supports)
- Structural Tubing
- Welds
- Conduit
- Service Cabinet
- Transformer
- Camera Cables
- Structural Steel (Poles)
- Fiber Optic Cable
- Fiber Optic Cable Connectors

SECTION 1.06 CONTROL OF MATERIALS

Article 1.06.01 - Source of Supply and Quality:

Add the following:

Traffic Signal Items:

For the following traffic signal items the contractor shall submit a complete description of the item, working drawings, catalog cuts and other descriptive literature which completely illustrates such items presented for formal approval. Such approval shall not change the requirements for a certified test report and materials certificate as may be called for. All shop drawings shall be submitted at one time, unless otherwise approved by the engineer.

Aluminum Pedestals	Loop Sealant
Traffic Signal Housings and Hardware	Loop Wire
Flasher Cabinet	Loop Lead-in Wire
LED Traffic Signal Lamp Unit	
Pedestrian Signals Housing and Hardware	
Pedestrian Pushbuttons and Type of Sign	
Accessible Pedestrian Signal & Detector	Video Vehicle Detection
Traffic Signal Controller Unit	Camera Assembly
Traffic Controller Cabinet	Camera Extension Bracket
Controller Unit	Video Detector Processor
Solid State Time Switch	Camera Cable
Solid State Load Switch	Monitor
Conflict Monitor	
Solid State Flasher	
Flash Transfer Relay	Cable Closure
Auxiliary Termination Cabinet	Communication Cable
	Fiber Optic Cable
Test Equipment	
Microwave Vehicle Detector	
Pre-Fabricated Loop Detector	
Loop Vehicle Detection	
Loop Detector	

SECTION 1.06 CONTROL OF MATERIALS

Article 1.06.07 - Certified Test Reports and Materials Certificate.

Add the following:

- 1) For the materials in the following items, a Certified Test Report will be required confirming their conformance to the requirements set forth in these plans or specifications or both. Should the consignee noted on a Certified Test Report be other than the Prime Contractor, then Materials Certificates shall be required to identify the shipment.

Steel Span Pole Anchor Bolts
Steel Span Poles
Steel Mast Arm Anchor Bolts
Steel Mast Arm Assembly

Steel Combination Span Poles
Steel Combination Span Pole Anchor Bolts

- 2) For the materials in the following items, a Materials Certificate will be required confirming their conformance to the requirements set forth in these plans or specifications or both.

Aluminum Pedestals
Steel Combination Span Pole
Steel Span Poles
Steel Mast Arm Assembly
Traffic Signal Housings and Hardware
Flasher Cabinet
LED Traffic Signal Lamp Unit
Pedestrian Signals Housing and Hardware
Pedestrian Pushbuttons and Type of Sign
Accessible Pedestrian Signal & Detector
Traffic Signal Controller Unit
Traffic Controller Cabinet
Controller Unit
Solid State Time Switch
Solid State Load Switch
Conflict Monitor
Solid State Flasher
Flash Transfer Relay
Auxiliary Termination Cabinet

Loop Vehicle Detection
Loop Detector
Loop Sealant

Video Vehicle Detection
Camera Assembly
Camera Extension Bracket
Video Detector Processor
Camera Cable
Monitor
Cable Closure
Communication Cable
Fiber Optic Cable

SECTION 1.07 - LEGAL RELATIONS AND RESPONSIBILITIES

Article 1.07.10 - Contractor's Duty to Indemnify the State against Claims for Injury or Damage:

Add the following after the only paragraph:

“It is further understood and agreed by the parties hereto, that the Contractor shall not use the defense of Sovereign Immunity in the adjustment of claims or in the defense of any suit, including any suit between the State and the Contractor, unless requested to do so by the State.”

SECTION 1.07 – LEGAL RELATIONS AND RESPONSIBILITIES

Article 1.07.11 Opening of Section of project to Traffic or Occupancy:

Add the following sentence to the last paragraph;

“In cases in which guiderail is damaged by the traveling public, repair or replacement will be reimbursable as contained elsewhere herein.”

SECTION 1.07 - LEGAL RELATIONS AND RESPONSIBILITIES

Article 1.07.13 - Contractor's Responsibility for Adjacent Property, Facilities and Services is supplemented as follows:

The following company and representative shall be contacted by the Contractor to coordinate the protection of their utilities on this project 30 days prior to the start of any work on this project involving their utilities:

Mr. David Moriarty
District 4 Electrical Supervisor
Department of Transportation
Southbury, Connecticut 06488
(203) 264-9590

City of Danbury
Mr. Antonio Iadarola, P.E.
Director of Public Works
155 Deer Hill Avenue
Danbury, CT 06810
(203) 797-4537

City of Danbury
Mr. Farid Khouri, P.E.
City Engineer
155 Deer Hill Avenue
Danbury, CT 06810
(203) 797-4641

Comcast of Danbury, Inc.
Mr. Dean Muratori
Construction Manager
80 Great Hill Road
Seymour, CT 06483
(203) 732-0146 ext.73802

Northeast Utilities Service Company
Mr. Wayne D. Gagnon
Engineering Manager – System Projects
107 Selden Street
Berlin, CT 06037
(860) 665-2473

AT&T Connecticut
Mr. Eric Clark
Manager –OSP Engineering
1441 North Colony Road
Meriden, CT 06450-4101
(203) 238-7407

Yankee Gas Services Company
Mr. Steven P. Testa
Construction Manager
107 Selden Street
Berlin, CT 06037
(860) 665-6214

Fiber Technologies Networks, LLC
Mr. Joe Pellegini
1781 Highland Avenue, Suite 102
Cheshire, CT 06410
(860) 758-7277

The following Department representative shall be contacted by the Contractor to coordinate an inspection of the service entrance into the controller/flasher cabinet for controllers within the State right-of-way, when ready for inspection, release, and connection of electrical service. The local Building Department shall be contacted for electrical service inspections for controllers located on Town roads located within the respective municipality.

Please provide the electrical service request number provided by the power company. This is the CRS Number for Northeast Utilities or the U.I. Work Order Number issued by United Illuminating. The street address is required for release to local power companies (Groton Utilities or Wallingford Electric).

Mr. Michael LeBlanc
Property & Facilities
Department of Transportation
Newington, CT 06111
860-594-2238
Cell 860-983-5114

SECTION 1.08 – PROSECUTION AND PROGRESS

Article 1.08.04 – Limitations of Operations: Limitations of Operations is amended by the following:

INCIDENT MANAGEMENT SYSTEM

The Contractor will not be allowed to perform any work that will disrupt the normal operation of the Incident Management System (IMS) as follows:

On Monday through Friday from 5:00 AM to 9:00 PM and on Saturday and Sunday.

On the day before or after any of the Legal Holidays listed below:

New Year's Day

Good Friday

Memorial Day

Independence Day

Labor Day

Thanksgiving Day

Christmas Day

On the Saturday, Sunday and Monday following Thanksgiving Day.

On the Friday, Saturday and Sunday immediately preceding any of the above Legal Holidays celebrated on a Monday.

On the Saturday, Sunday and Monday immediately following any of the above Legal Holidays celebrated on a Friday.

In order to maintain continuous operation of the Incident Management System, the Contractor shall adhere to the requirements in the special provision and "Notice to Contractor – Installation Qualifications" and "Item No. 1132001A Relocate Incident Management System".

SECTION 1.08 - PROSECUTION AND PROGRESS

Article 1.08.04 - Limitation of Operations - Add the following:

In order to provide for traffic operations as outlined in the Special Provision "Maintenance and Protection of Traffic," the Contractor will not be permitted to perform any work which will interfere with the described traffic operations on all project roadways as follows:

Route I-84

On the following State observed Legal Holidays:

New Year's Day
Good Friday, Easter*
Memorial Day
Independence Day
Labor Day
Thanksgiving Day**
Christmas Day

The following restrictions also apply:

On the day before and the day after any of the above Legal Holidays.

On the Friday, Saturday, and Sunday immediately preceding any of the above Holidays celebrated on a Monday.

On the Saturday, Sunday, and Monday immediately following any of the above Holidays celebrated on a Friday.

* From 6:00 a.m. the Thursday before the Holiday to 8:00 p.m. the Monday after the Holiday.

** From 6:00 a.m. the Wednesday before the Holiday to 8:00 p.m. the Monday after the Holiday.

During all other times

The Contractor shall maintain and protect traffic as shown on the accompanying "Limitation of Operations" charts, which dictate the minimum number of lanes that must remain open for each day of the week.

The Contractor will be allowed to halt Route I-84 traffic for a period not to exceed 10 minutes to perform necessary work as approved by the Engineer, between 12:01 a.m. and 5:00 a.m. on all non-Holiday days.

**Limitation of Operations Chart
Minimum Number of Lanes to Remain Open**

Route: I-84 Eastbound Location: Within Project Limits Number of Through Lanes: 3								Route: I-84 Westbound Location: Within Project Limits Number of Through Lanes: 3							
Hour Beginning	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Hour Beginning	Mon	Tue	Wed	Thu	Fri	Sat	Sun
Mid	1	1	1	1	1	1	1	Mid	1	1	1	1	1	1	1
1 AM	1	1	1	1	1	1	1	1 AM	1	1	1	1	1	1	1
2 AM	1	1	1	1	1	1	1	2 AM	1	1	1	1	1	1	1
3 AM	1	1	1	1	1	1	1	3 AM	1	1	1	1	1	1	1
4 AM	1	1	1	1	1	1	1	4 AM	1	1	1	1	1	1	1
5 AM	1	1	1	1	1	1	1	5 AM	2	2	2	2	2	1	1
6 AM	E	E	E	E	E	1	1	6 AM	E	E	E	E	E	2	1
7 AM	E	E	E	E	E	2	1	7 AM	E	E	E	E	E	2	2
8 AM	E	E	E	E	E	2	2	8 AM	E	E	E	E	E	3	2
9 AM	3	3	3	3	E	3	2	9 AM	E	E	E	E	E	3	3
10 AM	3	3	3	3	E	E	3	10 AM	3	3	3	3	E	E	3
11 AM	3	3	3	3	E	E	3	11 AM	3	3	3	3	E	E	E
Noon	3	3	3	3	E	E	E	Noon	3	3	3	3	E	E	E
1 PM	3	3	3	3	E	E	E	1 PM	3	3	3	3	E	E	E
2 PM	E	E	E	E	E	E	E	2 PM	E	E	E	E	E	E	E
3 PM	E	E	E	E	E	E	E	3 PM	E	E	E	E	E	E	E
4 PM	E	E	E	E	E	E	E	4 PM	E	E	E	E	E	E	3
5 PM	E	E	E	E	E	3	E	5 PM	E	E	E	E	E	3	3
6 PM	E	E	E	E	E	3	E	6 PM	3	3	3	3	E	3	3
7 PM	3	3	3	3	E	3	E	7 PM	3	3	3	3	3	3	3
8 PM	3	3	3	3	3	2	3	8 PM	2	2	2	2	3	2	3
9 PM	2	2	2	2	3	2	3	9 PM	2	2	2	2	2	2	3
10 PM	2	2	2	2	2	2	2	10 PM	1	1	1	1	2	2	2
11 PM	1	1	1	1	2	2	1	11 PM	1	1	1	1	1	1	1

On Holidays and within Holiday Periods, all Hours shall be ‘E.’

‘E’ = maintain existing traffic operations = all available travel lanes, including exit only lanes, climbing lanes and all available shoulder widths shall be open to traffic during this period

Route I-84 EB Exit 5 Off-Ramp

Maintain existing traffic operations on:

- Monday through Friday between 6:00 a.m. and 8:00 p.m.
- Saturday and Sunday between 10:00 a.m. and 6:00 p.m.

During stage construction, existing traffic operations will be considered to be as shown on the Maintenance and Protection of Traffic plans contained in the contract plans.

The Contractor will be required to complete all work associated with Interchange 5 Eastbound Off-Ramp Stage 1 Sequence 1 over one weekend period. The Contractor will be permitted to begin implementing the M&PT stage for this plan on a Friday night beginning at 8:00 p.m. The Contractor shall work continuously until all work is completed. All work associated with this stage and sequence must be completed so that two lanes of traffic on a paved surface, as shown on the Interchange 5 Eastbound Off-Ramp M&PT plan sheet for Stage 1 Sequence 2, are provided by Monday morning at 6:00 a.m. The Contractor shall provide the required number of crews and all necessary equipment to complete this work within the time period specified. The Contractor shall provide the Engineer with a detailed sequence of operations for this work at least two weeks prior to the anticipated starting date for review and approval by the Department.

Route I-84 WB Exit 6 Off-Ramp

Maintain existing traffic operations on:

- Monday through Friday between 6:00 a.m. and 9:00 a.m. & between 3:00 p.m. and 7:00 p.m.
- Saturday and Sunday between 10:00 a.m. and 6:00 p.m.

During stage construction, existing traffic operations will be considered to be as shown on the Maintenance and Protection of Traffic plans contained in the contract plans.

All Other Route I-84 Ramps

Maintain existing traffic operations on:

- Monday through Friday between 6:00 a.m. and 9:00 a.m. & between 3:00 p.m. and 6:00 p.m.
- Saturday and Sunday between 10:00 a.m. and 6:00 p.m.

Route 37 (Between Golden Hill Road and Second Avenue)

Maintain the existing number of lanes of traffic, including turning lanes, on:

- Monday through Friday between 6:00 a.m. and 9:00 p.m.
- Saturday and Sunday between 10:00 a.m. and 6:00 p.m.

Maintain at least one lane of through traffic in each direction on:

- Monday through Friday between 9:00 p.m. and 11:00 p.m.

The Contractor will be allowed to halt Route 37 traffic for a period of time not to exceed ten minutes to perform drainage work as approved by the Engineer on:

Monday through Friday between 12:00 a.m. and 6:00 a.m.

During stage construction, the existing number of lanes of traffic will be considered to be the number of lanes shown on the Maintenance and Protection of Traffic plans contained in the contract plans.

Route 37 (Between Second Avenue and Barnum Court)

Maintain the existing number of lanes of traffic, including turning lanes, on:

Monday through Friday between 6:00 a.m. and 9:00 a.m. & between 2:00 p.m. and 8:00 p.m.
Saturday and Sunday between 10:00 a.m. and 6:00 p.m.

Maintain at least one lane of through traffic in each direction on:

Monday through Friday between 9:00 a.m. and 2:00 p.m. & between 8:00 p.m. and 10:00 p.m.

During stage construction, the existing number of lanes of traffic will be considered to be the number of lanes shown on the Maintenance and Protection of Traffic plans contained in the contract plans.

Route 39 (Main Street)

Maintain the existing number of lanes of traffic, including turning lanes, on:

Monday through Friday between 6:00 a.m. and 9:00 a.m. & between 2:00 p.m. and 7:00 p.m.
Saturday and Sunday between 10:00 a.m. and 6:00 p.m.

Maintain at least two lanes of through traffic in the southbound direction and one lane of through traffic in the northbound direction on:

Monday through Friday between 9:00 a.m. and 2:00 p.m. & between 7:00 p.m. and 9:00 p.m.

Maintain at least one lane of through traffic in each direction on:

Monday through Friday between 9:00 p.m. and 10:00 p.m.

SR 841 (Downs Street)

Maintain the existing number of lanes of traffic, including turning lanes, on:

Monday through Friday between 6:00 a.m. and 9:00 a.m. & between 2:00 p.m. and 8:00 p.m.
Saturday and Sunday between 10:00 a.m. and 6:00 p.m.

Maintain at least one lane of through traffic in each direction on:

Monday through Friday between 9:00 a.m. and 2:00 p.m.

Hayestown Avenue

Maintain the existing number of lanes of traffic, including turning lanes, on:

Monday through Friday between 6:00 a.m. and 9:00 a.m. & between 3:00 p.m. and 6:00 p.m.

Saturday and Sunday between 10:00 a.m. and 6:00 p.m.

Maintain at least one lane of traffic in each direction on:

Monday through Friday between 9:00 a.m. and 3:00 p.m. & between 6:00 p.m. and 9:00 p.m.

Tamarack Avenue

Maintain the existing number of lanes of traffic, including turning lanes, on:

Monday through Friday between 6:00 a.m. and 9:00 p.m.

Saturday and Sunday between 10:00 a.m. and 6:00 p.m.

Second Avenue

Maintain the existing number of lanes of traffic, including turning lanes, on:

Monday through Friday between 6:00 a.m. and 9:00 a.m. & between 3:00 p.m. and 6:00 p.m.

Saturday and Sunday between 10:00 a.m. and 6:00 p.m.

The Contractor will be allowed to halt Second Avenue for a period of time not to exceed ten minutes to perform drainage work as approved by the Engineer on:

Monday through Friday between 9:00 a.m. and 3:00 p.m.

The Contractor will be allowed to close Second Avenue for drainage work between Route 37 and Oakland Avenue to through traffic and detour traffic in accordance with the Detour Plan contained in the contract plans.

The Contractor will be allowed to utilize the detour:

Monday through Friday between 9:00a.m. and 3:00 p.m.

Second Avenue will be reopened to normal traffic operations at the end of each work day. The detour shall take place during non-holiday weeks in the months of July or August.

The Contractor shall notify the Engineer, the Danbury Public Works Department, and Danbury emergency services at least two weeks in advance of the start of the Second Avenue closure.

All Other Roadways

Maintain the existing number of lanes of traffic, including turning lanes, on:

Monday through Friday between 6:00 a.m. and 9:00 a.m. & between 3:00 p.m. and 6:00 p.m.

Saturday and Sunday between 10:00 a.m. and 6:00 p.m.

Construction Staking

The pavement markings on Second Avenue will be reestablished in their original locations. The Contractor shall establish control points on Second Avenue from the existing pavement markings in accordance with Section 9.80 – Construction Staking. This work will be paid for under the Item No. 0980001A – Construction Staking.

Stage Construction of Bridge No. 01185 (I-84 over Kohanza Street)

Stage Construction of Bridge No. 01190 (I-84 over Tamarack Avenue)

The Contractor shall stage construct this structure in accordance with the Stage Construction Cross Sections contained in the Structure Plans.

Additional Lane Closure Restrictions

It is anticipated that work on adjacent projects will be ongoing simultaneously with this project. The Contractor shall be aware of those projects and anticipate that coordination will be required to maintain proper traffic flow at all times on all project roadways, in a manner consistent with these specifications and acceptable to the Engineer.

The Contractor will not be allowed to perform any work that will interfere with traffic operations on a roadway when traffic operations are being restricted on that same roadway, unless there is at least a one mile clear area length where the entire roadway is open to traffic or the closures have been coordinated and are acceptable to the Engineer. The one mile clear area length shall be measured from the end of the first work area to the beginning of the signing pattern for the next work area.

SECTION 4.06 - BITUMINOUS CONCRETE

Section 4.06 is being deleted in its entirety and replaced with the following:

4.06.01—Description

4.06.02—Materials

4.06.03—Construction Methods

4.06.04—Method of Measurement

4.06.05—Basis of Payment

4.06.01—Description: Work under this section shall include the production, delivery and placement of a non-segregated, smooth and dense bituminous concrete mixture brought to proper grade and cross section. This section shall also include the method and construction of longitudinal joints. The Contractor shall furnish ConnDOT with a Quality Control Plan as described in Article 4.06.03.

The terms listed below as used in this specification are defined as:

Bituminous Concrete: A concrete material that uses a bituminous material (typically asphalt) as the binding agent and stone and sand as the principal aggregate components. Bituminous concrete may also contain any of a number of additives engineered to modify specific properties and/or behavior of the concrete material. For the purposes of this Specification, references to bituminous concrete apply to all of its sub-categories, for instance those defined on the basis of production and placement temperatures, such as hot-mix asphalt (HMA) or warm-mix asphalt (WMA), those categories derived from the mix-design procedure used, such as “Marshall” mixes or “Superpave” mixes, or those defined on the basis of composition, such as polymer-modified asphalt (PMA).

Course: A lift or multiple lifts comprised of the same bituminous concrete mixture placed as part of the pavement structure.

Density Lot: All material placed in a single lift and as defined in Article 4.06.03.

Disintegration: Wearing away or fragmentation of the pavement. Disintegration will be evident in the following forms: Polishing, weathering-oxidizing, scaling, spalling, raveling, potholes or loss of material.

Dispute Resolution: A procedure used to resolve conflicts resulting from discrepancies between the Engineer and the Contractor’s density results that may affect payment.

Hot Mix Asphalt (HMA): A bituminous concrete mixture typically produced at 325°F.

Lift: An application of a bituminous concrete mixture placed and compacted to a specified thickness in a single paver pass.

Marshall: A bituminous concrete mix design used in mixtures designated as “Bituminous Concrete Class ()”.

Polymer Modified Asphalt (PMA): A bituminous concrete mixture containing a polymer modified asphalt binder in accordance with contract specifications.

Production Lot: All material placed during a continuous daily paving operation.

Quality Assurance (QA): All those planned and systematic actions necessary to provide confidence that a product or facility will perform as designed.

Quality Control (QC): The sum total of activities performed by the vendor (Producer, Manufacturer, and Contractor) to ensure that a product meets contract specification requirements.

Superpave: A bituminous concrete mix design used in mixtures designated as “S*” Where “S” indicates Superpave and * indicates the sieve related to the nominal maximum aggregate size of the mix.

Segregation: A non-uniform distribution of a bituminous concrete mixture in terms of volumetrics, gradation or temperature.

Warm Mix Asphalt (WMA): A bituminous concrete mixture that can be produced and placed at reduced temperatures than HMA using a qualified additive or technology.

4.06.02—Materials: All materials shall conform to the requirements of Section M.04.

1. Materials Supply: The bituminous concrete mixture must be from one source of supply and originate from one Plant unless authorized by the Engineer. Bituminous Concrete plant QC plan requirements are defined in Section M.04.

2. Recycle Option: The Contractor has the option of recycling reclaimed asphalt pavement (RAP) or Crushed Recycled Container Glass (CRCG) in bituminous concrete mixtures in accordance with Section M.04. CRCG shall not be used in the final lift of the surface course.

4.06.03—Construction Methods:

1. Material Documentation: All vendors producing bituminous concrete must have their truck-weighing scales, storage scales, and mixing plant automated to provide a detailed ticket.

Delivery tickets must include the following information:

- a. State of Connecticut printed on ticket.
- b. Name of producer, identification of plant, and specific storage bin (silo) if used.
- c. Date and time of day.

English

- d. Mixture Designation If RAP is used, the plant printouts shall include RAP dry weight, percentage and daily moisture content. If WMA technology is used, the technology and the additive rate or the water injection rate must be noted on the ticket. Class 3 mixtures for machine-placed curbing must state "curb mix only".
- e. Net weight of mixture loaded into truck (When RAP is used, RAP moisture shall be excluded from mixture net weight).
- f. Gross weight (Either equal to the net weight plus the tare weight or the loaded scale weight).
- g. Tare weight of truck – Daily scale weight.
- h. Project number, purchase order number, name of Contractor (if Contractor other than Producer).
- i. Truck number for specific identification of truck.
- j. Individual aggregate, RAP, and virgin asphalt high/target/low weights shall be printed on batch plant tickets (For drum plants and silo loadings, the plant printouts shall be printed out at 5 minute intervals maintained by the vendor for a period of three years after the completion of the project).
- k. For every mixture designation the running daily total delivered and sequential load number.

The net weight of mixture loaded into the truck must be equal to the cumulative measured weight of its components.

The Contractor must notify the Engineer immediately if, during the production day, there is a malfunction of the weighing or recording system in the automated plant or truck-weighing scales. Manually written tickets containing all required information will be allowed for one hour, but for no longer, provided that each load is weighed on State-approved scales. At the Engineer's sole discretion, trucks may be approved to leave the plant if a State inspector is present to monitor weighing. If such a malfunction is not fixed within forty-eight hours, mixture will not be approved to leave the plant until the system is fixed to the Engineer's satisfaction. No damages will be considered should the State be unable to provide an inspector at the plant.

The State reserves the right to have an inspector present to monitor batching and /or weighing operations.

2. Transportation of Mixture: Trucks with loads of bituminous concrete being delivered to State projects must not exceed the statutory or permitted load limits referred to as gross vehicle weight (GVW). The Contractor shall furnish a list of all vehicles and allowable weights transporting mixture.

The State reserves the right to check the gross and tare weight of any delivery truck. A variation of 0.4 percent or less in the gross or tare weight shown on the delivery ticket and the certified scale weight shall be considered evidence that the weight shown on the delivery ticket is correct. If the gross or tare weight varies from that shown on the delivery ticket by more than 0.4 percent, the Engineer will recalculate the net weight. The Contractor shall take action to correct discrepancy to the satisfaction of the Engineer.

If a truck delivers mixture to the project and the ticket indicates that the truck is overweight, the load will not be rejected but a “Measured Weight Adjustment” will be taken in accordance with Article 4.06.04.

The mixture shall be transported from the mixing plant in trucks that have previously been cleaned of all foreign material and that have no gaps through which mixture might inadvertently escape. The Contractor shall take care in loading trucks uniformly so that segregation is minimized. Loaded trucks shall be tightly covered with waterproof covers acceptable to the Engineer. Mesh covers are prohibited. The front and rear of the cover must be fastened to minimize air infiltration. The Contractor shall assure that all trucks are in conformance with this specification. Trucks found not to be in conformance shall not be allowed to be loaded until re-inspected to the satisfaction of the Engineer.

Truck body coating and cleaning agents must not have a deleterious effect on the transported mixture. The use of solvents or fuel oil, in any concentration, is strictly prohibited for the coating of the inside of truck bodies. When acceptable coating or agents are applied, truck bodies shall be raised immediately prior to loading to remove any excess agent in an environmentally acceptable manner.

3. Paving Equipment: The Contractor shall have the necessary paving and compaction equipment at the project site to perform the work. All equipment shall be in good working order and any equipment that is worn, defective or inadequate for performance of the work shall be repaired or replaced by the Contractor to the satisfaction of the Engineer. During the paving operation, the use of solvents or fuel oil, in any concentration, is strictly prohibited as a release agent or cleaner on any paving equipment (i.e., rollers, pavers, transfer devices, etc.).

Refueling of equipment is prohibited in any location on the paving project where fuel might come in contact with bituminous concrete mixtures already placed or to be placed. Solvents for use in cleaning mechanical equipment or hand tools shall be stored clear of areas paved or to be paved. Before any such equipment and tools are cleaned, they shall be moved off the paved or to be paved area; and they shall not be returned for use until after they have been allowed to dry.

Pavers: Each paver shall have a receiving hopper with sufficient capacity to provide for a uniform spreading operation and a distribution system that places the mix uniformly, without segregation. The paver shall be equipped with and use a vibratory screed system with heaters or burners. The screed system shall be capable of producing a finished surface of the required evenness and texture without tearing, shoving, or gouging the mixture. Pavers with extendible screed units as part of the system shall have auger extensions and tunnel extenders as necessary. Automatic screed controls for grade and slope shall be used at all times unless otherwise authorized by the Engineer. The controls shall automatically adjust the screed to compensate for irregularities in the preceding course or existing base. The controls shall maintain the proper transverse slope and be readily adjustable, and shall operate from a fixed or moving reference such as a grade wire or floating beam.

English

Rollers: All rollers shall be self-propelled and designed for compaction of bituminous concrete. Rollers types shall include steel-wheeled, pneumatic or a combination thereof and may be capable of operating in a static or dynamic mode. Rollers that operate in a dynamic mode shall have drums that use a vibratory or oscillatory system or combination of. The vibratory system achieves compaction through vertical amplitude forces. Rollers with this system shall be equipped with indicators that provide the operator with amplitude, frequency and speed settings/readouts to measure the impacts per foot during the compaction process. The oscillatory system achieves compaction through horizontal shear forces. Rollers with this system shall be equipped with frequency indicators. Rollers can operate in the dynamic mode using the oscillatory system on concrete structures such as bridges and catch basins if at the lowest frequency setting.

Pneumatic tire rollers shall be self-propelled and equipped with wide-tread compaction tires capable of exerting an average contact pressure from 60 to 90 pounds per square inch uniformly over the surface, adjusting ballast and tire inflation pressure as required. The Contractor shall furnish evidence regarding tire size; pressure and loading to confirm that the proper contact pressure is being developed and that the loading and contact pressure are uniform for all wheels.

Lighting: For paving operations, which will be performed during hours of darkness, the paving equipment shall be equipped with lighting fixtures as described below, or with approved lighting fixtures of equivalent light output characteristics. A sufficient number of spare lamps shall be available on site as replacements in the event of failures. The Contractor shall provide brackets and hardware for mounting light fixtures and generators to suit the configuration of the rollers and pavers. Mounting brackets and hardware shall provide for secure connection of the fixtures, minimize vibration, and allow for adjustable positioning and aiming of the light fixtures. Lighting shall be aimed to maximize the illumination on each task and minimize glare to passing traffic. The Contractor shall provide generators on rollers and pavers of the type, size, and wattage, to adequately furnish 120 V AC of electric power to operate the specified lighting equipment. A sufficient amount of fuel shall be available on site. There shall be switches to control the lights. Wiring shall be weatherproof and installed to all applicable codes. The minimum lighting requirements are found in tables 4.06-1 and 4.06-2:

Table 4.06-1: Paver Lighting

Fixture	Quantity	Remarks
Type A	3	Mount over screed area
Type B (narrow) or Type C (spot)	2	Aim to auger and guideline
Type B (wide) or Type C (flood)	2	Aim 25 feet behind paving machine

Table 4.06-2: Roller Lighting

Fixture*	Quantity	Remarks
Type B (wide)	2	Aim 50 feet in front of and behind roller
Type B (narrow)	2	Aim 100 feet in front of and behind roller
OR		
Type C (flood)	2	Aim 50 feet in front of and behind roller
Type C (spot)	2	Aim 100 feet in front of and behind roller

*All fixtures shall be mounted above the roller.

Type A: Fluorescent fixture shall be heavy-duty industrial type. It shall be enclosed and sealed to keep out dirt and dampness. It shall be UL listed as suitable for wet locations. The fixture shall contain two 4-foot long lamps - Type "F48T12CWHO". The integral ballast shall be a high power factor, cold weather ballast, and 120 volts for 800 MA HO lamps. The housing shall be aluminum, and the lens shall be acrylic with the lens frame secured to the housing by hinging latches. The fixture shall be horizontal surface mounting, and be made for continuous row installation.

Type B: The floodlight fixture shall be heavy-duty cast aluminum housing, full swivel and tilt mounting, tempered-glass lens, sealed door, reflector to provide a wide distribution or narrow distribution as required, mogul lamp socket for 250 watt Metal Halide lamp, 120 volt integral ballast, and be UL listed as suitable for wet locations.

Type C: The power beam holder shall have ribbed die cast aluminum housing and a clear tempered-glass lens to enclose the fixture. There shall be an arm fully adjustable for aiming, with a male-threaded mount with serrated teeth and lock nuts. There shall be a 120-volt heatproof socket with extended fixture wiring for an "Extended Mogul End Prong" lamp base. The fixture shall have gaskets, and shall be UL listed as suitable for wet locations. The lamps shall be 1000-watt quartz PAR64, both Q1000PAR64MFL (flood) and Q1000PARNSP (spot) will be required.

Material Transfer Vehicle (MTV): A MTV shall be used when placing a bituminous concrete surface course as indicated in the contract documents. A surface course is defined as the total thickness of the same bituminous concrete mix that extends up to and includes the final wearing surface whether it is placed in a single or multiple lifts, and regardless of any time delays between lifts.

The MTV must be a self-propelled vehicle specifically designed for the purpose of delivering the bituminous concrete mixture from the delivery truck to the paver. The MTV must have the capability to remix the bituminous concrete mixture.

The use of a MTV will be subject to the requirements stated in Article 1.07.05- Load Restrictions. The Engineer may limit the use of the vehicle if it is determined that the use of the MTV may damage highway components, utilities, or bridges. The Contractor shall submit to the Engineer at time of pre-construction the following information:

- The make and model of the MTV to be used.
- The individual axle weights and axle spacing for each separate piece of paving equipment (haul vehicle, MTV and paver).
- A working drawing showing the axle spacing in combination with all three pieces of equipment that will comprise the paving echelon.

4. Seasonal Requirements: Paving, including placement of temporary pavements, shall be divided into two seasons, In-Season and Extended Season. In-Season paving shall occur from May 1 – October 14, and Extended Season shall occur from October 15- April 30. The following requirements shall apply unless otherwise authorized or directed by the Engineer:

- Bituminous concrete mixes shall not be placed when the air or subbase temperature is below 40°F regardless of the season.
- Should paving operations be scheduled during the Extended Season, the Contractor's Quality Control Plan for placement described in Section 9. "Contractor Quality Control Plan for Placement" shall include a separate section titled "Extended Season Paving" and address minimum delivered mix temperature, maximum paver speed, enhanced rolling patterns and the method to balance mixture delivery and placement operations. Work covered by the section on Extended Season paving shall not commence until the Engineer's comments have been incorporated into the section and approved.
- Should placement of the final lift of bituminous concrete be scheduled during the Extended Season, the Contractor is required to submit this plan to the Engineer for review 30 days prior to the paving operation.

5. Superpave Test Section: The Engineer may require the Contractor to place a test section whenever the requirements of this specification or Section M.04 are not met.

The Contractor shall submit the quantity of mixture to be placed and the location of the test section for review and acceptance by the Engineer. The equipment used in the construction of a passing test section shall be used throughout production.

If a test section fails to meet specifications, the Contractor shall stop production, make necessary adjustments to the job mix formula, plant operations, or procedures for placement and compaction. The Contractor shall construct test sections, as allowed by the Engineer, until all the required specifications are met. All test sections shall also be subject to removal as set forth in Article 1.06.04.

6. Transitions for Roadway Surface: Transitions shall be formed at any point on the roadway where the pavement surface deviates, vertically, from the uniform longitudinal profile as specified on the plans. Whether formed by milling or by bituminous concrete mixture, all transition lengths shall conform to the criteria below unless otherwise specified.

Permanent Transitions: A permanent transition is defined as any transition that remains as a permanent part of the work. All permanent transitions, leading and trailing ends shall meet the following length requirements:

- a) Posted speed limit is greater than 35 MPH: 30 feet per inch of vertical change (thickness)
- b) Posted speed limit is 35 MPH or less: 15 feet per inch of vertical change (thickness).
- c) Bridge Overpass and underpass transition length will be 75 feet either
 - (1) Before and after the bridge expansion joint, or
 - (2) Before or after the parapet face of the overpass.

In areas where it is impractical to use the above described permanent transition lengths the use of a shorter permanent transition length may be permitted when approved by the Engineer.

Temporary Transitions: A temporary transition is defined as a transition that does not remain a permanent part of the work. All temporary transitions shall meet the following length requirements:

- a) Posted speed limit is greater than 35 MPH
 - (1) Leading Transitions = 15 feet per inch of vertical change (thickness)
 - (2) Trailing Transitions = 6 feet per inch of vertical change (thickness)
- b) Posted speed limit is 35 MPH or less
 - (1) Leading and Trailing = 4 feet per inch of vertical change (thickness)

Note: Any temporary transition to be in-place over the winter shutdown period, holidays, or during extended periods of inactivity (more than 7 calendar days) shall conform to the "Permanent Transition" requirements shown above.

7. Spreading and Finishing of Mixture: Prior to the placement of the bituminous concrete, the underlying base course shall be brought to the plan grade and cross section within the allowable tolerance. Immediately before placing the mixture, the area to be surfaced shall be cleaned by sweeping or by other means acceptable to the Engineer. The bituminous concrete mixture shall not be placed whenever the surface is wet or frozen. The Engineer will verify the mix temperature by means of a probe or infrared type of thermometer. A probe type thermometer, verified by the Department on an annual basis, must be used in order to reject a load of mixture based on temperatures outside the range stated in the placement QC plan.

Placement: The bituminous concrete mixture shall be placed and compacted to provide a smooth, dense surface with a uniform texture and no segregation at the specified thickness and dimensions indicated in the plans and specifications.

When unforeseen weather conditions prevent further placement of the mix, the Engineer is not obligated to accept or place the bituminous concrete mixture that is in transit from the plant.

In advance of paving, traffic control requirements shall be set up daily, maintained throughout placement, and shall not be removed until all associated work including density testing is completed.

The Contractor shall inspect the newly placed pavement for defects in the mixture or placement before rolling is started. Any deviation from standard crown or section shall be immediately remedied by placing additional mixture or removing surplus mixture. Such defects shall be corrected to the satisfaction of the Engineer.

Where it is impractical due to physical limitations to operate the paving equipment, the Engineer may permit the use of other methods or equipment. Where hand spreading is permitted, the mixture shall be placed by means of suitable shovels and other tools, and in a uniformly loose layer at a thickness that will result in a completed pavement meeting the designed grade and elevation.

Placement Tolerances: Each lift of bituminous concrete placed at a uniform specified thickness shall meet the following requirements for thickness and area. Any pavement exceeding these limits shall be subject to an adjustment or removal. Lift tolerances will not relieve the Contractor from meeting the final designed grade. Lifts of specified non-uniform thickness, i.e. wedge or shim course, shall not be subject to thickness and area adjustments.

- a) Thickness- Where the total thickness of the lift of mixture exceeds that shown on the plans beyond the tolerances shown in Table 4.06-3, the longitudinal limits of such variation including locations and intervals of the measurements will be documented by the Engineer for use in calculating an adjustment in accordance with Article 4.06.04.

TABLE 4.06-3 Thickness Tolerances

Mixture Designation	Lift Tolerance
Class 4 and S1	+/- 3/8 inch
Class 1, 2 and 12 and S0.25, S0.375, S0.5	+/- 1/4 inch

Where the thickness of the lift of mixture is less than that shown on the plans beyond the tolerances shown in Table 4.06-3, the Contractor, with the approval of the Engineer, shall take corrective action in accordance with this specification.

- b) Area- Where the width of the lift exceeds that shown on the plans by more than the specified thickness of each lift, the longitudinal limits of such variation including locations and intervals of the measurements will be documented by the Engineer for use in calculating the adjustment in Article 4.06.04.
- c) Delivered Weight of Mixture - When the delivery ticket shows that the truck exceeds the allowable gross weight for the vehicle type the quantity of tons representing the overweight amount will be documented by the Engineer for use in calculating an adjustment in accordance with Article 4.06.04.

Transverse Joints: All transverse joints shall be formed by saw-cutting a sufficient distance back from the previous run, existing bituminous concrete pavement or bituminous concrete driveways to expose the full thickness of the lift. A brush of tack coat shall be used on any cold joint immediately prior to additional bituminous concrete mixture being placed.

Tack Coat Application: A thin uniform coating of tack coat shall be applied to the pavement immediately before overlaying and be allowed sufficient time to break (set). All surfaces in contact with the bituminous concrete that have been in place longer than 3 calendar days shall have an application of tack coat. The tack coat shall be applied by a non-gravity pressurized spray system that results in uniform overlapping coverage at an application rate of 0.03 to 0.05 gallons per square yard for a non-milled surface and an application rate of 0.05 to 0.07 gallons per square yard for a milled surface. For areas where both milled and un-milled surfaces occur, the tack coat shall be an application rate of 0.03 to 0.05 gallons per square yard. The Engineer must approve the equipment and the method of measurement prior to use. The material for tack coat shall not be heated in excess of 160°F and shall not be further diluted.

Compaction: The Contractor shall compact the mixture to meet the density requirements as stated in Article 4.06.03 and eliminate all roller marks without displacement, shoving, cracking, or aggregate breakage.

The Contractor shall only operate rollers in the dynamic mode using the oscillatory system at the lowest frequency setting on concrete structures such as bridges and catch basins. The use of the vibratory system on concrete structures is prohibited. Rollers operating in the dynamic mode shall be shut off when reversing directions.

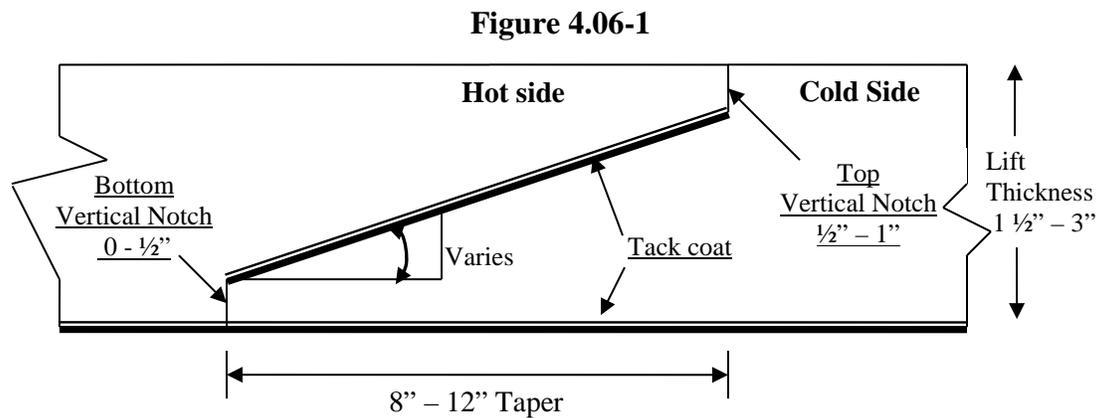
If the Engineer determines that the use of compaction equipment in the dynamic vibratory mode may damage highway components, utilities, or adjacent property, the Contractor shall provide alternate compaction equipment. The Engineer may allow the Contractor to operate rollers in the dynamic mode using the oscillatory system at the lowest frequency setting.

These allowances will not relieve the Contractor from meeting pavement compaction requirements.

Surface Requirements: The pavement surface of any lift shall meet the following requirements for smoothness and uniformity. Any irregularity of the surface exceeding these requirements shall be corrected by the Contractor.

- a) Smoothness- Each lift of the surface course shall not vary more than $\frac{1}{4}$ inch from a Contractor-supplied 10 foot straightedge. For all other lifts of bituminous concrete, the tolerance shall be $\frac{3}{8}$ inch. Such tolerance will apply to all paved areas.
- b) Uniformity- The paved surface shall not exhibit segregation, rutting, cracking, disintegration, flushing or vary in composition as determined by the Engineer.

8. Longitudinal Joint Construction Methods: Unless noted on the plans or the contract documents or directed by the Engineer, the Contractor shall use Method I- Notched Wedge Joint (see figure 4.06-1) when constructing longitudinal joints where lift thicknesses are between $1\frac{1}{2}$ and 3 inches, except for S1 and Class 4 mixes. Method II Butt Joint (see figure 4.06-2) shall be used for lifts less than $1\frac{1}{2}$ inches or greater than 3 inches, and S1 and Class 4 mixes. During placement of multiple lifts of bituminous concrete, the longitudinal joint shall be constructed in such a manner that it is located at least 6 inches from the joint in the lift immediately below. The joint in the final lift shall be at the centerline or at lane lines. Each longitudinal joint shall maintain a consistent offset from the centerline of the roadway along its entire length.

Method I - Notched Wedge Joint:

A notched wedge joint shall be constructed, as shown in the figure using a device that is capable of adjusting the top and bottom vertical notches independently and is attached to the paver screed.

The taper portion of the joint must be placed over the longitudinal joint in the lift immediately below. The top vertical notch must be located at the centerline or lane line in the final lift. The requirement for paving full width “curb to curb” as described in Method II may be waived if addressed in the QC plan and approved by the Engineer.

The taper portion of the wedge joint shall be compacted and not be exposed to traffic for more than 5 calendar days.

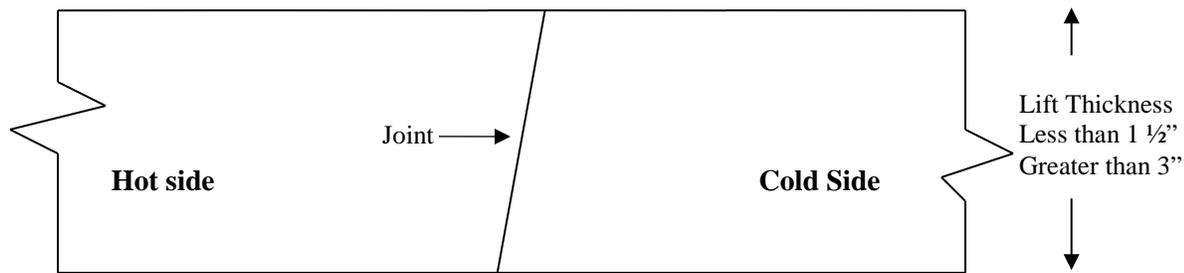
The pavement surface under the wedge joint must have an application of tack coat material. Prior to placing the completing pass (hot side), an application of tack coat must be applied to the exposed surface of the tapered section; regardless of time elapsed between paver passes. The in-place time allowance described in Sub article 4.06.03-7 does not apply to joint construction.

Any exposed wedge joint must be located to allow for the free draining of water from the road surface.

The Engineer reserves the right to define the paving limits when using a wedge joint that will be exposed to traffic.

Method II - Butt Joint:

Figure 4.06-2

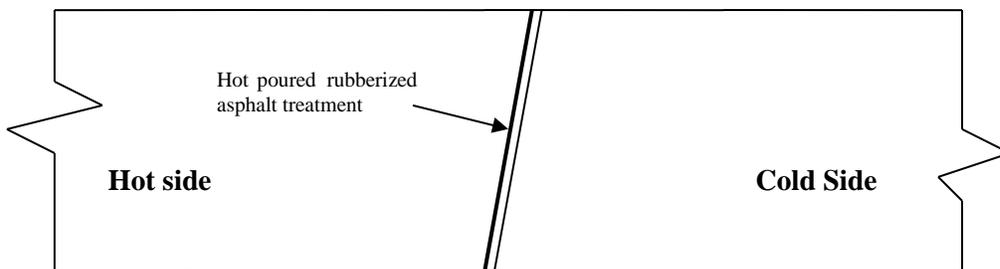


When adjoining passes are placed, the Contractor shall utilize equipment that creates a near vertical edge (refer to figure). The completing pass (hot side) shall have sufficient mixture so that the compacted thickness is not less than the previous pass (cold side). The end gate on the paver should be set so there is an overlap onto the cold side of the joint.

The Contractor shall not allow any butt joint to be incomplete at the end of a work shift unless otherwise allowed by the Engineer. When using this method, the Contractor is not allowed to leave a vertical edge exposed at the end of a work shift and must complete paving of the roadway full width “curb to curb.”

Method III- Butt Joint with Hot Poured Rubberized Asphalt Treatment: When required by the contract or allowed by the Engineer, Method III (see figure 4.06-3) may be used.

Figure 4.06-3



English

All of the requirements of Method II must be met with Method III. In addition, the longitudinal vertical edge must be treated with a joint seal material meeting the requirements of Section M.04 prior to placing a completing pass. The joint seal material shall be applied in accordance with the manufacturer's recommendation so as to provide a uniform coverage and avoid excess bleeding onto the newly placed pavement.

9. Contractor Quality Control (QC) Requirements for Placement:

The Contractor shall be responsible for maintaining adequate quality control procedures throughout the placement operations. Therefore, the Contractor must ensure that the materials, mixture and work provided by Subcontractors, Suppliers and Producers also meet contract specification requirements.

Quality Control Plan: Prior to placement the Contractor shall submit a QCP to the Engineer for approval. The QCP shall be submitted at the pre-construction meeting or a minimum 30 days prior to any production or paving. The QCP shall be in the format provided by the Engineer (http://www.ct.gov/dot/lib/dot/documents/dconstruction/pat/qcp_outline_hma_placement.pdf). Work covered by the QCP shall not commence until the Engineer's comments have been incorporated into the QCP and approved. The QCP shall detail every aspect of the placement process and if required, include a separate section on Extended Season paving as described in Section 4. "Seasonal Requirements". Information provided shall include the organization and procedures which the Contractor shall use to control all project site activity. The QCP must address the actions, inspection, or sampling and testing necessary to keep the production and placement operations in control, to determine when an operation has gone out of control and to respond to correct the situation in a timely fashion. The QCP shall also include details on when and who will communicate with personnel at the bituminous concrete plant to determine when immediate changes to the production or placement processes are needed, and to implement the required changes.

In addition the QCP shall also include the name and qualifications of a Quality Control Manager (QCM). The QCM shall be responsible for the administration of the QCP, and any modifications that may become necessary. The QCM shall have the ability to direct all Contractor personnel on the project during paving operations. All Contractor sampling, inspection and test reports shall be reviewed and signed by the QCM prior to submittal to the Engineer.

Approval of the QCP will be based on the inclusion of all of the required information. Approval of the QCP does not relieve the Contractor of its responsibility to comply with the project specifications. The Contractor may modify the QCP as work progresses and must document the changes in writing prior to commencing the next paving operation. These changes include but are not limited to changes in quality control procedures or personnel. Placement may be suspended by the Engineer until the revisions to the QCP have been put into effect.

The Quality Control Plan shall also include the name and qualifications of any outside testing laboratory performing any QC functions on behalf of the Contractor.

Quality Control Inspection, Sampling and Testing: The Contractor shall perform all quality control sampling and testing, provide inspection, and exercise management control to ensure that bituminous concrete production and placement conforms to the requirements as outlined in its QCP during all phases of the work.

- a) Control Charts: The Contractor shall develop and maintain density control charts and shall submit them to the Engineer. The control charts shall include the project number, test numbers, test parameter, applicable upper and lower specification limits, and test data. The control charts shall be used as part of the quality control system to document the placement process. The control chart(s) shall be updated each day of production, and a copy shall be submitted prior to the next day's production.
- b) Records of Inspection and Testing: For each day of placement, the Contractor shall document all test results and inspections on forms approved by the Engineer. The document shall be certified by the Quality Control Manager or his representative that the information in the document is accurate, and that all work complies with the requirements of the contract.

The Contractor shall submit complete and accurate density sampling, testing and inspection documents to the Engineer within 48 hours. The documents shall be submitted in a manner acceptable to the Engineer.

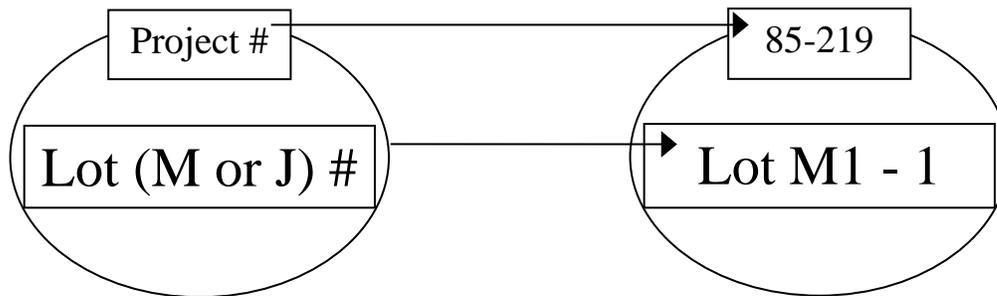
The Contractor may obtain one (1) mat core and one (1) joint core per day for process control, provided this process is detailed in the QCP. The results of these process control cores shall not be used to dispute the Department determinations from the acceptance cores. The Contractor shall submit the location of each process control core to the Engineer for approval prior to taking the core. Additional cores may be obtained to correlate a density gauge used by the contractor for quality control as approved by the Engineer. The core holes shall be filled to the same requirements described in Sub article 4.06.03-10.

10. Density Testing of Bituminous Concrete Utilizing Core Samples: This procedure describes the frequency and the method the Contractor shall use to obtain pavement cores for acceptance from the project. Coring shall be performed on each lift specified to a thickness of one and one-half (1 ½) inches or more. Each lift including the longitudinal joints shall be compacted to the degree specified in Tables 4.06-9 and 4.06-10. The density of each core shall be determined using the production lot's average maximum theoretical gravity established from the plant production testing. Bituminous concrete Class 4 and HMA S1 are excluded from the longitudinal joint density requirements.

The Contractor shall extract cores (4 or 6 inch diameter for S0.25, S0.375 and S0.5 mixes, 6 inch diameter for S1.0 mixtures -wet sawed) from sampling locations determined by the Engineer. The Engineer must witness the extraction and labeling of cores, as well as the filling of the core holes. The cores shall be labeled by the Contractor with the project number, lot number, and sub-lot number on the top surface of the core. When labeling the core lot number, include whether the core is from a mat lot or joint lot by using an "M" for a mat core and "J" for a joint core. For example, a core from the first sub-lot of the first mat lot shall be labeled with "Lot M1 - 1". The first number refers to the lot and the second number refers to the sub-lot. Refer to

Figure 4.06-4. The side of the cores shall be labeled with the core lot number and date placed. The project inspector shall fill out a MAT-109 containing the same information to accompany the cores. The Contractor shall deliver the cores and MAT-109 to the Department’s Central Testing Lab in a safe manner to ensure no damage occurs to the cores. The Contractor shall use a container approved by the Engineer. In general the container shall consist of an attached lid container made out of plastic capable of being locked shut and tamper proof. The Contractor shall use foam, bubble wrap, or another suitable material to prevent the cores from being damaged during transportation. Once the cores and MAT-109 are in the container the Engineer will secure the lid using a security seal. The security seal’s identification number must be documented on the MAT-109. The Central Lab will break the security seal and take possession of the cores upon receipt.

Figure 4.06-4



Frequency of sampling is in accordance with the following tables:

TABLE 4.06-4 - TESTING REQUIREMENT FOR BRIDGE DENSITY LOT

Length of Each Structure (Feet)	MAT – No. of Cores	JOINT - No. of cores
≤ 500'	See Table 4.06-5(A or B)	See Table 4.06-5(A or B)
501' – 1500'	3	3
1501' – 2500'	4	4
2501' and greater	5	5

All material placed on structures less than or equal to 500 feet in length shall be included as part of a standard lot as follows:

**TABLE 4.06-5A – TESTING REQUIREMENT FOR DENSITY LOTS
≥ 500 TONS**

Lot Type	No. of Mat Cores		No. of Joint Cores		Target Lot Size (Tons)
Lot Without Bridge ⁽¹⁾	4		4		2000
Lot With Bridge(s) ⁽¹⁾⁽²⁾	4 plus	1 per structure (≤ 300')	4 plus	1 per structure (≤ 300')	2000
		2 per structure (301' – 500')		2 per structure (301' – 500')	

**TABLE 4.06-5B – TESTING REQUIREMENT FOR DENSITY LOTS
< 500 TONS**

Lot Type	No. of Mat Cores	No. of Joint Cores	Lot Size (Tons)
Lot Without Bridge ⁽¹⁾	3	3	1 per lift
Lot With Bridge(s) ⁽¹⁾⁽²⁾	3	3	1 per lift

Note (1): The number of “Required Paver Passes for Full Width” shall be used to determine the sub-lot sizes within the lot. The number of paver passes for full width is determined by the contractor.

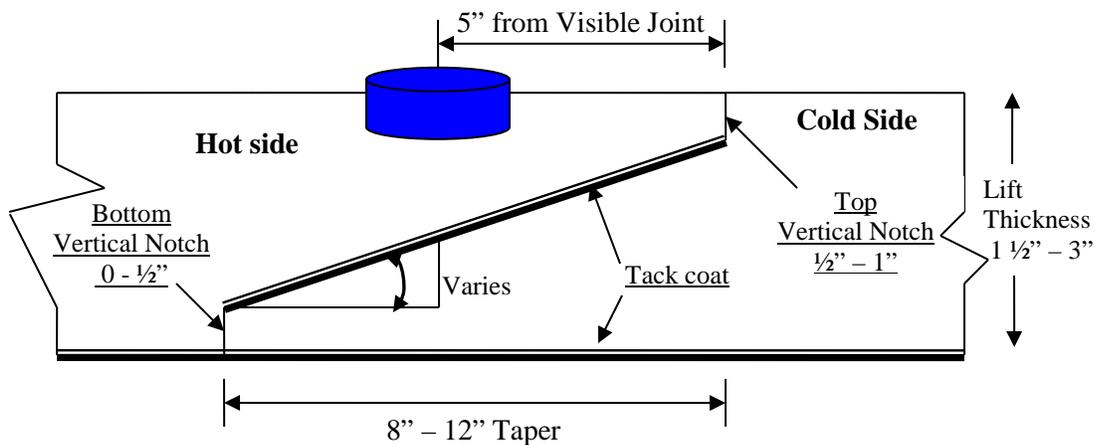
Note (2): If a non-bridge mat or joint core location randomly falls on a structure, the core is to be obtained on the structure in addition to the core(s) required on the structure.

A density lot will be complete when the full designed paving width of the established lot length has been completed and shall include all longitudinal joints that exist between the curb lines regardless of date(s) paved. Quantity of material placed on structures less than or equal to 500 feet long is inclusive of the standard lot. Prior to paving, the total length of the project to be paved shall be split up into lots that contain approximately 2000 tons each. Areas such as highway ramps may be combined to create one lot. In general, combined areas should be set up to target a 2000 ton lot size. One adjustment will apply for each lot. The tons shall be determined using the yield calculation in Article 4.06.04. The last lot shall be the difference between the total payable tons for the project and the sum of the previous lots.

After the compaction process has been completed, the material shall be allowed to cool sufficiently to allow the cutting and removal of the core without damage. The Contractor shall core to a depth that allows extraction so that the uppermost layer being tested for density will not be affected.

A mat core shall not be taken any closer than one foot from the edge of a paver pass. If a random number locates a core less than one foot from any edge, locate the core so that the sample is one foot from the edge.

Joint cores must be taken so that the center of the core is 5 inches from the visible joint on the hot mat side. Refer to figure 4.06-5.

Figure 4.06-5

Cores may be obtained daily or weekly. All cores must be cut within 5 calendar days of placement. Any core that is damaged or obviously defective while being obtained will be replaced with a new core from a location within 2 feet measured in a longitudinal direction.

Core holes shall be filled immediately upon core extraction. Prior to being filled, the hole shall be prepared by removing any free water and applying tack coat using a brush or other means to uniformly cover the cut surface. The core hole shall be filled with a mixture containing the same nominal maximum aggregate size and compacted with a hand compactor or other mechanical means to the maximum compaction possible. The bituminous concrete mixture shall be compacted to 1/8 inch above the finished pavement prior to opening the roadway to traffic.

11. Acceptance Inspection, Sampling and Testing: Inspection, sampling, and testing to be used by the Engineer shall be performed at the minimum frequency specified in Section M.04 and stated herein.

Sampling for acceptance shall be established using ASTM D 3665, or a statistically based procedure of random sampling approved by the Engineer.

Plant Material Acceptance: The Contractor shall provide the required acceptance sampling, testing and inspection during all phases of the work in accordance with Section M.04. The Department will perform verification testing on the Contractor's acceptance test results. Should binder content or air void results exceed the specified tolerances in the Department's current QA Program for Materials, Acceptance and Assurance Testing Policies and Procedures, the Department will investigate to determine an assignable cause. Contractor's test results for a subject lot or sub lot may be replaced with verification's result for the purpose of assessing adjustments. The verification procedure is included in the Department's current QA Program for Materials.

Density Acceptance: The Engineer will perform all acceptance testing on the cores in accordance with AASHTO T 331(M).

12. Density Dispute Resolution Process: The Contractor and Engineer will work in partnership to avoid potential conflicts and to resolve any differences that may arise during quality control or acceptance testing for density. Both parties will review their sampling and testing procedures and results and share their findings. If the Contractor disputes the Engineer's test results, the Contractor must submit in writing a request to initiate the Dispute Resolution Process within 10 calendar days of the notification of the test results. No request for dispute resolution will be allowed unless the Contractor provides quality control results within the timeframe described in Sub article 4.06.03-9 supporting its position. Should the dispute not be resolved through evaluation of existing testing data or procedures, the Engineer may authorize the Contractor to obtain a new set of core samples per disputed lot. The core samples must be extracted no later than 30 calendar days from the date of Engineer's authorization. The number and type (mat, joint, or structure) of the cores taken for dispute resolution must reflect the number and type of the cores taken for acceptance. The location of each core shall be 36" from the original acceptance core location forward along a line parallel to the baseline that results in the same type (mat, joint, or structure) of core. All such core samples shall be extracted and filled using the procedure outlined in Article 4.06.03. The results from the dispute resolution cores shall be added to the results from the acceptance cores and averaged for determining the final in-place density value.

13. Corrective Work Procedures: Any portion of the completed pavement that does not meet the requirements of the specification shall be corrected at the expense of the Contractor. Any corrective courses placed as the final wearing surface shall not be less than 1½ inches in thickness after compaction.

If pavement placed by the Contractor does not meet the specifications, and the Engineer requires its replacement or correction, the Contractor shall:

- a) Propose a corrective procedure to the Engineer for review and approval prior to any corrective work commencing. The proposal shall include:
 - Limits of pavement to be replaced or corrected, indicating stationing or other landmarks that are readily distinguishable.
 - Proposed work schedule.
 - Construction method and sequence of operations.
 - Methods of maintenance and protection of traffic.
 - Material sources.
 - Names and telephone numbers of supervising personnel.
- b) Perform all corrective work in accordance with the Contract and the approved corrective procedure.

14. Protection of the Work: The Contractor shall protect all sections of the newly finished pavement from damage that may occur as a result of the Contractor's operations for the duration of the Project. Prior to the Engineer's authorization to open the pavement to traffic, the Contractor is responsible to protect the pavement from damage.

15. Cut Bituminous Concrete Pavement: Work under this item shall consist of making a straight-line cut in the bituminous concrete pavement to the lines delineated on the plans or as directed by the Engineer. The cut shall provide a straight, clean, vertical face with no cracking, tearing or breakage along the cut edge.

4.06.04—Method of Measurement:

1. Bituminous Concrete Class () or HMA S* or PMA S*: The quantity of bituminous concrete measured for payment will be determined by the documented net weight in tons accepted by the Engineer in accordance with this specification and Section M.04.

2. Adjustments: Adjustments may be applied to bituminous concrete quantities and will be measured for payment using the following formulas:

Yield Factor for Adjustment Calculation = 0.0575 Tons/SY/inch

Actual Area = [(Measured Length (ft)) x (Avg. of width measurements (ft))]

Actual Thickness (t) = Total tons delivered / [Actual Area (SY) x 0.0575 Tons/SY/inch]

- a) Area: If the average width exceeds the allowable tolerance, an adjustment will be made using the following formula. The tolerance for width is equal to the specified thickness (in.) of the lift being placed.

Tons Adjusted for Area (T_A) = [(L x W_{adj})/9] x (t) x 0.0575 Tons/SY/inch = (-) Tons

Where: L = Length (ft)

(t) = Actual thickness (inches)

W_{adj} = (Designed width (ft) + tolerance /12) - Measured Width

- b) Thickness: If the actual thickness is less than the allowable tolerance, the Contractor shall submit a repair procedure to the Engineer for approval. If the actual thickness exceeds the allowable tolerance, an adjustment will be made using the following formula:

Tons Adjusted for Thickness (T_T) = A x t_{adj} x 0.0575 = (-) Tons

Where: A = Area = {[L x (Designed width + tolerance (lift thickness)/12)] / 9}

t_{adj} = Adjusted thickness = [(Dt + tolerance) - Actual thickness]

Dt = Designed thickness (inches)

- c) Weight: If the quantity of bituminous concrete representing the mixture delivered to the project is in excess of the allowable gross vehicle weight (GVW) for each vehicle, an adjustment will be made using the following formula:

Tons Adjusted for Weight (T_w) = GVW – DGW= (-) Tons

Where: DGW = Delivered gross weight as shown on the delivery ticket or measured on a certified scale.

- d) Mixture Adjustment: If the quantity of bituminous concrete representing the produced mixture exceeds one or more of the production tolerances for Marshall (Table 4.06-6) or Superpave mix designs (Table 4.06-7 and 4.06-8) , an adjustment will be made using the following formulas. The Department's Division of Material Testing will calculate the daily adjustment values for T_{MD} and T_{SD} .

- (1) *Marshall Design*- The tolerances shown in Table 4.06-6 for gradation and binder content will be used to determine whether a mixture adjustment will apply. If the mixture does not meet the requirements of Section M.04, an adjustment will be computed using the following formula:

Tons Adjusted for Marshall Design (T_{MD}) = M x 0.10

Where: M= Tons of bituminous concrete mixture exceeding the tolerances in Table 4.06-5.

**TABLE 4.06-6
TOLERANCES FOR CONSECUTIVE TESTS (MARSHALL)**

Classes	Criteria	% Tolerances (+/-)
-	Binder	0.4
1, 2, 4, 5, 5A & 5B	#200	2.0
1, 2, 4	#50	4
1, 2, 5, 5A & 5B	#30	5
1, 2, 4, 5, 5A & 5B	#8	6
1, 2, 4, 5, 5A & 5B	#4	7
1, 2, 4, 5, 5A & 5B	$\frac{3}{8}$ & $\frac{1}{2}$ inch	8

- (2) *Superpave Design*- The adjustment values in Table 4.06-7 and 4.06-8 shall be calculated for each sub lot based on the Air Void and Liquid Binder Content test results for that sub lot. The total adjustment for each day's production (lot) will be computed using tables and the following formulas:

Tons Adjusted for Superpave Design (T_{SD}) = [(AdjAV_t + AdjPB_t) / 100] X Tons

$$\text{Percent Adjustment for Air Voids} = \text{AdjAV}_t = [\text{AdjAV}_1 + \text{AdjAV}_2 + \text{AdjAV}_i + \dots + \text{AdjAV}_n] / n$$

Where: AdjAV_t = Total percent air void adjustment value for the lot

AdjAV_i = Adjustment value from Table 4.06-7 resulting from each sub lot or the average of the adjustment values resulting from multiple tests within a sub lot, as approved by the Engineer.

n = number of sub lots based on Table M.04.03-1

**TABLE 4.06-7
ADJUSTMENT VALUES FOR AIR VOIDS (SUPERPAVE)**

Adjustment Value (AdjAV _i) (%)	S0.25, S0.375, S0.5, S1 Air Voids (AV)
+2.5	3.8 - 4.2
+3.125*(AV-3)	3.0 - 3.7
-3.125*(AV-5)	4.3 - 5.0
20*(AV-3)	2.3 - 2.9
-20*(AV-5)	5.1 - 5.7
-20.0	≤ 2.2 or ≥ 5.8

$$\text{Percent Adjustment for Liquid Binder} = \text{AdjPB}_t = [(\text{AdjPB}_1 + \text{AdjPB}_2 + \text{AdjPB}_i + \dots + \text{AdjPB}_n)] / n$$

Where: AdjPB_t = Total percent liquid binder adjustment value for the lot

AdjPB_i = Adjustment value from Table 4.06-7 resulting from each sub lot

n = number of binder tests in a production lot

TABLE 4.06-8

Adjustment Value (AdjAV _i) (%)	<u>S0.25, S0.375, S0.5, S1</u> Pb (refer to Table M.04.03-5)
0.0	Equal to or above the min. liquid content
- 10.0	Below the min. liquid content

- e) Density Adjustment: The quantity of bituminous concrete measured for payment for a specified lift of pavement 1½ inches or greater may be adjusted for density. Separate density adjustments will be made for each lot and will not be combined to establish one density adjustment. If either the Mat or Joint adjustment value is “remove and replace”, the density lot shall be removed and replaced (curb to curb).

$$\text{Tons Adjusted for Density (T}_D) = [\{ (PA_M \times .50) + (PA_J \times .50) \} / 100] \times \text{Density Lot Tons}$$

Where: T_D = Total tons adjusted for density for each lot
 PA_M = Mat density percent adjustment from Table 4.06-9
 PA_J = Joint density percent adjustment from Table 4.06-10

**TABLE 4.06-9
ADJUSTMENT VALUES FOR PAVEMENT MAT DENSITY**

Average Core Result Percent Mat Density	Percent Adjustment (Bridge and Non-Bridge) (1,2)
97.1 - 100	$-1.667*(ACRPD-98.5)$
94.5 - 97.0	+2.5
93.5 - 94.4	$+2.5*(ACRPD-93.5)$
92.0 - 93.4	0
90.0 - 91.9	$-5*(92-ACRPD)$
88.0 - 89.9	$-10*(91-ACRPD)$
87.0 - 87.9	-30
86.9 or less	Remove and Replace (curb to curb)

**TABLE 4.06-10
ADJUSTMENT VALUES FOR PAVEMENT JOINT DENSITY**

Average Core Result Percent Joint Density	Percent Adjustment (Bridge and Non-Bridge) (1,2)
97.1 - 100	$-1.667*(ACRPD-98.5)$
93.5 - 97.0	+2.5
92.0 - 93.4	$+1.667*(ACRPD-92)$
91.0 - 91.9	0
89.0 - 90.9	$-7.5*(91-ACRPD)$
88.0 - 88.9	$-15*(90-ACRPD)$
87.0 - 87.9	-30
86.9 or less	Remove and Replace (curb to curb)

(1) ACRPD = Average Core Result Percent Density

(2) All Percent Adjustments to be rounded to the second decimal place. For example, 1.667 is to be rounded to 1.67.

3. Transitions for Roadway Surface: The installation of permanent transitions shall be measured under the appropriate item used in the formation of the transition.

The quantity of material used for the installation of temporary transitions shall be measured for payment under the appropriate item used in the formation of the transition. The installation and

English

removal of a bond breaker, and the removal and disposal of any temporary transition formed by milling or with bituminous concrete pavement is not measured for payment.

4. Cut Bituminous Concrete Pavement: The quantity of bituminous concrete pavement cut will be measured in accordance with Article 2.02.04.

5. Material for Tack Coat: The quantity of tack coat will be measured for payment by the number of gallons furnished and applied on the Project and approved by the Engineer. No tack coat material shall be included that is placed in excess of the tolerance described in Article 4.06.03.

Method of Measurement:

- a. Container Method- Material furnished in a container will be measured to the nearest ½ gallon. The volume will be determined by either measuring the volume in the original container by a method approved by the Engineer or using a separate graduated container capable of measuring the volume to the nearest ½ gallon. The container in which the material is furnished must include the description of material, including lot number or batch number and manufacturer or product source.
- b. Truck Method- The Engineer will establish a weight per gallon of the bituminous material based on the specific gravity at 60°F for the material furnished. The number of gallons furnished will be determined by weighing the material on scales furnished by and at the expense of the Contractor.

6. Material Transfer Vehicle (MTV) - The furnishing and use of a MTV will be measured separately for payment based on the actual number of surface course tons delivered to a paver using the MTV.

4.06.05—Basis of Payment:

1. Bituminous Concrete Class (), HMA S* or PMA S*: The furnishing and placing of bituminous concrete will be paid for at the Contract unit price per ton for "Bituminous Concrete, Class ()" or "HMA S*" or "PMA S*".

- All costs associated with providing illumination of the work area are included in the general cost of the work.
- All costs associated with constructing longitudinal joints are included in the general cost of the work.
- All costs associated with obtaining cores for core correlation and dispute resolution are included in the general cost of the work.

2. Bituminous Concrete Adjustment Costs: The adjustment will be calculated using the formulas shown below if all of the measured adjustments in Article 4.06.04 do not equal zero. A payment will be made for a positive adjustment. A deduction from monies due the Contractor will be made for a negative adjustment.

Production Lot: $[T_T + T_A + T_W + (T_{MD} \text{ or } T_{SD})] \times \text{Unit Price} = \text{Est. (P)}$

Density Lot: $T_D \times \text{Unit Price} = \text{Est. (D)}$

Where: Unit Price = Contract unit price per ton per type of mixture

T_* = Total tons of each adjustment calculated in Article 4.06.04

Est. () = Pay Unit represented in dollars representing incentive or disincentive.

The estimated cost figure if included in the bid proposal or estimate is not to be altered in any manner by the bidder. If the bidder should alter the amount shown, the altered figure will be disregarded and the original cost figure will be used to determine the amount of the bid for the Contract.

3. Transitions for Roadway Surface: The installation of permanent transitions shall be paid under the appropriate item used in the formation of the transition. The quantity of material used for the installation of temporary transitions shall be paid under the appropriate pay item used in the formation of the transition. The installation and removal of a bond breaker, and the removal and disposal of any temporary transition formed by milling or with bituminous concrete pavement is included in the general cost of the work.

4. The cutting of bituminous concrete pavement will be paid in accordance with Article 2.02.05.

5. Material for tack coat will be paid for at the Contract unit price per gallon for "Material for Tack Coat".

6. The Material Transfer Vehicle (MTV) will be paid at the Contract unit price per ton for a "Material Transfer Vehicle".

<u>Pay Item*</u>	<u>Pay Unit*</u>
Bituminous Concrete, Class ()	ton
HMA S*	ton
PMA S*	ton
Bituminous Concrete Adjustment Cost	est.
Material for Tack Coat	gal.
Material Transfer Vehicle	ton

*For contracts administered by the State of Connecticut, Department of Administrative Services, the pay items and pay units are as shown in contract award price schedule.

SECTION 9.21 - CONCRETE SIDEWALKS AND RAMPS

Section 9.21 is being deleted in its entirety and replaced with the following:

9.21.01 – Description

9.21.02 – Materials

9.21.03 – Construction Methods

9.21.04 – Method of Measurement

9.21.05 – Basis of Payment

9.21.01—Description: This item shall consist of concrete sidewalks and ramps constructed on a gravel or reclaimed miscellaneous aggregate base course in the locations and to the dimensions and details shown on the plans or as ordered and in accordance with these specifications.

9.21.02—Materials: Materials for this work shall conform to the requirements of Article M.03.01 for Class “F” Concrete.

Gravel or reclaimed miscellaneous aggregate for base shall conform to Article M.02.01 for granular fill.

Detectable warning strips shall be a prefabricated detectable warning tile chosen from the Department’s Qualified Products List for retrofit and/or cast in place applications.

9.21.03—Construction Methods:

1. Excavation: Excavation, including removal of any existing sidewalk (bituminous or concrete) and curbing, shall be made to the required depths below the finished grade, as shown on the plans or as directed. All soft and yielding material shall be removed and replaced with suitable material.

When connecting new concrete sidewalk to a section of existing concrete sidewalk, the connection point shall be at the nearest joint in the existing sidewalk.

The Contractor shall establish the limits required to achieve grades for each ramp prior to removal of existing sidewalk and ramps. The Contractor shall document and notify the Engineer of any control points that may conflict with the design grades or configuration of ramps shown on the plans. Control points can be but are not limited to ROW, utility poles, drainage structures, buildings, fences, walls or other features found near the proposed ramp. When control points are encountered within the limits of the ramp, the Engineer will determine if an alternative ramp type is required or the ramp is to be constructed as shown on the plans.

2. Gravel or Reclaimed Miscellaneous Aggregate Base: The gravel or reclaimed miscellaneous aggregate base shall be placed in layers not over 6 inches in depth and to such a depth that after compaction it shall be at the specified depth below the finished grade of the walk. The base shall be wetted and rolled or tamped after the spreading of each layer.

3. Forms: Forms shall be of metal or wood, straight, free from warp and of sufficient strength to resist springing from the pressure of the concrete. If made of wood, they shall be of 2-inch surfaced plank except that at sharp curves thinner material may be used. If made of metal, they shall be of an approved section and have a flat surface on the top. Forms shall be of a depth equal to the depth of the sidewalk. Forms shall be securely staked, braced and held firmly to the required line and grade and shall be sufficiently tight to prevent leakage of mortar. All forms shall be cleaned and oiled or wetted before concrete is placed against them. Sheet metal

templates 1/8 inch in thickness, of the full depth and width of the walk, shall be spaced at intervals of 12 feet or as directed. If the concrete is placed in alternate sections, these templates shall remain in place until concrete has been placed on both sides of the template. As soon as the concrete has obtained its initial set, the templates shall be removed.

4. Concrete: The concrete shall be proportioned, mixed, placed, etc., in accordance with the provisions of Section 6.01 for Class “F” Concrete. Concrete shall be cured in accordance with the provisions of Article 4.01.03 for Concrete Pavement.

5. Finishing: The surface of the concrete shall be finished with a wood float or by other approved means. The outside edges of the slab and all joints shall be edged with a 1/4-inch radius edging tool. Each slab shall be divided into two or more sections by forming dummy joints with a jointing tool as directed.

6. Backfilling and Removal of Surplus Material: The sides of the sidewalk shall be backfilled with suitable material thoroughly compacted and finished flush with the top of the sidewalk. All surplus material shall be removed and the site left in a neat and presentable condition to the satisfaction of the Engineer.

7. Detectable Warning Strip: The detectable warning strip for new construction shall be set directly in poured concrete and each tile shall be weighted down to prevent the tile from floating after placement in wet concrete in accordance with curing procedures. Install detectable warning strip, according to the plans and the Manufacturer’s specifications, or as directed by the Engineer.

The detectable warning strip for retrofit construction shall be installed according to the plans in the direction of pedestrian route and contained wholly within painted crosswalk when present. Its installation shall conform to all Manufactures requirements.

9.21.04—Method of Measurement: This work will be measured for payment as follows:

1. Concrete Sidewalk or Sidewalk Ramp: This work will be measured by the actual number of square feet of completed and accepted concrete sidewalk or ramp.

2. Excavation: Excavation below the finished grade of the sidewalk or ramp, backfilling, and disposal of surplus material will not be measured for payment, but the cost shall be included in the price bid for the sidewalk or ramp. Excavation above the finished grade of the sidewalk or ramp will be measured and paid for in accordance with Section 2.02.

3. Gravel or Reclaimed Miscellaneous Aggregate Base: This work will not be measured for payment, but the cost shall be considered as included in the price bid for the sidewalk or ramp.

4. Detectable Warning Strip: For new construction (cast in place), the detectable warning strip will be measured for payment by the actual number of each ramp where a detectable warning strip has been installed and accepted regardless of the number of tiles installed.

5. Retrofit Detectable Warning Strip: For retrofit construction (surface applied), the detectable warning strip will be measured for payment by the actual number of each ramp where a detectable warning strip has been installed and accepted regardless of the number of tiles installed.

6. Construction Staking: The establishment of control points and limits of grading will be

measured in accordance with the item Construction Staking.

9.21.05—Basis of Payment: Construction of a concrete sidewalk or ramp will be paid for at the contract unit price per square foot for "Concrete Sidewalk," or "Concrete Sidewalk Ramp" complete in place, which price shall include all excavation as specified above, backfill, disposal of surplus material, curb removal and any monolithic or separately cast sidewalk curb when required for the sidewalk ramp as shown on the plans, gravel or reclaimed miscellaneous aggregate base, equipment, tools, materials and labor incidental thereto.

A new detectable warning strip will be paid for at the contract unit price for each ramp where the detectable warning strip has been installed complete in place. This price shall include all tiles, materials, equipment, tools and labor incidental thereto.

Retrofitting the existing concrete sidewalk with a detectable warning strip will be paid for at the contract unit price for each ramp where the retrofit detectable warning strip has been installed complete in place. This price will include all tiles, saw cutting concrete, adhesive, drilling holes for fasteners, materials, equipment, tools and labor incidental there to.

The establishment of control points and limits of grading will be paid for in accordance with the item Construction Staking.

Pay Item	Pay Unit
Concrete Sidewalk	s.f.
Concrete Sidewalk Ramp	s.f.
Detectable Warning Strip	Each
Retrofit Detectable Warning Strip	Each

SECTION 10.00 - GENERAL CLAUSES FOR HIGHWAY ILLUMINATION AND TRAFFIC SIGNAL PROJECTS

Article 10.00.10 Section 3. Functional Inspection, first paragraph after the 2nd sentence: Add the following:

The contractor shall have a bucket truck with crew on site during the Functional Inspection to make any necessary aerial signal adjustments as directed by the Engineer.

Article 10.00.12 - Negotiations with utility company: Add the following:

The contractor shall give notice to utility companies a minimum of 30 days prior to required work or services to the utility company. Refer to Section 1.07 – Legal Relations and Responsibilities for the list of utility companies and representatives the contractor shall use.

The Contractor shall perform all work in conformance with Rules and Regulations of Public Utility Regulatory Authority (PURA) concerning Traffic Signals attached to Public Service Company Poles. The Contractor is cautioned that there may be energized wires in the vicinity of the specified installations. In addition to ensuring compliance with NESC and OSHA regulations, the Contractor and/or its Sub-Contractors shall coordinate with the appropriate utility company for securing/protecting the site during the installation of traffic signal mast arms, span poles or illumination poles.

When a span is attached to a utility pole, the Contractor shall ensure the anchor is in line with the proposed traffic signal span wire. More than 5 degree deviation will lower the holding strength and is not allowed. The Contractor shall provide any necessary assistance required by the utility company, and ensure the anchor and guy have been installed and properly tensioned prior to attaching the span wire to the utility pole.

Article 10.00.14 – Maintenance of Illumination During Construction: Add the following:

The Contractor shall organize his work so that any portion of the roadway which has existing illumination and is open for use remains lighted. The Contractor shall also provide illumination on all temporary crossovers, ramps and roadways, constructed as part of the stage construction, which are open for use. Highway illumination may consist of: existing lighting, new lighting, temporary lighting, or any combination of the above. It is the Contractor's responsibility to stage the installation/relocation of service cabinets, poles, lights, and circuitry so that all roadways as described above remain lighted. If it is necessary to install temporary poles, lights, or circuitry, that work shall be submitted to the Engineer for approval prior to installation, and will be paid for at the contract bid unit price for these items. Temporary illumination work not specifically

covered by the contract specifications and pay items will be paid for as extra work at the discretion of the Engineer.

If the contract documents include temporary illumination plans, these plans shall serve as a framework for providing roadway illumination during construction. Temporary illumination plans may not represent the extent of the temporary illumination work required, or the exact quantity of temporary lights to be installed.

Prior to the start of any work that will interfere with the existing lighting system, the Contractor, along with ConnDOT District Electrical Maintenance, shall inspect the system for lighting outages, pole knockdowns, and circuit malfunctions. If these deficiencies are found, they shall be noted and repaired by ConnDOT prior to the start of work by the Contractor.

Once the Contractor's work interferes with or impacts the existing roadway lighting system, maintenance of that system within the project limits becomes the Contractor's responsibility. The repair of any lighting system malfunctions occurring outside of the project limits, caused by the Contractor's work, shall also be the Contractor's responsibility. ConnDOT District Construction personnel will note the start and end date of the Contractor's responsibility for maintenance of the existing lighting system. The Contractor shall maintain the illumination throughout the duration of the project, until accepted by the State. The Contractor shall supply to the Project Engineer and to the ConnDOT District Electrical Maintenance Supervisor, the names and phone numbers of a primary and back-up representative, to be contacted should a problem with the lighting system occur.

Initial notification of lighting outages or pole knockdowns within the project limits should immediately be directed to ConnDOT Highway Operations, who would then notify ConnDOT Electrical Maintenance. ConnDOT Highway Operations can be reached at the following telephone numbers: for projects in District 3 call (203)-696-2690, for projects in Districts 1, 2, and 4 call (860) 594-3447. The following procedures will be followed for lighting outages:

- 1) Once notified of a lighting outage, ConnDOT Electrical Maintenance personnel will assess the situation, and in the case of a pole knockdown, may clear the pole from the roadway and make safe any exposed wires.
- 2) Upon assessment of the lighting outage, ConnDOT Electrical Maintenance will notify the Project Inspector and the Contractor's designated representative of the outage, thereby transferring responsibility for any further repairs to the Contractor.
- 3) Upon notification, The Contractor shall be responsible to repair the lighting system before the normal nighttime turn-on of the lights. If this cannot be achieved, the Contractor will be required to have the lighting operational prior to the next normal nighttime turn-on of the lights, up to a maximum of 24 hours from the time the Contractor was notified of the problem. The Contractor shall contact the district construction field office and apprise the Project Inspector of the situation, and brief him on what steps will be taken to bring the lighting back on line along with an anticipated time frame for doing this.

- 4) For isolated individual luminaire outages (not a continuous circuit), the Contractor shall repair such luminaires within 48 hours of notification.

The Contractor shall follow standard “lock-out”, “tag-out”, and “call before you dig” procedures when working on the lighting circuit. Both the Contractor and ConnDOT Electrical Maintenance shall have mutual accessibility to active lighting control cabinets.

The Contractor shall be reimbursed for any costs associated with the maintenance of the existing lighting system that are beyond the Contractor’s control. Such reimbursements would cover damage caused by the general public and normal system age related component failures (lamp burn-out, ballast/starter failure, cable splice failure, etc.). However; the Contractor shall be responsible for repair of damage to the existing lighting system incurred as the result of his operations including damage caused by improper wiring methods. All repairs or replacements due to the Contractor’s operations shall be made by the Contractor at the Contractor’s expense.

The Project Inspector shall maintain a log book of any lighting repair work performed, which will include a description of the repairs, and the date the work was performed. The log book shall be made accessible to ConnDOT Electrical Maintenance personnel.

Temporary illumination circuitry shall consist of pre-assembled aerial cable of the type and size as indicated in the special provisions. If aerial cable cannot be installed due to specific construction activities (driving of piles, placing of bridge girders, etc.), the Contractor shall notify the Engineer and suggest alternative methods of installation. Alternative options may include installing cable in duct underground, or installing surface mounted cable in duct or PVC conduit with cable along the backside of a bridge parapet or temporary concrete barrier curbing. Temporary cable in duct/conduit laying directly on the ground will not be allowed. The option of surface mounting duct or conduit to the backside of a parapet or barrier will only be allowed when construction activities make it necessary, and where the surface mounted conduit will not expose workers to a high voltage hazard. The Engineer’s approval will be required prior to the installation of any temporary circuitry not installed overhead.

When temporary circuitry is installed in trench, standard warning tape procedures will be followed as set forth in Article 1.05.15. When temporary circuitry is surface mounted to the backside of a parapet or barrier wall, the Contractor shall install warning placards which read: “Live Electricity”. Warning placards shall be installed at the beginning, end, and at intermittent points 100’ (30 meters) apart along the exposed length of the duct/conduit. All temporary lighting circuits shall include a continuous No. 8 bare copper grounding conductor connected to all light standards and effectively grounded as per the NEC.

SECTION 12.00 – GENERAL CLAUSES FOR HIGHWAY SIGNING

Description:

Work under this item shall conform to the requirements of Section 12.00 supplemented as follows:

12.00.06 – Data Labels:

For the purpose of developing and maintaining a highway sign inventory and for the purpose of sampling and testing reflective sheeting, the Contractor shall affix a Data Label(s) to the back of each sign face-extruded aluminum sign and each sign face-sheet aluminum sign in the vicinity of the lower left hand corner or quadrant. Data Labels shall be 2 (two) separate 5 (five) inch by 3 (three) inch (125mm by 75mm), non-reflective weatherproof films with black copy on a yellow background having a pressure sensitive adhesive backing.

A “Fabrication” Data Label is to include information about the sign fabricator, date of fabrication and the sheeting manufacturer - type. An “Installation” Data Label is to include The State Project Number or Maintenance Permit Number that installed the sign and date of installation.

The cost of the data labels coded and in place on the sign shall be included in the unit cost of the respective sign material. Payment for the respective quantities of each sign face-extruded aluminum sign and each sign face-sheet aluminum sign may be withheld until all Data Label(s) have been installed to the satisfaction of the Engineer.

The Data Label designs, with additional notes relative to design requirements are attached herewith.

DATA LABELS
NON REFLECTIVE, WEATHERPROOF FILM
BLACK COPY, YELLOW BACKGROUND

CONN DOT SIGN FACE DATA LABEL											
Fabricator: (Insert NAME or State)											
Sheeting Manufacturer - Type (Insert NAME - TYPE)											
Date Fabricated - Month / Year											
J	F	M	A	M	J	J	A	S	O	N	D
12	13	14	15	16	17	18	19	20	21	22	23

CONN DOT SIGN FACE DATA LABEL											
Installed By:											
Project No.: (Insert 000-0000 or State)											
Permit No.: (Insert D_-000000)											
Date Installed - Month / Year											
J	F	M	A	M	J	J	A	S	O	N	D
12	13	14	15	16	17	18	19	20	21	22	23

Data Labels To Be 5 Inch By 3 Inch Each (125mm x 75mm) With Face Designs As Shown Above.

All Copy Ink Must Be Durable And Not Fade, Discolor, Or Smudge.

All Variable Legends To Be Included At Label Fabrication.

Only One "Installed By" Permit Or Project Number Should Be Provided.

Sign Fabrication And / Or Installation By State Forces, Insert "State."

The Month And Year Of Fabrication And Installation May Be Punched Or Marked Out

The Back Of The Data Label Must Contain A Pre-coated Pressure-Sensitive Adhesive Covered By A Removable Liner.

At Application, The Liner Must Be removable Without Soaking In Water Or Other Solvents.

The Adhesive Must Form A Durable Bond To Surfaces That Are Smooth, Clean, Corrosion-Free And Weather Resistant.

Completed Data Labels Must Not Discolor, Crack, Craze, Blister, Delaminate, Peel, Chalk, Or Lose Adhesion When Subjected To Temperatures From -30 Degrees to 200 Degrees Fahrenheit.

SECTION 12.08 - SIGN FACE-SHEET ALUMINUM

Work under this item shall conform to the requirements of Section 12.08 amended as follows:

General: Delete all references to parapet mounted sign supports.

Article M.18.15 – Sign Mounting Bolts: *Replace with the following:*

Bolts used for sign mounting shall be stainless steel and conform to ASTM F593, Group 1 or 2 (Alloy Types 304 or 316). Locking nuts shall be stainless steel and shall conform to ASTM F594 (Alloy Types 304 or 316). Washers shall also be stainless steel and shall conform to ASTM A240 (Alloy Types 304 or 316).

SECTION M.04 - BITUMINOUS CONCRETE

Section M.04 is being deleted in its entirety and replaced with the following:

M.04.01—Bituminous Concrete Materials and Facilities

M.04.02—Mix Design and Job Mix Formula (JMF)

M.04.03—Production Requirements

M.04.01—Bituminous Concrete Materials and Facilities: Each source of material, and facility or plant used to produce and test bituminous concrete must be qualified on an annual basis by the Engineer. Test Procedures and Specifications referenced herein are in accordance with the latest AASHTO and ASTM Standard Test Procedures and Specifications. Such references when noted with an (M) have been modified by the Engineer and are detailed in Table M.04.03-6.

The Contractor shall submit to the Engineer all sources of coarse aggregate, fine aggregate, mineral filler, PG binder, and if applicable any additives such as but not limited to anti-strip, warm mix, and polymer modifiers. The Contractor shall submit a Material Safety Data Sheet (MSDS) for each grade of binder, and additive to be used on the Project. The Contractor shall not change any material sources without prior approval of the Engineer.

An adequate quantity of each size aggregate, mineral filler, bitumen, and additives, shall be maintained at the bituminous concrete plant site at all times while the plant is in operation to ensure that the plant can consistently produce bituminous concrete mixtures that meet the job mix formula (JMF) as specified in Article M.04.02. The quantity of such material shall be reviewed by the Engineer on an individual plant basis and is dependent upon the plant's daily production capacity. A total quantity of any material on site that amounts to less than one day's production capacity may be cause for the job mix formula to be rejected.

1. Coarse Aggregate:

- a. **Requirements:** The coarse aggregate shall consist of clean, hard, tough, durable fragments of crushed stone or crushed gravel of uniform quality. Aggregates from multiple sources of supply must not be mixed or stored in the same stockpile.
- b. **Basis of Approval:** The request for approval of the source of supply shall include a washed sieve analysis in accordance with AASHTO T 27. The G_{sa}, G_{sb}, and P_w_a shall be determined in accordance with AASHTO T 85. The coarse aggregate must not contain more than 1% crusher dust, sand, soft disintegrated pieces, mud, dirt, organic and other injurious materials. When tested for abrasion using AASHTO T 96, the aggregate loss must not exceed 40%. When tested for soundness using AASHTO T 104 with a magnesium sulfate solution, the coarse aggregate must not have a loss exceeding 10% at the end of 5 cycles.

For all bituminous mixtures, materials shall also meet the coarse aggregate angularity criteria as specified in Tables M.04.02-2 thru M.04.02-4 for blended aggregates retained

on the #4 sieve when tested according to ASTM D 5821. The amount of aggregate particles of the coarse aggregate blend retained on the #4 sieve that are flat or elongated shall be determined in accordance with ASTM D 4791 and shall not exceed 10% by weight when tested to a 3:1 ratio, as shown in Tables M.04.02-2 thru M.04.02-4.

2. Fine Aggregate:

Requirements: The fine aggregate from each source quarry/pit deposit shall consist of clean, hard, tough, rough-surfaced and angular grains of natural sand; manufactured sand prepared from washed stone screenings; stone screenings, slag or gravel; or combinations thereof, after mechanical screening or manufactured by a process approved by the Engineer. The Contractor is prohibited from mixing two or more sources of fine aggregate on the ground for the purpose of feeding into a plant.

- a. All fine aggregate shall meet the listed criteria shown in items #1 thru #7 of Table M.04.01-1. Table M.04.01-1 indicates the quality tests and criteria required for all fine aggregate sources. Individually approved sources of supply shall not be mixed or stored in the same stockpile. The fine aggregates must be free from injurious amounts of clay, loam, and other deleterious materials.

For Superpave mixtures, in addition to the above requirements, the fine aggregate angularity shall be determined by testing the materials passing the #8 sieve in accordance with AASHTO T 304, Method A. Qualification shall be based on the criteria listed in Tables M.04.02-2 thru M.04.02-4. The fine aggregate shall also be tested for clay content as a percentage contained in materials finer than the #8 sieve in accordance with AASHTO T 176.

Table M.04.01-1: Fine Aggregate Criteria by Pit/Quarry Source

Item	Title	AASHTO Protocol(s)	Criteria
1	Grading	T 27 & T 11	100% Passing 3/8 inch 95% Passing the #4 min.
2	Absorption	T 84	3% maximum
3	Plasticity limits	T 90	0 or not detectable
4	L.A. Wear	T 96	50% maximum(fine agg. particle size # 8 and above)
5	Soundness by Magnesium Sulfate	T 104	20% maximum @ 5 cycles
6	Clay Lumps and Friable Particles	T 112	3% maximum
7	Deleterious Material	As determined by the Engineer	Organic or inorganic calcite, hematite, shale, clay or clay lumps, friable materials, coal-lignite, shells, loam, mica, clinkers, or organic matter (wood, etc). -Shall not contain more than 3% by mass of any individual listed constituent and not more than 5% by mass in total of all listed constituents.
8	Petrographic Analysis	ASTM C 295	Terms defined in Section M.04.01-2c.

- b. Basis of Approval: A Quality Control Plan for Fine Aggregate (QCPFA) provided by the Contractor shall be submitted for review and approval for each new source documenting how conformance to Items 1 through 7 as shown in Table M.04.01-1 is monitored. The QCPFA must be resubmitted any time the process, location or manner of how the fine aggregate (FA) is manufactured changes, or as requested by the Engineer. The QCPFA must include the locations and manufacturing processing methods. The QCPFA for any source may be suspended by the Engineer due to the production of inconsistent mixtures.

The Contractor shall submit all test results to the Engineer for review. The Contractor shall also include a washed sieve analysis in accordance with AASHTO T 27/T 11. Any fine aggregate component or final combined product shall have 100% passing the 3/8 inch sieve and a minimum of 95% passing the # 4. The G_{sa}, G_{sb}, and P_{w_a} shall be determined in accordance with AASHTO T 84.

The Contractor will be notified by the Engineer if any qualified source of supply fails any portion of Table M.04.01-1. One retest will be allowed for the Contractor to make corrections and/or changes to the process. If, upon retest, the material does not meet the requirements of items 1-7, additional testing will be required in accordance with item 8.

- c. The Contractor may provide a Petrographic analysis of the material performed by a third party acceptable to the Engineer at its' own expense. The Contractor shall submit the results of the analysis with recommended changes to the manufacturing process to the Engineer. The Contractor shall submit fine aggregate samples for testing by the Engineer after the recommended changes have been made.

The Contractor may request the use of such fine aggregate on select project(s) for certain applications of bituminous concrete pavement. Such material will be monitored for a period no less than 48 months, at no cost to the State. Terms of any evaluation and suitable application will be determined by the Engineer.

3. Mineral Filler:

- a. Requirements: Mineral filler shall consist of finely divided mineral matter such as rock dust, including limestone dust, slag dust, hydrated lime, hydraulic cement, or other accepted mineral matter. At the time of use it shall be freely flowing and devoid of agglomerations. Mineral filler shall be introduced and controlled at all times during production in a manner acceptable to the Engineer.
- b. Basis of Approval: The request for approval of the source of supply shall include the location, manufacturing process, handling and storage methods for the material. Mineral filler shall conform to the requirements of AASHTO M-17

4. Liquid Bituminous Materials:

a. General:

- i. Liquid PG binders shall be uniformly mixed and blended and be free of contaminants such as fuel oils and other solvents. Binders shall be properly heated and stored to prevent damage or separation.
- ii. The blending at mixing plants of PG binder from different suppliers is strictly prohibited. Contractors who blend PG binders will be classified as a supplier and will be required to certify the binder in accordance with AASHTO R-26(M). The binder shall meet the requirements of AASHTO M-320(M) and AASHTO R-29(M). The Contractor shall submit a Certified Test Report and bill of lading representing each delivery in accordance with AASHTO R-26(M). The Certified Test Report must also indicate the binder specific gravity at 77°F; rotational viscosity at 275°F and 329°F and the mixing and compaction viscosity-temperature chart for each shipment.
- iii. The Contractor shall submit the name(s) of personnel responsible for receipt, inspection, and record keeping of PG binder materials. Contractor plant personnel shall document specific storage tank(s) where binder will be transferred and stored until used, and provide binder samples to the Engineer upon request. The person(s) shall assure that each shipment (tanker truck) is accompanied by a statement certifying that the transport vehicle was inspected before loading and was found acceptable for the material shipped and that the binder will be free of contamination from any residual material, along with two (2) copies of the bill of lading.
- iv. Basis of Approval: The request for approval of the source of supply shall list the location where the material will be manufactured, and the handling and storage methods, along with necessary certification in accordance with AASHTO R-26(M). Only suppliers/refineries that have an approved "Quality Control Plan for Performance Graded Binders" formatted in accordance with AASHTO R-26(M) will be allowed to supply PG binders to Department projects.

b. Neat Performance Grade (PG) Binder:

- i. PG binder shall be classified by the supplier as a "Neat" binder for each lot and be so labeled on each bill of lading. Neat PG binders shall be free from modification with: fillers, extenders, reinforcing agents, adhesion promoters, thermoplastic polymers, acid modification and other additives, and shall indicate such information on each bill of lading and certified test report.
- ii. The asphalt binder shall be Performance Grade PG 64-22.

c. Modified Performance Grade (PG) Binder

Unless otherwise noted, the asphalt binder shall be Performance Grade PG 76-22 asphalt modified with a Styrene-Butadiene-Styrene (SBS) polymer. The polymer modifier shall be added at either the refinery or terminal and delivered to the bituminous concrete production facility as homogenous blend. The stability of the modified binder shall be verified in accordance with ASTM D7173 using the Dynamic Shear Rheometer (DSR). The DSR $G^*/\sin(\delta)$ results from the top and bottom sections of the ASTM D7173 test shall not differ by more than 10%. The results of ASTM D7173 shall be included on the Certified Test Report. The binder shall meet the requirements of AASHTO M-320(M) and AASHTO R-29(M).

d. Warm Mix Additive or Technology:

- i. The warm mix additive or technology must be listed on the NEAUPG Qualified Warm Mix Asphalt (WMA) Technologies List at the time of bid, which may be accessed online at http://www.neaupg.uconn.edu/wma_info.html.
- ii. The warm mix additive shall be blended with the asphalt binder in accordance with the manufacturer's recommendations.
- iii. The blended binder shall meet the requirements of AASHTO M-320(M) and AASHTO R-29(M) for the specified binder grade. The Contractor shall submit a Certified Test Report showing the results of the testing demonstrating the binder grade. In addition, it must include the grade of the virgin binder, the brand name of the warm mix additive, the manufacturer's suggested rate for the WMA additive, the water injection rate (when applicable) and the WMA Technology manufacturer's recommended mixing and compaction temperature ranges.
- iv. Cut-backs (medium cure type):
 - i. Requirements: The liquid petroleum materials shall be produced by fluxing an asphalt base with appropriate petroleum distillates to produce the grade specified.
 - ii. Basis of Approval: The request for approval of the source of supply shall be submitted at least seven days prior to its use listing the location where the materials will be produced, and manufacturing, processing, handling and storage methods. The Contractor shall submit a Certified Test Report in accordance with Section 1.06 and a Material Safety Data Sheet (MSDS) for the grade to be used on the Project. The liquid asphalt shall be MC-250 conforming to AASHTO M-82.

e. Emulsions

- i. Requirements: The emulsified asphalt shall be homogeneous and not be used if exposed to freezing temperatures.
- ii. Basis of Approval: The request for approval of the source of supply must include the location where the materials will be produced, and manufacturing, processing, handling and storage methods.
 1. Emulsified asphalts shall conform to the requirements of AASHTO M-140. Materials used for tack coat shall not be diluted and meet grade RS-1. When ambient temperatures are 80°F and rising, grade SS-1 or SS-1h may be substituted if accepted by the Engineer. Each shipment shall be accompanied with a Certified Test Report listing Saybolt viscosity, residue by evaporation, penetration of residue, and weight per gallon.
 2. Cationic emulsified asphalt shall conform to the requirements of AASHTO M-208(M). Materials used for tack coat shall not be diluted and meet grade CRS-1. The settlement and demulsibility test will not be performed unless deemed necessary by the Engineer. When ambient temperatures are 80°F and rising, grade CSS-1 or CSS-1h may be substituted if accepted by the Engineer. Each shipment shall be accompanied with a Certified Test Report listing Saybolt viscosity, residue by evaporation, penetration of residue, and weight per gallon.

5. Reclaimed Asphalt Pavement (RAP):

- a. Requirements: RAP shall consist of asphalt pavement constructed with asphalt and aggregate reclaimed by cold milling or other removal techniques approved by the Engineer. For bituminous concrete mixtures containing RAP, the Contractor shall submit a JMF in accordance with Article M.04.02 to the Engineer for review.
- b. Basis of Approval: The RAP material will be accepted on the basis of one of the following criteria:
 - i. When the source of all RAP material is from pavements previously constructed on Department projects, the Contractor shall provide a materials certificate listing the detailed locations and lengths of those pavements and that the RAP is only from those locations listed.
 - ii. When the RAP material source or quality is not known, the Contractor shall test the material and provide the following information along with a request for approval to the Engineer at least 30 calendar days prior to the start of the paving operation. The request shall include a material certificate stating that the RAP consists of aggregates that meet the specification requirements of sub articles M.04.01-1 through 3 and that the binder in the RAP is substantially free of solvents, tars and other contaminants. The Contractor is prohibited from using unapproved material on Department projects

and shall take necessary action to prevent contamination of approved RAP stockpiles. Stockpiles of unapproved material shall remain separate from all other RAP materials at all times. The request for approval shall include the following:

1. A 50-pound sample of the RAP to be incorporated into the recycled mixture.
2. A 25-pound sample of the extracted aggregate from the RAP.
3. A statement that RAP material has been crushed to 100% passing the ½ inch sieve and remains free from contaminants such as joint compound, wood, plastic, and metals.

6. Crushed Recycled Container Glass (CRCG):

- a. Requirements: The Contractor may propose to use clean and environmentally-acceptable CRCG in an amount not greater than 5% by weight of total aggregate.
- b. Basis of Approval: The Contractor shall submit to the Engineer a request to use CRCG. The request shall state that the CRCG contains no more than 1% by weight of contaminants such as paper, plastic and metal and conform to the following gradation:

CRCG Grading Requirements	
<u>Sieve Size</u>	<u>Percent Passing</u>
3/8-inch	100
No. 4	35-100
No. 200	0.0-10.0

7. Joint Seal Material:

Requirements: Joint seal material shall be a hot-poured rubber compound intended for use in sealing joints and cracks in bituminous concrete pavements. Joint seal material must meet the requirements of AASHTO M-324 – Type 2.

8. Plant Requirements:

- a. Mixing Plant and Machinery:

The mixing plant used in the preparation of the bituminous concrete shall comply with AASHTO M-156(M)/ASTM D 995 for a Batch Plant or a Drum Dryer Mixer Plant, and be approved by the Engineer.

- b. Storage Silos:

For all mixes, the Contractor may use silos for short-term storage of Superpave mixtures with prior notification and approval of the Engineer. A silo must have heated cones and an unheated silo cylinder if it does not contain a separate internal heating system. Prior approval must be obtained for storage times greater than those indicated. When multiple

silos are filled, the Contractor shall discharge one silo at a time. Simultaneous discharge of multiple silos is not permitted.

<u>Type of silo cylinder</u>	<u>Maximum storage time for all classes (hr)</u>	
	HMA	WMA/PMA
Open Surge	4	Mfg Recommendations
Unheated – Non-insulated	8	Mfg Recommendations
Unheated – Insulated	18	Mfg Recommendations
Heated – No inert gas	TBD by the Engineer	

- c. Documentation System: The mixing plant documentation system shall include equipment for accurately proportioning the components of the mixture by weight and in the proper order, controlling the cycle sequence and timing the mixing operations. Recording equipment shall monitor the batching sequence of each component of the mixture and produce a printed record of these operations on each delivery ticket, as specified herein. Material feed controls shall be automatically or manually adjustable to provide proportions within the tolerances listed below for any batch size.

An asterisk (*) shall be automatically printed next to any individual batch weight(s) exceeding the tolerances in ASTM D 995 section 8.7.3. The entire batching and mixing interlock cut-off circuits shall interrupt and stop the automatic batching operations when an error exceeding the acceptable tolerance occurs in proportioning.

There must be provisions so that scales are not manually adjusted during the printing process. In addition, the system shall be interlocked to allow printing only when the scale has come to a complete rest. A unique printed character (m) shall automatically be printed on the truck and batch plant printout when the automatic batching sequence is interrupted or switched to auto-manual or full manual during proportioning. For each day's production, each project shall be provided a clear, legible copy of these recordings on each delivery ticket.

- d. Aggregates: The Contractor shall ensure that aggregate stockpiles are managed to provide uniform gradation and particle shape, prevent segregation and cross contamination in a manner acceptable to the Engineer. For drum plants only, the Contractor shall determine the percent moisture content at a minimum, prior to production and half way through production.
- e. Mixture: The dry and wet mix times shall be sufficient to provide proper coating (minimum 95% as determined by AASHTO T 195(M)) of all particles with bitumen and produce a uniform mixture.

The Contractor shall make necessary adjustments to ensure all types of bituminous concrete mixtures contain no more than 0.5% moisture throughout when tested in accordance with AASHTO T 329.

- f. RAP: The Contractor shall indicate the percent of RAP, the moisture content (as a minimum determined twice daily – prior to production and halfway through production), and the net dry weight of RAP added to the mixture on each truck ticket. For each day of production, the production shall conform to the job mix formula and RAP percentage and no change shall be made without the prior approval of the Engineer.
- g. Asphalt Binder: The last day of every month, a binder log shall be submitted when the monthly production for the Department exceeds 5000 tons. Blending of PG binders from different suppliers or grades at the bituminous concrete production facility is strictly prohibited.
- h. Warm mix additive: For mechanically foamed WMA, the maximum water injection rate shall not exceed 2.0% water by total weight of binder and the water injection rate shall be constantly monitored during production.
- i. Field Laboratory: The Contractor shall furnish the Engineer an acceptable field laboratory at the production facility to test bituminous concrete mixtures during production. The field laboratory shall have a minimum of 300 square feet, have a potable water source and drainage in accordance with the CT Department of Public Health Drinking Water Division, be equipped with all necessary testing equipment as well as with a PC, printer, and telephone with a dedicated hard-wired phone line. In addition, the PC shall have a high speed internet connection with a minimum upstream of 384 Kbps and a functioning web browser with unrestricted access to <https://ctmail.ct.gov>. This equipment shall be maintained in clean and good working order at all times and be made available for use by the Engineer.

The laboratory shall be equipped with a suitable heating system capable of maintaining a minimum temperature of 65°F. It shall be clean and free of all materials and equipment not associated with the laboratory. Windows shall be installed to provide sufficient light and ventilation. During summer months adequate cooling or ventilation must be provided so the indoor air temperature shall not exceed the ambient outdoor temperature. Light fixtures and outlets shall be installed at convenient locations, and a telephone shall be within audible range of the testing area. The laboratory shall be equipped with an adequate workbench that has a suitable length, width, and sampling tables, and be approved by the Engineer.

The field laboratory testing apparatus, supplies, and safety equipment shall be capable of performing all tests in their entirety that are referenced in AASHTO R 35(M), *Standard Practice for Superpave Volumetric Design for Hot-Mix Asphalt (HMA)* and AASHTO M 323, *Standard Specification for Superpave Volumetric Mix Design*. In addition, the quantity of all equipment and supplies necessary to perform the tests must be sufficient to initiate and complete the number of tests identified in Table M.04.03-2 for the quantity of mixture produced at the facility on a daily basis. The Contractor shall ensure that the

Laboratory is adequately supplied at all times during the course of the project with all necessary testing materials and equipment.

The Contractor shall maintain a list of laboratory equipment used in the acceptance testing processes including but not limited to, balances, scales, manometer/vacuum gauge, thermometers, gyratory compactor, clearly showing calibration and/or inspection dates, in accordance with AASHTO R-18. The Contractor shall notify the Engineer if any modifications are made to the equipment within the field laboratory. The Contractor shall take immediate action to replace, repair, and/or recalibrate any piece of equipment that is out of calibration, malfunctioning, or not in operation.

M.04.02—Mix Design and Job Mix Formula (JMF)

1. Marshall Method - Class 1, 2, 3, 4, 5, 5A, 5B and 12:

- a. Requirements: When specified, the Marshall method shall be employed to develop a bituminous concrete mix design that includes a JMF consisting of target values for gradation and bitumen content for each class of bituminous concrete designated for the project in accordance with the latest Asphalt Institute's MS-2 manual. Each class of bituminous concrete must meet the requirements as shown in Table M.04.02-1.
- b. Basis of Approval: The Contractor shall submit to the Engineer a request for approval of the JMF annually in accordance with one of the methods described herein. Prior to the start of any paving operations, the JMF and production percentage of bitumen must be accepted by the Engineer, and the Contractor must demonstrate the ability to meet the accepted JMF and production percentage of bitumen for each class of mixture. Additionally, the fraction of material retained between any two consecutive sieves shall not be less than 4%.

The Engineer will test each class of mixture for compliance with the submitted JMF and Table M.04.02-1. The maximum theoretical density (Gmm) will be determined by AASHTO T 209(M). If the mixture does not meet the requirements, the JMF shall be adjusted within the ranges shown in Table M.04.02-1 until an acceptable mixture is produced. All equipment, tests and computations shall conform to the Marshall method in accordance with AASHTO T 245(M).

An accepted JMF from the previous operating season may be acceptable to the Engineer provided that there are no changes in the sources of supply for the coarse aggregate, fine aggregate, recycled material (if applicable) and the plant operation had been consistently producing acceptable mixture.

The Contractor shall not change sources of supply after a JMF has been accepted. Before a new source of supply for materials is used, a new JMF shall be submitted to the Engineer for approval.

- c. Marshall Mixture (Virgin): For bituminous concrete mixtures that contain no recycled material, the limits prescribed in Table M.04.02-1 govern. The Contractor shall submit to the Engineer for approval, a JMF with the individual fractions of the aggregate expressed as percentages of the total weight of the mix and the source(s) of all materials. The JMF shall indicate two bitumen contents; the JMF target percentage and a production percentage (actual amount added to mix) of bitumen for each mix class by total weight. For surface course Class 1, a 0.45 power gradation chart shall also be submitted on which is plotted the percentage passing each sieve. The JMF shall also indicate the target temperature of completed mixture as it is dumped from the mixer and tested in accordance with Article M.04.03.
- d. Marshall Mixtures with RAP: In addition to subarticles M.04.02 – 1a through c, RAP in bituminous concrete shall comply with requirements stated in Article M.04.01, and as stated herein. Upon approval of the Engineer, a maximum of 15% RAP may be used with no binder grade modification. RAP material shall not be used with any other recycling option.
The Contractor may increase the RAP percentage in 5% increments up to a maximum of 30% provided a new JMF is accepted by the Engineer. The following information shall be included in the JMF submittal:
- Gradation and asphalt content of the RAP.
 - Percentage of RAP to be used.
 - Virgin aggregate source(s).
 - Total binder content based on total mixture weight.
 - Production pull percentage of added virgin binder based on total mixture weight.
 - Gradation of combined bituminous concrete mixture (including RAP).
 - Grade of virgin added, if greater than 15% of total mix weight.
- e. Marshall Mixture with CRCG: In addition to subarticle M.04.02 – 1a through c, for bituminous concrete that contains CRCG, the Contractor shall submit a materials certificate to the Engineer stating that the mixture and its components comply with requirements stated in subarticle M.04.01 - (6). Additionally, 1% hydrated lime, or other accepted non-stripping agent, shall be added to all mixtures containing CRCG. CRCG material shall not be used with any other recycling option.

2. Cold Patch Method - Class 5, 5A, 5B:

- a. Requirements: This mixture must be capable of being stockpiled and workable at all times. A non-stripping agent accepted by the Engineer shall be used in accordance with manufacturer's recommendations. The Contractor shall take necessary steps to ensure that this mixture uses aggregate containing no more than 1% moisture and is not exposed to any rain, snow, or standing water for a period of 6 hours after being mixed. This mixture shall be mixed and stockpiled at the point of production on a paved surface at a height not greater than 4 feet during the first 48 hours prior to its use.

- i. Class 5A mixture shall have $\frac{3}{8}$ to $\frac{1}{2}$ inch polypropylene fibers that have been approved by the Engineer added at a rate of 6 pounds per ton of mixture.
 - ii. Class 5B mixture shall have $\frac{1}{4}$ inch polyester fibers that have been approved by the Engineer added at the rate of 2 $\frac{1}{2}$ pounds per ton of mixture.
 - iii. Class 5 mixture shall not contain fibers.
- b. Basis of Approval: The aggregates, fibers and binder (MC-250) shall meet the requirements as specified in sub articles M.04.01-1 through 4 and in Table M.04.02-1. The use of recycled material is not permitted with these classes of bituminous concrete. Mixtures not conforming to the binder content as shown in Table M.04.02-1 shall be subject to rejection. There is a two test minimum per day of production. Mixtures not conforming to the gradation as shown in Table M.04.02-1 shall be subject to payment adjustment as specified in Section 4.06.

TABLE M.04.02 – 1 MASTER RANGES FOR MARSHALL BITUMINOUS-CONCRETE MIXTURES

Notes: (a) 75 blow (Marshall Criteria). (b) 3-6% when used for a roadway wearing surface. (c) For divided highways with 4 or more lanes, a stability of 1500 lbs is required. (d) Contains an accepted non-stripping compound. (e) To help prevent stripping, the mixed material will be stockpiled on a paved surface and at a height not greater than 4 feet during the first 48 hours. (f) As determined by AASHTO T 245(M). (g) The percent passing the #200 sieve shall not exceed the percentage of bituminous asphalt binder determined by AASHTO T 164 or AASHTO T 308(M). (h) Mixture with 5% or more aggregate retained on 3/4" sieve. (i) Mixtures finer than condition (h) above. (j) Class 5 mixture shall contain no fibers. Class 5A mixture shall have 3/8 to 1/2 inch polypropylene fibers that have been previously accepted by the Engineer added at a minimum rate of 6 pounds per ton of mixture. Class 5B mixture shall have 1/4 inch polyester fibers that have been previously accepted by the Engineer added at the minimum rate of 2 1/2 pounds per ton of mixture

CLASS	1	2	3	4	12	5 (e)(j)	5A (e)(j)	5B (e)(j)	JMF % Tol. (±)
Grade of PG Binder content %	PG 64-22 5.0 – 6.5	PG 64-22 5.0 – 8.0	PG 64-22 6.5 - 9.0	PG 64-22 4.0 - 6.0	PG 64-22 7.5 - 10.0	MC-250 (d) 6.0 - 7.5	MC-250 (d) 6.0 - 7.5	MC-250 (d) 6.0 - 7.5	0.4
Sieve Size	Percent Passing (%)								
# 200	3.0 – 8.0 (g)	3.0 – 8.0 (g)	3.0 – 8.0 (g)	0.0 – 5.0 (g)	3.0 – 10.0 (g)	0.0 - 2.5	0.0- 2.5	0.0 - 2.5	2.0
# 50	6 – 26	8 – 26	10 - 30	5 - 18	10 - 40				4
# 30	10 - 32	16 - 36	20 - 40		20 - 60	2 - 15	2 – 15	2 - 15	5
# 8	28 - 50	40 - 64	40 - 70	20 - 40	60 - 95	10 - 45	10 – 45	10 - 45	6
# 4	40 - 65	55 - 80	65 - 87	30 - 55	80 - 95	40 - 100	40 – 100	40 - 100	7
1/4"									
3/8 "	60 - 82	90 - 100	95 - 100	42 - 66	98 - 100	100	100	100	8
1/2 "	70 - 100	100	100		100				8
3/4"	90 - 100			60 - 80					8
1"	100								
2"				100					
Additionally, the fraction of material retained between any two consecutive sieves shall not be less than 4%									
Mixture Temperature									
Binder	325°F maximum					140-185° F			
Aggregate	280-350° F					100-175° F			
Mixtures	265-325° F				275-325°F	120-175° F			25 °F
Mixture Properties									
VOIDS - %	3.0 – 6.0 (a)	2.0 – 5.0 (b)	0 – 4.0		0 - 5.0 (a)				
Stability (f) lbs. min.	1200 (c)	1000	1000		1000				
FLOW (f) in.	.08 - .15	.08 - .15	.08 - .18		.08 - .15				
VMA % - min.	15(h) :16 (i)								

3. Superpave Design Method – S0.25, S0.375, S0.5, and S1

- a. Requirements: The Contractor or its representative shall design and submit Superpave mix designs annually for approval. The design laboratory developing the mixes shall be approved by the Engineer. The mix design shall be based on the specified Equivalent Single-Axle Loads (ESAL). Each bituminous concrete mix type must meet the requirements shown in Tables M.04.02-2 thru Table M.04.02-5 and in accordance with AASHTO M 323(M) and AASHTO R 35(M). The mix design shall include the nominal maximum aggregate size and a JMF consisting of target values for gradation and bitumen content for each bituminous concrete mix type designated for the project.

The contractor shall provide test results with supporting documentation from an AASHTO Materials Reference Laboratory (AMRL) with the use of NETTCP Certified Technicians for the following tests;

1. Aggregate consensus properties for each type & level, as specified in Table M.04.02-3. In addition the G_{sa}, G_{sb}, P_{wa} shall also be provided for each component aggregate.
2. New mixes shall be tested in accordance with AASHTO T 283(M) *Standard Method of Test for Resistance of Compacted Hot-Mix Asphalt (HMA) to Moisture-Induced Damage*, (TSR). The compacted specimens may be fabricated at a bituminous concrete facility and then tested at an AMRL accredited facility.

The AASHTO T 283(M) test results, specimens, and corresponding JMF sheet (Form MAT-429s) shall be submitted by the Contractor for review.

The Contractor shall supply the Engineer with 1 gallon of the specified PG binder and 1 gallon of the same PG binder with the warm mix additive blended into it. The MSDS for the WMA additive shall be included with every submittal.

In addition, minimum binder content values apply to all types of bituminous concrete mixtures, as stated in Table M.04.02-5. For mixtures containing RAP, the virgin production and the anticipated proportion of binder contributed by the RAP cannot be less than the total permitted binder content value for that type nor the JMF minimum binder content.

- i. Superpave Mixture (virgin): For bituminous concrete mixtures that contain no recycled material, the limits prescribed in Tables M.04.02-2 thru Table M.04.02-5 apply. The Contractor shall submit a JMF, on a form provided by the Engineer, with the individual fractions of the aggregate expressed as percentages of the total weight of the mix and the source(s) of all materials to the Engineer for approval. The JMF shall indicate the corrected target binder content and applicable binder correction factor (ignition oven or extractor) for each mix type by total weight of mix. The mineral filler (dust) shall be defined as that portion of blended mix that

passes the #200 sieve by weight when tested in accordance with AASHTO T 30(M). The dust-to-effective asphalt (D/Pbe) ratio shall be between 0.6 and 1.2 by weight. The dry/wet mix times and hot bin proportions (batch plants only) for each type shall be included in the JMF.

The percentage of aggregate passing each sieve shall be plotted on a 0.45 power gradation chart and shall be submitted for all bituminous concrete mixtures. This chart shall delineate the percentage of material passing each test sieve size as defined by the JMF. The percentage of aggregate passing each standard sieve shall fall within the specified control points, but outside the restricted zone limits as shown in Tables M.04.02-2 thru Table M.04.02-5. Mixes with documented performance history which pass through the restricted zone may be permitted for use as long as all other physical and volumetric criteria meets specifications as specified in Tables M.04.02-2 thru Table M.04.02-5 and with prior approval from the Engineer. A change in the JMF requires that a new chart be submitted.

- ii. Superpave Mixtures with RAP: Use of approved RAP may be allowed with the following conditions:
 - RAP amounts up to 15% may be used with no binder grade modification.
 - RAP amounts up to 20% may be used provided a new JMF is approved by the Engineer. The JMF submittal shall include the grade of virgin binder added and test results that show the combined binder (recovered binder from the RAP, virgin binder at the mix design proportions and warm mix asphalt additive if used) meets the requirements of the specified binder grade.

Unless approved by the Engineer, RAP material shall not be used with any other recycling option.

- b. Basis of Approval: On an annual basis, the Contractor shall submit to the Engineer any bituminous concrete mix design, and JMF anticipated for use on Department projects. Prior to the start of any paving operations, the mix design and JMF must be approved by the Engineer. Bituminous concrete mixture supplied to the project without an approved mix design and JMF will be rejected. The following information must be included in the mix design submittal:
 - a. Gradation, specific gravities and asphalt content of the RAP,
 - b. Source of RAP and percentage to be used.
 - c. Warm mix Technology and manufacturer's recommended additive rate and tolerances, mixing and compaction temperature ranges for the mix with and without the warm-mix technology incorporated.
 - d. Result of TSR testing, and if applicable Anti-strip manufacturer, and dosage rate.
 - e. Target Temperature at plant discharge.

Note – Testing to be performed shall be done in accordance with section M.04.03.

The JMF shall be accepted if the Plant mixture and materials meet all criteria as specified in Tables M.04.02-2 thru Table M.04.02-5. If the mixture does not meet the requirements, the contractor shall adjust the JMF within the ranges shown in Tables M.04.02-2 thru Table M.04.02-5 until an acceptable mixture is produced. All equipment, tests, and computations shall conform to the latest AASHTO R-35(M) and AASHTO M-323(M).

Any JMF, once approved, shall only be acceptable for use when it is produced by the designated plant, it utilizes the same component aggregates and binder source, and it continues to meet all criteria as specified herein, and component aggregates are maintained within the tolerances shown in Table M.04.02-2.

The Contractor shall not change any component source of supply including consensus properties after a JMF has been accepted. Before a new source of materials is used, a revised JMF shall be submitted to the Engineer for approval. Any approved JMF applies only to the plant for which it was submitted. Only one mix with one JMF will be approved for production at any one time. Switching between approved JMF mixes with different component percentages or sources of supply is prohibited.

Superpave mixture with CRCG: In addition to subarticles M.04.02 – 3 a through c, for bituminous concrete mixtures that contain CRCG, the Contractor shall submit a materials certificate to the Engineer stating that the CRCG complies with requirements stated in Article M.04.01, as applicable. Additionally, 1% hydrated lime, or other accepted non-stripping agent, shall be added to all mixtures containing CRCG. CRCG material shall not be used with any other recycling option.

- c. Mix Status: Each facility will have each type of bituminous concrete mixture evaluated based on the previous year of production, for the next construction paving season, as determined by the Engineer. Based on the rating a type of mixture receives it will determine whether the mixture can be produced without the completion of a PPT. Ratings will be provided to each bituminous concrete producer annually prior to the beginning of the paving season.

The rating criteria are based on compliance with Air Voids and Voids in Mineral Aggregate (VMA) as indicated in Table M.04.03-3: *Superpave Master Range for Bituminous Concrete Mixture Production*, and are as follows:

Criteria A: Based on Air Voids. Percentage of acceptance results with passing air voids.

Criteria B: Based on Air Voids and VMA. The percentage of acceptance results with passing VMA, and the percentage of acceptance results with passing air voids, will be averaged.

The final rating assigned will be the lower of the rating obtained with Criteria A or Criteria B.

Ratings are defined as:

“A” – Approved:

A rating of “A” is assigned to each mixture type from a production facility with a current rating of 70% passing or greater.

“PPT” – Pre-Production Trial:

Rating assigned to each mixture type from a production facility when:

1. there are no passing acceptance production results submitted to the Department from the previous year;
2. there is a source change in one or more aggregate components from the JMF on record by more than 10% by weight;
3. there is a change in RAP percentage ,
4. the mixture has a rating of less than 70% from the previous season;
5. a new JMF not previously submitted.

Bituminous concrete mixtures rated with a “PPT” cannot be shipped or used on Department projects. A passing “PPT” test shall be performed with NETTCP certified personnel on that type of mixture by the bituminous concrete producer and meet all specifications (Table M.04.02-2 Table M.04.02-5) before production shipment may be resumed.

Contractors that have mix types rated a “PPT” may use one of the following methods to change the rating to an “A.”

Option A: Schedule a day when a Department inspector can be at the facility to witness a passing “PPT” test or,

Option B: When the Contractor or their representative performs a “PPT” test without being witnessed by an inspector, the Contractor shall submit the test results and a split sample including 2 gyratory molds, 5,000 grams of boxed bituminous concrete for binder and gradation determination, and 5,000 grams of cooled loose bituminous concrete for Gmm determination for verification testing and approval. Passing verifications will designate the bituminous concrete type to be on an “A” status. Failing verifications will require the contractor to submit additional trials.

Option C: When the Contractor or their representative performs a “PPT” test without being witnessed by a Department inspector, the Engineer may verify the mix in the Contractor’s laboratory. Passing verifications will designate the bituminous concrete type to be an “A” status. Failing verifications will require the Contractor to submit additional trials.

When Option (A) is used and the “PPT” test meets all specifications, the “PPT” test is considered a passing test and the rating for that mix is changed to “A”. When the “PPT” test is not witnessed, the “PPT” Option (B) or (C) procedure must be followed. If the “PPT” Option (B) procedure is followed, the mixtures along with the test results must be delivered to the Materials Testing Lab. The test results must meet the “C” tolerances established by the Engineer. The tolerance Table is included in the Department’s current QA Program for Materials, Acceptance and Assurance Testing Policies and Procedures.

“U” – No Acceptable Mix Design on File:

Rating assigned to a type of mixture that does not have a JMF submitted, or the JMF submitted has not been approved, or is incomplete. A mix design or JMF must be submitted annually seven (7) days prior in order to obtain an “A,” or “PPT” status for that mix. A “U” will be used only to designate the mix status until the mix design has been approved, and is accompanied with all supporting data as specified. Bituminous concrete mixtures rated with a “U” cannot be used on Department projects.

TABLE M.04.02- 2: SUPERPAVE MASTER RANGE FOR BITUMINOUS CONCRETE MIXTURE DESIGN CRITERIA

Notes: (1) Minimum Pb as specified in Table M.04.02-5. (2) Voids in Mineral Aggregates shall be computed as specified herein. (3) Control point range is also defined as the master range for that mix. (4) Dust is considered to be the percent of materials passing the #200 sieve. (5) For WMA, lower minimum aggregate temperature will require Engineer's approval. (6) For WMA and PMA, the mix temperature shall meet manufacturer's recommendations.

Sieve	S0.25				S0.375				S0.5				S1			
	CONTROL POINTS ⁽³⁾		RESTRICTED ZONE		CONTROL POINTS ⁽³⁾		RESTRICTED ZONE		CONTROL POINTS ⁽³⁾		RESTRICTED ZONE		CONTROL POINTS ⁽³⁾		RESTRICTED ZONE	
inches	Min (%)	Max (%)	Max (%)	Min (%)	Min (%)	Max (%)	Min (%)	Max (%)	Min (%)	Max (%)	Min (%)	Max (%)	Min (%)	Max (%)	Min (%)	Max (%)
2.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1.5	-	-	-	-	-	-	-	-	-	-	-	-	100	-	-	-
1.0	-	-	-	-	-	-	-	-	-	-	-	-	90	100	-	-
3/4	-	-	-	-	-	-	-	-	100	-	-	-	-	90	-	-
1/2	100	-	-	-	100	-	-	-	90	100	-	-	-	-	-	-
3/8	97	100	-	-	90	100	-	-	-	90	-	-	-	-	-	-
#4	-	90	-	-	-	90	-	-	-	-	-	-	-	-	39.5	39.5
#8	32	67	47.2	47.2	32	67	47.2	47.2	28	58	39.1	39.1	19	45	26.8	30.8
#16	-	-	31.6	37.6	-	-	31.6	37.6	-	-	25.6	31.6	-	-	18.1	24.1
#30	-	-	23.5	27.5	-	-	23.5	27.5	-	-	19.1	23.1	-	-	13.6	17.6
#50	-	-	18.7	18.7	-	-	18.7	18.7	-	-	15.5	15.5	-	-	11.4	11.4
#100	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
#200	2.0	10.0	-	-	2.0	10.0	-	-	2.0	10.0	-	-	1.0	7.0	-	-
Pb ⁽¹⁾	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
VMA ⁽²⁾ (%)	16.0 ± 1				16.0 ± 1				15.0 ± 1				13.0 ± 1			
VA (%)	4.0 ± 1				4.0 ± 1				4.0 ± 1				4.0 ± 1			
Gse	JMF value				JMF value				JMF value				JMF value			
Gmm	JMF ± 0.030				JMF ± 0.030				JMF ± 0.030				JMF ± 0.030			
Dust/Pbe ⁽⁴⁾	0.6 – 1.2				0.6 – 1.2				0.6 – 1.2				0.6 – 1.2			
Agg. Temp ⁽⁵⁾	280 – 350F				280 – 350F				280 – 350F				280 – 350F			
Mix Temp ⁽⁶⁾	265 – 325 F				265 – 325 F				265 – 325 F				265 – 325 F			
Design TSR	≥ 80%				≥ 80%				≥ 80%				≥ 80%			
T-283 Stripping	Minimal, as determined by the Engineer															

TABLE M.04.02-3

SUPERPAVE MASTER RANGE FOR CONSENSUS PROPERTIES OF COMBINED AGGREGATE STRUCTURES

Notes: (1) If less than 25 % of a given layer is within 4 inches of the anticipated top surface, the layer may be considered to be below 4 inches for mixture design purposes.					
Traffic Level	Design ESALs (80 kN)	Coarse Aggregate Angularity ⁽¹⁾ ASTM D 5821	Fine Aggregate Angularity ⁽⁷⁾ AASHTO T 304	Flat or Elongated Particles ASTM D 4791	Sand Equivalent AASHTO T 176
-----	(million)			> # 4	-----
1*	< 0.3	55/- -	40	10	40
2	0.3 to < 3.0	75/- -	40	10	40
3	≥ 3.0	95/90	45	10	45
	Design ESALs are the anticipated project traffic level expected on the design lane, projected over a 20 year period, regardless of the actual expected design life of the roadway.	Criteria presented as minimum values. 95/90 denotes that a minimum of 95% of the coarse aggregate, by mass, shall have one fractured face and that a minimum of 90% shall have two fractured faces.	Criteria presented as minimum percent air voids in loosely compacted fine aggregate passing the #8 sieve.	Criteria presented as maximum Percent by mass of flat or elongated particles of materials retained on the #4 sieve, determined at 3:1 ratio.	Criteria presented as minimum values for fine aggregate passing the #8 sieve.

* NOTE: Level 1 for use by Towns and Municipalities ONLY.

TABLE M.04.02- 4: SUPERPAVE MASTER RANGE FOR TRAFFIC LEVELS AND DESIGN VOLUMETRIC PROPERTIES.

Traffic Level	Design ESALs	Number of Gyration by Superpave Gyrotory Compactor			Percent Density of Gmm from HMA/WMA specimen			Voids Filled with Asphalt (VFA) Based on Nominal mix size – inch			
		(million)	Nini	Ndes	Nmax	Nini	Ndes	Nmax	0.25	0.375	0.5
1*	< 0.3	6	50	75	≤ 91.5	96.0	≤ 98.0	70 - 80	70 - 80	70 - 80	67 - 80
2	0.3 to < 3.0	7	75	115	≤ 90.5	96.0	≤ 98.0	65 - 78	65 - 78	65 - 78	65 - 78
3	≥ 3.0	8	100	160	≤ 90.0	96.0	≤ 98.0	73 - 76	73 - 76	65 - 75	65 - 75

* NOTE: Level 1 for use by Towns and Municipalities ONLY.

**TABLE M.04.02– 5: SUPERPAVE MINIMUM BINDER CONTENT
BY MIX TYPE & LEVEL.**

Mix Type	Level	Binder Content Minimum ⁽¹⁾
S0.25	1*	5.6
S0.25	2	5.5
S0.25	3	5.4
S0.375	1*	5.6
S0.375	2	5.5
S0.375	3	5.4
S0.5	1*	5.0
S0.5	2	4.9
S0.5	3	4.8
S1	1*	4.6
S1	2	4.5
S1	3	4.4

* NOTE: Level 1 for use by Towns and Municipalities ONLY.

M.04.03— Production Requirements:

1. Quality Control Plan and Processes: The Contractor shall submit a Quality Control Plan (QCP) for bituminous concrete production specifically for the plant producing the bituminous concrete mixture for review and approval of the Engineer on an annual basis.

The QCP shall describe the organization and procedures which the Contractor shall use to administer quality control. The QCP shall include the procedures used to control the production process, to determine when immediate changes to the processes are needed, and to implement the required changes. The QCP must detail the inspection, sampling and testing protocols to be used, and the frequency for each.

Control Chart(s) shall be developed and maintained for critical aspect(s) of the production process as determined by the Contractor. The control chart(s) shall identify the material property, applicable upper and lower control limits, and be updated with current test data. The control chart(s) shall be used as part of the quality control system to document variability of the bituminous concrete production process. The control chart(s) shall be submitted to the Engineer upon request.

The QCP shall also include the name and qualifications of a Quality Control Manager. The Quality Control Manager shall be responsible for the administration of the QCP, including compliance with the plan and any plan modifications. All daily QC sampling, inspection and test reports shall be reviewed by the Quality Control Manager and be submitted to the Engineer upon request.

The QCP shall also include the name and qualifications of any outside testing laboratory performing any QC functions on behalf of the Contractor. The QCP must also include a list of sampling & testing methods and frequencies used during production, and the names of all Quality Control personnel and their duties.

Approval of the QCP does not imply any warranty by the Engineer that adherence to the plan will result in production of bituminous concrete that complies with these specifications. The Contractor shall submit any changes to the QCP as work progresses.

2. Acceptance Sampling & Testing Methods: Acceptance samples of mixtures shall be obtained from the hauling vehicles and tested by the Contractor at the facility during each day's production.

The hauling vehicle from which samples are obtained shall be selected using stratified – random sampling based on the total estimated tons of production in accordance with ASTM D 3665, except that the first test shall be randomly taken from the first 151 tons or as directed by the Engineer.

The number of sub lots and tests required per sub lot is based on the total estimated tons of production per day as indicated in Table M.04.03-1. Quantities of the same type/level mix per plant may be combined daily for multiple state projects to determine the number of sub lots.

The payment adjustment for air voids and liquid binder will be calculated per sub lot as described in Section 4.06.

An acceptance test shall not be performed within 150 tons of production from a previous acceptance test unless approved by the Engineer. Quality Control tests are not subject to this restriction. Unless otherwise tested, a minimum of one (1) acceptance test shall be performed for every four days of production at a facility for each type/level mix (days of production may or may not be consecutive days).

The Contractor shall submit all acceptance tests results to the Engineer within 24 hours or prior to the next day's production. All acceptance test specimens and supporting documentation must be retained by the Contractor. Verification testing will be performed by the Engineer on the retained specimens in accordance with the Department's QA Program for Materials.

Should the Department be unable to verify the Contractor's acceptance test result(s) due to a failure of the Contractor to retain acceptance test specimens or supporting documentation, the Contractor shall review its quality control plan, determine the cause of the nonconformance and respond in writing within 24 hours to the Engineer describing the corrective action taken at the plant. In addition the Contractor must provide supporting documentation or test results to validate the subject acceptance test result(s). The Engineer may invalidate any positive adjustments for material corresponding to the acceptance test(s). Failure of the Contractor to adequately address quality control issues at a facility may result in suspension of production for Department projects at that facility.

Contractor personnel performing acceptance sampling and testing must be present at the facility prior to, and during production, and be certified as a NETTCP HMA Plant Technician or Interim HMA Plant Technician and be in good standing. Production of material for use on State projects must be suspended by the Contractor if such personnel are not present.

Technicians found by the Engineer to be non-compliant with NETTCP or Department policies may be removed by the Engineer from participating in the acceptance testing process for Department projects until their actions can be reviewed.

Anytime during production that testing equipment becomes inoperable, production can continue for a maximum of 1 hour. The Contractor shall obtain box sample(s) in accordance with Table M.04.03-1 to satisfy the daily acceptance testing requirement for the quantity shipped to the project. The box sample(s) shall be tested once the equipment issue has been resolved to the satisfaction of the Engineer. Production beyond 1 hour may be considered by the Engineer. Production will not be permitted beyond that day until the subject equipment issue has been resolved.

Table M.04.03 – 1: Acceptance Testing Frequency per Type/Level/Plant

Daily quantity produced in tons (lot)	Number of Sub Lots/Tests
0 to 150	0, Unless requested by the Engineer
151 to 600	1
601 to 1,200	2
1,201 to 1,800	3
1,801 or greater	1 per 600 tons or portions thereof

i. Marshall Mix Acceptance Sampling and Testing Procedures: When the Marshall mix design is specified, the following acceptance procedures and AASHTO test methods shall be used:

Table M.04.03 – 2: Marshall Acceptance Test Procedures

Protocol	Reference	Description
1	AASHTO T 30(M)	Mechanical Analysis of Extracted Aggregate
2	AASHTO T 40(M)	Sampling Bituminous Materials
3	AASHTO T 308(M)	Binder content by Ignition Oven method (adjusted for aggregate correction factor)
4	AASHTO T 245(M)	Resistance to Plastic Flow of Bituminous Mixtures Using Marshall Apparatus
5	AASHTO T 209(M)	Theoretical Maximum Specific Gravity and Density of Bituminous Paving Mixtures
6	AASHTO T 269(M)	Percent Air Voids in Compacted Dense and Open Bituminous Paving Mixtures
7	AASHTO T 329	Moisture Content of Hot-Mix Asphalt (HMA) by Oven Method

- a. Cessation of Supply: Marshall Mix Production shall cease for the Project from any facility that consistently fails to produce mixture that meets the JMF and volumetric properties. The criteria for ceasing the supply of a class of mixture from any plant are as follows:
- i. Off-Test Status: The results of AASHTO T 164 or AASHTO T 308(M) and T 30(M) will be used to determine if the mixture is within the tolerances shown in Table M.04.02-1. The Contractor will be notified that a plant is "off test" for a class of mixture when the test results indicate that any single value for bitumen content or gradation are not within the tolerances shown in Table M.04.02-1 for that class of mixture.
 - ii. When multiple plants and silos are located at one site, mixture supplied to one project is considered as coming from one source for the purpose of applying the "off test" adjusted payment.
 - iii. If a test indicates that the bitumen content or gradation are outside the tolerances, the Contractor may make a single JMF change on classes 1, 2, 3, 4 and 12 as allowed by the Engineer prior to any additional testing. A JMF change shall

include the date and name of the Engineer that allowed it. Consecutive test results outside the requirements of Table M.04.02-1 JMF tolerances may result in rejection of the mixture.

- iv. The Engineer may cease supply of mixture from the plant when the test results from three non-consecutive samples of a class of mixture are not within the JMF tolerances or the test results from two non-consecutive samples not within the master range indicated in Table M.04.02-1 during any one production period, due to inconsistent production.
 - v. Any modification to the JMF shall not exceed 50% of the JMF tolerances indicated in Table M.04.02-1 for any given component of the mixture without approval of the Engineer. When such an adjustment is made to the bitumen, the corresponding production percentage of bitumen shall be revised accordingly.
- b. Adjustments for Off Test Mixture under Cessation of Supply: The bituminous concrete plant shall cease supplying to the project:
- i. When the test results from three consecutive samples are “off test” and not within the JMF tolerances or,
 - ii. The test results from two consecutive samples are “off test” and not within the ranges indicated in Table M.04.02 – 1 or,
 - iii. When the percent of material passing the minus #200 sieve material exceeds the percent of extracted bitumen content for three consecutive samples during any production period of the values stated in Table M.04.02-1:
 - a. The quantity of mixtures shipped to the project determined to be “off test” and outside the tolerances will be tabulated by the Engineer and will be adjusted in accordance with Section 4.06.
 - b. Following cessation, a trial production period will be required at the plant for that class of mixture. Use of that class of mixture from that plant will be prohibited on the Project until the plant has demonstrated the ability to consistently produce acceptable mixture.
 - c. When the Engineer has accepted the mixtures from the trial production period, the use of that mixture on the Project may resume.

ii. Superpave Mix Acceptance Sampling and Testing Procedures: When the Superpave mix design is specified, the following acceptance and AASHTO test procedures shall be used:

Table M.04.03– 3: Superpave Acceptance Testing Procedures

Protocol	Reference	Description
1	AASHTO T 168(M)	Sampling of bituminous concrete
2	AASHTO T 308(M)	Binder content by Ignition Oven method (adjusted for aggregate correction factor)
3	AASHTO T 30(M)	Gradation of extracted aggregate for bituminous concrete mixture
4	AASHTO T 312(M)	⁽¹⁾ Superpave Gyratory molds compacted to N _{des}
5	AASHTO T 166(M)	⁽²⁾ Bulk specific gravity of bituminous concrete
6	AASHTO R 35(M)	⁽²⁾ Air voids, VMA
7	AASHTO T 209(M)	Maximum specific gravity of bituminous concrete (average of two tests)
8	AASHTO T 329	Moisture content of Production bituminous concrete

The Contractor shall perform moisture susceptibility (TSR) testing annually for all design levels of HMA-, WMA-, and PMA- S0.5 plant-produced mixtures, in accordance with the latest version of AASHTO T 283(M).

If any material source changes from the previous year, or during the production season, a mix design TSR as well as a production TSR is required for the new mixture. The AASHTO T 283(M) test shall be performed at an AASHTO Materials Reference Laboratory (AMRL) by NETTCP Certified Technicians. The test results and specimens shall be submitted to the Engineer for review. This shall be completed within 30 days from the start of production. Superpave mixtures that require anti-strip additives (either liquid or mineral) shall continue to meet all requirements specified herein for binder and bituminous concrete. The Contractor shall submit the name, manufacturer, percent used, and MSDS sheet for the anti-strip additive (if applicable) to the Engineer. In addition, compaction of samples shall be accomplished utilizing an accepted

Superpave Gyrotory Compactor (SGC), supplied by the Contractor. The SGC shall be located at the facility supplying mixture to the project.

a. Determination of Off-Test Status:

i. Off Test Status: Superpave mixes shall be considered “*off test*” when any Control Point Sieve, VA, VMA, and Gmm values are outside of the limits specified in Table M.04.03-3 and the computed binder content (Pb) established by AASHTO T308(M) or as documented on the vehicle delivery ticket is below the minimum binder content stated in sub article M.04.03-5. Note that further testing of samples or portions of samples not initially tested for this purpose cannot be used to change the status.

ii. Any time the bituminous concrete mixture is considered Off-test:

1. The Contractor shall notify the Engineer (and project staff) when the plant is “*off test*” for a type of mixture. When multiple plants and silos are located at one site, mixture supplied to one project is considered as coming from one source for the purpose of applying the “*off test*” determination.
2. The Contractor must take immediate actions to correct the deficiency, minimize “*off test*” production to the project, and obtain an additional Process Control (PC) test after any corrective action to verify production is in conformance to the specifications. A PC test will not be used for acceptance and is solely for the use of the Contractor in its quality control process.

b. Cessation of Supply for Superpave Mixtures with no Payment Adjustment: Production of bituminous concrete shall cease for the Project from any plant that consistently fails to produce mixture that meets the JMF and volumetric properties. The quantity of Superpave mixtures shipped to the project that is “off-test” will not be adjusted for deficient mixtures.

A Contractor shall cease to supply mixture from a plant when:

1. Bituminous concrete mixture is “off test” on three (3) consecutive tests for VMA or Gmm, regardless of date of production due to inconsistency (i.e., small production requires 1 test per day for multiple days).

2. Bituminous concrete mixture is “off test” on two (2) consecutive tests for the Control Point sieves in one day’s production.

Following cessation, the Contractor shall immediately make necessary material or process corrections and run a Pre-Production Trial (PPT) for that type of mixture. Use of that type of mixture from that plant will be prohibited on the Project until the Contractor has demonstrated the ability to produce acceptable mixture from that facility. When the Contractor has a passing test and has received approval from the Engineer, the use of that mixture to the Project may resume.

c. Cessation of Supply for Superpave Mixtures with Payment Adjustment:

Production of bituminous concrete shall cease for the Project from any plant that consistently fails to produce mixture that meets the Superpave minimum binder content by mix type and level listed in Table M.04.02-5. The quantity of Superpave mixtures shipped to the project that is “off-test” will be adjusted for deficient mixtures in accordance with Section 4.06.

A Contractor shall cease to supply mixture from a plant when the binder content (P_b) is below the requirements of Table M.04.03-5 on the ignition oven test result after two (2) consecutive tests, regardless of the date of production.

Following cessation, the Contractor shall immediately make necessary material or process corrections and run a Pre-Production Trial (PPT) for that type of mixture. Use of that type of mixture from that plant will be prohibited on the Project until the Contractor has demonstrated the ability to produce acceptable mixture from that facility. When the Contractor has a passing test and has received approval from the Engineer, the use of that mixture to the Project may resume.

- d. JMF Changes for Superpave Mixture Production: It is understood that a JMF change is effective from the time it was submitted forward and is not retroactive to the previous test or tests. JMF changes are permitted to allow for trends in aggregate and mix properties but every effort shall be employed by the Contractor to minimize this to ensure a uniform and dense pavement.

JMF changes to the G_{mm} or mix Absorption Correction Factor (A_{cf}) are only permitted prior to or after a production shift for all bituminous-concrete types of mixtures and only when they:

- i. Are requested in writing and pre-approved by the Engineer;
- ii. Are based on a minimum of a two test trend;
- iii. Are documented with a promptly submitted revised JMF on form provided by the Engineer.
- iv. A revised JMF submittal shall include the date and name of the Engineer that allowed it.

TABLE M.04.03- 3: SUPERPAVE MASTER RANGE FOR BITUMINOUS CONCRETE MIXTURE PRODUCTION

Notes: (1) 300°F minimum after October 15. (2) Minimum Pb as specified in Table M.04.03-5 (3) Control point range is also defined as the master range for that mix. (4) JMF tolerances shall be defined as the limits for production compliance. VA & Pb payment is subject to adjustments, as defined in sub-article 4.06.04 - 2. (5) For WMA, lower minimum aggregate temperature will require Engineer's approval. (6) For WMA and/or polymer modified asphalt, the mix temperature shall meet manufacturer's recommendations. In addition, for WMA, the maximum mix temperature shall not exceed 325°F once the WMA technology is incorporated.									
	S0.25		S0.375		S0.5		S1		Tolerances
Sieve	CONTROL POINTS ⁽⁴⁾		CONTROL POINTS ⁽⁴⁾		CONTROL POINTS ⁽⁴⁾		CONTROL POINTS ⁽⁴⁾		JMF Limits ⁽⁴⁾
inches	Min(%)	Max(%)	Min(%)	Max(%)	Min(%)	Max(%)	Min(%)	Max(%)	±Tol
2.0	-	-	-	-	-	-	-	-	
1.5	-	-	-	-	-	-	100	-	
1.0	-	-	-	-	-	-	90	100	
3/4	-	-	-	-	100	-	-	90	
1/2	100	-	100	-	90	100	-	-	
3/8	97	100	90	100	-	90	-	-	
#4	-	90	-	90	-	-	-	-	
#8	32	67	32	67	28	58	19	45	
#16	-	-	-	-	-	-	-	-	
#200	2.0	10.0	2.0	10.0	2.0	10.0	1.0	7.0	
Pb ⁽²⁾	-	-	-	-	-	-	-	-	note (2)
VMA (%)	16.0		16.0		15.0		13.0		1.0
VA (%)	4.0		4.0		4.0		4.0		1.0
Gmm	JMF value		JMF value		JMF value		JMF value		0.030
Agg. Temp ⁽⁵⁾	280 – 350F		280 – 350F		280 – 350F		280 – 350F		
Mix Temp ⁽⁶⁾	265 – 325 F ⁽¹⁾		265 – 325 F ⁽¹⁾		265 – 325 F ⁽¹⁾		265 – 325 F ⁽¹⁾		
Prod. TSR	N/A		N/A		≥80%		N/A		
T-283 Stripping	N/A		N/A		Minimal as determined by the Engineer		N/A		

TABLE M.04.03– 4: SUPERPAVE MASTER RANGE FOR TRAFFIC LEVELS AND DESIGN VOLUMETRIC PROPERTIES.

Traffic Level	Design ESALs	Number of Gyration by Superpave Gyratory Compactor	
	(million)	Nini	Ndes
1*	< 0.3	6	50
2	0.3 to < 3.0	7	75
3	≥3.0	8	100

* NOTE: Level 1 for use by Towns and Municipalities ONLY.

TABLE M.04.03– 5: SUPERPAVE MINIMUM BINDER CONTENT BY MIX TYPE & LEVEL.

Mix Type	Level	Binder Content Minimum ⁽¹⁾
S0.25	1*	5.6
S0.25	2	5.5
S0.25	3	5.4
S0.375	1*	5.6
S0.375	2	5.5
S0.375	3	5.4
S0.5	1*	5.0
S0.5	2	4.9
S0.5	3	4.8
S1	1*	4.6
S1	2	4.5
S1	3	4.4

* NOTE: Level 1 for use by Towns and Municipalities ONLY.

**Table M.04.03-6:
Modifications to Standard AASHTO and ASTM Test Specifications and Procedures.**

AASHTO Standard Specification	
Reference	Modification
M 320	<p>1. Mass change for PG 64-22 shall be a maximum loss of 0.5% when tested in accordance with AASHTO T 240.</p> <p>2. The two bottles used for the mass change determination may be re-heated and used for further testing.</p>
AASHTO Standard Methods of Test	
Reference	Modification
T 27	Section 7.7 Samples are not washed
T 30	Section 6.2 thru 6.5 Samples are not routinely washed
T 168	<p>Samples are taken at one point in the pile. All types of bituminous concrete except Class 4 are scooped from the sample container instead of remixing and quartering. (Method verified by laboratory study).</p> <p>Samples from a hauling vehicle are taken from only one point instead of three as specified.</p> <p>Selection of Samples: Sampling is equally important as the testing, and the sampler shall use every precaution to obtain samples that are truly representative of the bituminous mixture.</p> <p>Box Samples: In order to enhance the rate of processing samples taken in the field by construction or maintenance personnel the samples will be tested in the order received and data processed to be determine conformance to material specifications and to prioritize inspections by laboratory personnel.</p>
T 195	Section 4.3 only one truck load of mixture is sampled. Samples are taken from opposite sides of the load.
T 209	<p>Article 9.5.1 Bowl is suspended 2 minutes prior to reading rather than 10 minutes. This makes no significant difference in results.</p> <p>Section 7.2 The average of two bowls is used proportionally in order to satisfy minimum mass requirements.</p> <p>8.3 Omit Pycnometer method.</p>
T 245	<p>Article 3.3.2 A compacting temperature of 140 to 146°C (284 to 295°F) is used</p> <p>Article 3.5.2 Seventy-five (75) blows per side are used on Classes 1 and 12, per ConnDOT design requirements</p> <p>Section 3.1 for production testing: one specimen is molded for each extraction test for production over 275 metric tons/day (300 tons/day). Other mixtures: two specimens per extraction test.</p>
T 283	When foaming technology is used, the material used for the fabrication of the specimens shall be cooled to room temperature, and then reheated to the manufactures recommended compaction temperature prior to fabrication of the

	specimens.
T 308	<p>In addition to the standard testing procedure, the Department has adopted a procedure that addresses a correction factor that is calculated using the composite aggregate percentages (Composite Aggregate Correction Factor Method (CACF)).</p> <p>The aggregate is burned in compliance with the standard AASHTO procedure Method A exclusively. All modifications are listed for this method only.</p> <p>A2.2 and A2.3 Omit</p> <p>A2.4 Omit. Replace with: Determine an aggregate gradation for each aggregate component “blank” in accordance with T30.</p> <p>A2.5 Omit. Replace with: The individual aggregate samples are to be dried in an oven at a maximum temperature of $148 \pm 5^{\circ}\text{C}$ ($300 \pm 9^{\circ}\text{F}$) to a constant weight. RAP samples are to be oven dried at a maximum temperature of $110 \pm 5^{\circ}\text{C}$ ($230 \pm 9^{\circ}\text{F}$) to a constant weight. RAP samples will be burned for total binder content only and not to arrive at a correction factor for a mixture.</p> <p>A2.6 and A2.7 and A2.8 Omit.</p> <p>A2.8.1 Omit Note 2</p> <p>A2.9 Omit. Replace with: Perform a gradation analysis on the residual aggregate in accordance with T30 and compare it to the gradation performed prior to burning.</p> <p>A2.9.1 and A2.9.2 Omit</p> <p>The correction factors for each size aggregate are provided by the Contractor to the Engineer prior to the Annual Plant Inspection. The Engineer may verify the correction factors. The Composite Aggregate Correction Factor (CACF) for any mixture may be calculated by summing the result of the correction factor for each individual aggregate multiplied by the percentage of that aggregate in the overall mixture.</p> <p>(Note: All correction factors must be re-calculated every time the percentage of any aggregate changes within the mixture.)</p> <p>If the average corrected Pb content from the ignition oven differs by 0.3% or more from the average bituminous concrete facility production weigh ticket in five (5) consecutive tests regardless of the production date (moving average), the Contractor shall immediately investigate, determine an assignable cause and correct the issue. When two consecutive moving average differences are 0.3% or more, the Engineer may require a new correction factor calculation for all the aggregate components in the mix.</p> <p>In addition to the standard testing procedure, the Department has adopted a procedure that addresses the time involved between sampling the hot-mix asphalt specimen and the beginning of the test.</p> <p>6.3 Omit. Replace with: The test specimen must be ready to be placed in an approved ignition furnace for testing within ten minutes of being obtained from the hauling vehicle and the test shall start immediately after.</p>

T 331	6.1 Cores are dried to a constant mass prior to testing using a core-dry machine.
AASHTO Standard Recommended Practices	
Reference	Modification
R 35	<p><u>Volumetric Calculations of VMA and Correction Factor</u> VMA_a - Voids in Mineral Aggregate from (V_a + V_b) the mix:</p> <p>A. VMA calculated from the mix shall be determined in accordance with <i>Formula 5.16.1A</i>. It can be correlated that the VMA calculated from AASHTO R-35 is equivalent to VMA_a when the P_b × (100-P_b) / 100 is known and substituted for A_{cf}, as shown in <i>Formula 5.16.1A (ii)</i>. Test results from VMA_a shall therefore be required to meet all contract specifications. Values of VMA_a that are out of specifications during production may be cause for the contractor to determine assignable reason, take corrective action, and modify the Job Mix Formula (JMF), as needed. Continued VMA_a data that is out of specifications may be cause for the Engineer to order cessation of supply.</p> <p><i>Formula 5.16.1A</i>. Determining the VMA of bituminous concrete by the mix or air voids & effective binder method:</p> $VMA_a = V_a + \left[\frac{(Gmb_d \times (Pb_t - A_{cf}))}{G_b} \right]$ <p>Where: VMA_a = VMA calculated from plant production mix (V_a + V_b) Gmb_d = Bulk specific gravity as determined by AASHTO T 166(M) Pb_t = Total Binder Content (corrected) by AASHTO T 308(M) A_{cf} = Absorption correction factor provided by Contractor (refer to B. i and ii)</p> <p>B. Determining the bituminous concrete mix binder correction factor for each class by use of percent absorption of water by AASHTO T 84/85, AASHTO M 323 and D_f method. This value shall be performed by the Contractor during the mix design only and submitted as a JMF value. Two methods for determining the A_{cf} are shown, although method (i) will be the desired method to be used. Both methods are equivalent when the G_{sa}, G_{sb} and P_{wa} are recent and valid for the mix.</p> <p>i. $A_{cf} = D_f \times P_{wa} \times (100 - P_{b_t}) / 100$ ii. $A_{cf} = (P_{b_a} \text{ from annual JMF submittal}) \times (100 - P_{b_t}) / 100$</p> <p>Where: D_f = as determined by Formula 5.16.1B. P_{wa} = as determined by AASHTO T 84/85 P_{b_a} = as determined by AASHTO M 323 (from annual JMF submittal) D_f (Density Factor): The Contractor shall calculate the bituminous concrete</p>

	<p>mix design D_f (derived from formula XI.2 APPENDIX XI of AASHTO R 35) for each class of material, in accordance with Formula 5.16.1B.</p> <p>Formula 5.16.1B. Determining the Density Factor (D_f) of mix design bituminous concrete:</p> $D_f = \left(\frac{G_{se} - G_{sb}}{G_{sa} - G_{sb}} \right)$ <p>Where: D_f = Density Factor or multiplier determined by AASHTO R-35(M) G_{se} = Effective Specific Gravity determined by AASHTO M-323 at plant G_{sa} = Apparent Specific Gravity determined by AASHTO T 84/85 of mix design G_{sb} = Bulk Specific Gravity determined by AASHTO T 84/85 of mix design</p>
<p>R 26</p>	<p>Quality Control Plans must be formatted in accordance with AASHTO R 26, certifying suppliers of performance-graded asphalt binders, Section 9.0, Suppliers Quality Control Plan, and “NEAUPG Model PGAB QC Plan.”</p> <ol style="list-style-type: none"> 1. The Department requires that all laboratory technician(s) responsible for testing PG-binders be certified or Interim Qualified by the New England Transportation Technician Certification Program (NETTCP) as a PG Asphalt Binder Lab Technician. 2. Sampling of asphalt binders should be done under the supervision of qualified technician. NETCP “Manual of Practice,” Chapter 2 Page 2-4 (Key Issues 1-8). 3. A copy of the Manual of Practice for testing asphalt binders in accordance with the Superpave PG Grading system shall be in the testing laboratory. 4. All laboratories testing binders for the Department are required to be accredited by the AASHTO Materials Reference Laboratory (AMRL). 5. Sources interested in being approved to supply PG-binders to the Department by use of an “in-line blending system,” must record properties of blended material, and additives used. 6. Each source of supply of PG-binder must indicate that the binders contain no additives used to modify or enhance their performance properties. Binders that are manufactured using additives, modifiers, extenders etc., shall disclose the type of additive, percentage and any handling specifications/limitations required. <p>Suppliers shall provide AASHTO M-320 Table 2 testing at a minimum of once per month on one sample of material. Each supplier shall rotate the PG grade each month (including polymer-modified asphalt (PMA)), so that data can be collected for all the grades produced.</p>

SECTION M.13 ROADSIDE DEVELOPMENT

Article M.13.04—Seed Mixtures:

Delete the Seed Mixture Chart and replace with the following:

Article M.13.04—Seed Mixtures: (a) The grass seed mixture shall conform to the following:

<u>Species</u>	<u>Proportion By Weight (Mass) Pounds(kilograms)</u>	<u>Minimum Purity (Percent)</u>	<u>Minimum Germination (Percent)</u>
VELVET BENTGRASS, (<u>AGROSTIS CANINA</u>) CERTIFIED VARIETY: OR EQUAL CERTIFIED VARIETY;	25 (9.1)	96	85
RED FESCUE (<u>FESTUCA RUBRA L. SSP. RUBRA</u>) CERTIFIED VARIETY: OR EQUAL CERTIFIED VARIETY	35 (15.9)	97	80
PARTRIDGE PEA (<u>CHAMAECRISTA FASCICULATA</u>) CERTIFIED VARIETY:	10 (4.5)	95	90
INDIAN GRASS (<u>SORGHASTRUM NUTANS</u>) CERTIFIED VARIETY:	15 (5.45)	95	90
CANADA WILDRYE (<u>ELYMUS CANADENSIS</u>) CERTIFIED VARIETY:	5 (2.3)	95	90
KENTUCKY BLUE GRASS (<u>POA PRATENSIS</u>) CERTIFIED VARIETY:	10 (4.5)	95	90

ITEM NO. 0020763A - DISPOSAL OF SEDIMENTS

Description:

Work under this item shall consist of the loading, transportation and final off-site disposal of sediments. These sediments are contaminated at non-hazardous levels as documented in the reports listed in the “Notice to Contractor – Environmental Investigations”. The controlled sediments are designated for off-site disposal at an upland facility and, after characterization by the Engineer, shall be taken from the WSA, loaded, transported, and disposed of at a DOT-approved upland disposal facility listed herein.

The Contractor must use one or more of the following Department-approved facilities for the disposal of non-hazardous sediments:

Allied Waste Niagra Falls Landfill, LLC 5600 Niagra Falls Blvd. Niagra, NY 14304 716-285-3344; David Hanson	Clean Earth of Carteret 24 Middlesex Avenue Carteret, NJ 07008 732-541-8909; Cheryl Coffee
Clean Earth of Philadelphia, Inc. 3201 S 61 Street Philadelphia, PA 215-724-5520; Mike Kelly	Clean Earth of North Jersey, Inc. 115 Jacobus Avenue, South Kearny, NJ 07105 973-344-4004
Clean Earth of Southeast Pennsylvania, Inc. 7 Steel Road Morrisville, PA 19067 215-428-1700; Joe Siravo	Cranston Sanitary Landfill 1690 Pontiac Avenue Cranston, RI 02920 413-552-3688; Paul Mahoney
Cumberland County Landfill 135 Vaughn Road Shippensburg, PA 17257 713-423-9953	ESMI of New York, LLC 304 Towpath Road Fort Edward, NY 12828 518-747-5500; Peter Hansen
ESMI of New Hampshire 67 International Drive Loudon, NH 03307 603-783-0228; Stephen Raper	Moretown Landfill 187 Palisades Park Waterbury, VT 05676 802-244-1100 x26
Mostoller Landfill 7095 Glades Pike Summerset, PA 15501 814-444-0112	Northampton Landfill 170 Glendale Road Florence, MA 01062 413-498-0099

The Southbridge Recycling and Disposal Park 165 Barefoot Road Southbridge, MA 01550 603-235-3597	South Hadley Landfill, LLC 12 Industrial Drive South Hadley, MA 01075 413-535-3095
Upton Landfill Maple Avenue Upton, MA 413-522-3688	Waste Management of NH 90 Rochester Neck Road Rochester, NH 03839 603-330-2197
Waste Management – Chicopee 161 New Lombard Road Chicopee, MA 01020 413-534-8741 x222	Waste Management – Model City Facility 1550 Balmer Road Model City, NY 14107 716-754-0365; Linda Davidi
Waste Management: Granby Sanitary Landfill 11 New Ludlow Road Granby, MA 01033 413-467-3200	

Construction Methods:

A. Submittals

The apparent low bidder shall submit in writing, within fourteen days after Bid opening, (1) a letter listing the names of the treatment/recycle/disposal facilities (from the list above) which the bidder, if it is awarded the Contract, will use to receive controlled sediments from this Project, (2) a copy of the attached “Disposal Facility Material Acceptance Certification” form from each facility, which shall be signed by an authorized representative of each treatment/recycle/disposal facility, and (3) a copy of the facility acceptance criteria and facility sampling frequency requirements from each facility.

Any other Contractor which the Department may subsequently designate as the apparent low bidder shall make the aforementioned submissions within fourteen (14) days from the date on which the Department notifies the Contractor that it has become the apparent low bidder. If, however, the Department deems it is necessary for such a subsequent-designated Contractor to make said submissions within a shorter period of time, the Contractor shall make those submissions within the time designated by the Department.

Failure to comply with all of the above requirements may result in the rejection of the bid.

No facility may be substituted for the one(s) designated in the Contractor’s submittal without the Engineer’s prior approval. If the material cannot be accepted by any of the Contractor’s designated facilities, the Department will supply the Contractor with the name(s) of other acceptable facilities.

Disposal Facility Materials Acceptance Certification

Project Number _____

Project Location _____

Facility Name _____ Telephone _____

Facility Address _____ Fax _____

The Contractor has supplied the analytical data contained in the report concerning the site investigation performed by the Designer. I have personally reviewed this data and intend to accept the following:

Controlled materials as described in Item # 020763A Disposal of Sediments for the subject Project at a cost of \$ _____ per ton for treatment/disposal and an additional \$ _____ per ton for transportation from the Project to the disposal facility (if applicable).

This intent to accept the material will be subject to and dependent upon the facility's subsequent evaluation of waste characterization determination documentation to be provided to the Contractor by the Engineer.

Authorized Facility Representative _____ / _____
Printed/Typed Name Title
_____/_____
Signature Date

Note: The facility shall attach the acceptance criteria and facility sampling frequency requirements to this document.

DO NOT ALTER FORM IN ANY WAY. FORM MUST BE COMPLETED IN ENTIRETY.

B. Material Disposal

After the sediment has adequately dewatered and any necessary solidification material has been added, the Engineer will sample materials stored at the WSA at a frequency established by the selected treatment/recycling/disposal facilities. The Contractor shall designate to the Engineer which facility he intends to use prior to samples being taken. The Contractor is hereby notified that laboratory turnaround time is expected to be fifteen (15) working days. Turnaround time is the period of time beginning when the Contractor notifies the Engineer that the bin within the WSA is full and ready for sampling and ending with the Contractor's receipt of the laboratory analytical results. Any change of intended treatment/recycling/disposal facility may prompt the need to resample and will therefore restart the time required for laboratory turnaround. The laboratory will furnish such results to the Engineer. Upon receipt, the Engineer will make available to the Contractor the results of the final waste characterization determinations. **No delay claim will be considered based upon the Contractor's failure to accommodate the laboratory turnaround time as identified above.**

The Contractor shall obtain and complete all paperwork necessary to arrange for material disposal, including disposal facility waste profile sheets. It is solely the Contractor's responsibility to co-ordinate the disposal of controlled materials with its selected treatment/recycling/disposal facility(s). Upon receipt of the final approval from the facility, the Contractor shall arrange for the loading, transport and treatment/recycling/disposal of the materials in accordance with all Federal and State regulations. **No claim will be considered based on the failure of the Contractor's disposal facility(s) to meet the Contractor's production rate or for the Contractor's failure to select sufficient facilities to meet its production rate.**

All manifests or bills of lading utilized to accompany the transportation of the material shall be prepared by the Contractor a minimum of 24 hours in advance and signed by an authorized Department representative, as Generator, for each truck load of material that leaves the site. The Contractor shall forward the appropriate original copies of all manifests or bills of lading to the Engineer the same day the material leaves the Project.

A load-specific certificate of disposal, signed by the authorized agent representing the disposal facility, shall be obtained by the Contractor and promptly delivered to the Engineer for each load.

C. Material Transportation

In addition to all pertinent Federal, State and local laws or regulatory agency polices, the Contractor shall adhere to the following precautions during the transport of sediments off-site:

- Transported controlled materials are to be covered sufficiently to preclude the loss of material during transport prior to leaving the site and are to remain covered until the arrival at the selected treatment/recycling/disposal facility.

- All vehicles departing the site are to be properly logged to show the vehicle identification, driver's name, time of departure, destination, and approximate volume, and contents of materials carried.
- No materials shall leave the site unless a treatment/recycling/disposal facility willing to accept all of the material being transported has agreed to accept the type and quantity of waste.
- Discharge openings on trucks used for the transportation of sediments must be securely closed during transportation. Trucks deemed unacceptable for use by the Engineer will not be used for the transportation of sediments.

D. Equipment Decontamination

All equipment shall be provided to the work site free of gross contamination. The Engineer may prohibit from the site any equipment that in his opinion has not been thoroughly decontaminated prior to arrival. Any decontamination of the Contractor's equipment prior to arrival at the site shall be at the expense of the Contractor. The Contractor is prohibited from decontaminating equipment on the Project site that has not been thoroughly decontaminated prior to arrival.

The Contractor shall furnish labor, materials, tools and equipment for decontamination of all equipment and supplies that are used to handle the controlled sediments. Decontamination shall be conducted at an area designated by the Engineer and shall be required prior to equipment and supplies leaving the Project, between stages of the work, and between work in different AOEC's.

The Contractor shall use dry decontamination procedures. Residuals from dry decontamination activities shall be collected and managed as controlled sediments. If the results from dry methods are unsatisfactory to the Engineer, the Contractor shall modify decontamination procedures as required.

The Contractor shall be responsible for the collection and treatment/recycling/disposal of any liquid wastes that may be generated by its decontamination activities in accordance with applicable regulations.

Method of Measurement:

The work of "DISPOSAL OF SEDIMENTS" will be measured for payment as the actual net weight in tons of material delivered to the treatment/recycling/disposal facility. Such determinations shall be made by measuring each hauling vehicle on the certified permanent scales at the treatment/recycling/disposal facility. Total weight will be the summation of weight bills issued by the facility specific to this Project. Excess excavations made by the Contractor beyond the payment limits specified in Specifications Sections 2.02, 2.03, 2.05, 2.06, or the Contract Special Provisions (as appropriate) will not be measured for payment and the

Contractor assumes responsibility for all costs associated with the appropriate handling, management and disposal of this material.

Equipment decontamination, the collection of residuals, and the collection and disposal of liquids generated during equipment decontamination activities will not be measured separately for payment.

Basis of Payment:

This work will be paid for at the Contract unit price, which shall include the loading and transportation of sediments from the WSA to the treatment/recycling/disposal facility; the treatment/recycling/disposal; the preparation of manifests and fees paid; and all equipment, materials, tools, and labor incidental to loading, transporting, and treating/recycling/disposal of materials. **This unit price will be applicable to all of the Contractor-selected disposal facilities for the duration of the Project.**

This price shall also include equipment decontamination; the collection of residuals generated during decontamination and placement of such material in the WSA; and the collection and disposal of liquids generated during equipment decontamination activities.

Solidification of sediments will be paid under other Contract items.

Pay Item	Pay Unit
Disposal of Sediments	Ton

ITEM 0020801A – ASBESTOS ABATEMENT

Description:

Work under this item shall include the abatement of asbestos containing materials (ACM) and associated work by persons who are knowledgeable, qualified, trained and licensed in the removal, treatment, handling, and disposal of ACM and the subsequent cleaning of the affected environment. ACM shall include material composed of any type of asbestos in amounts greater than one percent (1%) by weight. The Contractor performing this work shall possess a valid Asbestos Abatement Contractor license issued by the Connecticut Department of Public Health (CTDPH).

These Specifications govern all work activities that disturb asbestos containing materials. All activities shall be performed in accordance with, but not limited to, the current revision of the OSHA General Industry Standard for Asbestos (29 CFR 1926.1001), the OSHA Asbestos in Construction Regulations (29 CFR 1926.1101), the USEPA Asbestos National Emission Standards for Hazardous Air Pollutants (NESHAP) Regulations (40 CFR Part 61 Subpart M), the CTDPH Standards for Asbestos Abatement, Licensure and Training (19a-332a-1 through 16, 20-440-1 through 9 & 20-441), and the CTDEEP Special Waste Disposal Regulations (22a-209-8(i)).

The asbestos abatement work shall include the removal and disposal of all ACM as identified on the Contract Plans and Specifications prior to the planned renovation/demolition project.

Deviations from these Specifications require the written approval of the Engineer.

The Contractor may elect to utilize an Alternative Work Practice (AWP), if approved by the CTDPH and the Engineer prior to the initiation of the abatement activities. An AWP is a variance from certain CTDPH asbestos regulatory requirements, which must provide the equivalent or a greater measure of asbestos emission control than the standard work practices prescribed by the CTDPH.

Materials:

All materials shall be delivered to the job site in the original packages, containers, or bundles bearing the name of the manufacturer, the brand name and product technical description.

No damaged or deteriorating materials shall be used. If material becomes contaminated with asbestos, the material shall be decontaminated or disposed of as asbestos-containing waste material. The cost to decontaminate and dispose of this material shall be at the expense of the Contractor.

Fire retardant polyethylene sheet shall be in roll size to minimize the frequency of joints, with factory label indicating four (4) or six (6) mil thickness.

Six (6) mil polyethylene disposable bags shall have pre-printed OSHA/EPA/DOT labels and shall be transparent.

Tape (or equivalent) capable of sealing joints in adjacent polyethylene sheets and for the attachment of polyethylene sheets to finished or unfinished surfaces must be capable of adhering under both dry and wet conditions.

Surfactant is a chemical wetting agent added to water to improve penetration and shall consist of fifty (50) percent polyoxyethylene ether and fifty (50) percent polyoxyethylene ester, or equivalent. The surfactant shall be mixed with water to provide a concentration one (1) ounce surfactant to five (5) gallons of water, or as directed by the manufacturer.

Spray equipment must be capable of mixing necessary chemical agents with water, generating sufficient pressure and volume; and equipped with adequate hose length to access all necessary work areas.

Sanders, grinders, wire brushes and needle-gun type removal equipment shall be equipped with a High Efficiency Particulate Air (HEPA) filtered vacuum dust collection system.

Containers for storage, transportation and disposal of asbestos containing waste material shall be impermeable and both air and watertight.

Labels and warning signs shall conform to OSHA 29 CFR 1926.1101, USEPA 40 CFR Part 61.152, and USDOT 49 CFR Part 172 as appropriate.

Encapsulant, a material used to chemically entrap asbestos fibers to prevent these fibers from becoming airborne, shall be of the type which has been approved by the Engineer. Use shall be in accordance with manufacturer's printed technical data. The encapsulant shall be clear and must be compatible with new materials being installed, if any.

Glovebag assembly shall be manufactured of six (6) mil transparent polyethylene or PVC with two (2) inward projecting long sleeve gloves, an internal pouch for tools, and an attached labeled receptacle for waste.

Mastic removal chemicals shall be low odor and non-citrus based, with a flash point in excess of 140° F.

Any planking, bracing, shoring, barricades and/or temporary sheet piling, necessary to appropriately perform work activities shall conform to all applicable federal, state and local regulations.

Air filtration devices and vacuum units shall be equipped with HEPA filters.

Construction Methods:

(1) Pre-Abatement Submittals and Notices

- (a) The Contractor shall submit, in accordance with CTDPH Standard 19a-332a-3, proper notification using the prescribed form, to the Commissioner, State of Connecticut, Department of Public Health not fewer than ten (10) days prior to the commencement of work as follows:
1. **The asbestos to be removed is exterior NESHAP Category II Non-Friable ACM, and it is not expected that the abatement procedures will render the Category II asbestos friable; thereby not categorizing it as NESHAP Regulated ACM (RACM); therefore not defining the removal as a CTDPH “abatement”; and as such the CT licensed Asbestos Abatement Contractor will not be required to file an Asbestos Abatement notification so long as no more than 10 linear feet (LF)/25 square feet (SF) of ACM is rendered friable.**
- (b) Fifteen (15) working days prior to the commencement of asbestos abatement work, the Contractor shall submit to the Engineer for review and acceptance and/or acknowledgment of the following:
1. Permits and licenses for the removal, transport, and disposal of asbestos-containing or contaminated materials, including a CTDPH valid asbestos removal contractor’s license.
 2. Documentation dated within the previous twelve (12) months, certifying that all employees have received USEPA Model Accreditation Plan approved asbestos worker/supervisor training in the proper handling of materials that contain asbestos; understand the health implications and risks involved, including the illnesses possible from exposure to airborne asbestos fibers; understands the use and limits of respiratory equipment to be used; and understands the results of monitoring of airborne quantities of asbestos as related to health and respiratory equipment as indicated in 29 CFR 1926.1101 on an initial and annual basis, and copies of all employees CTDPH asbestos worker and/or supervisor licenses.
 3. Documentation from the Contractor, typed on company letterhead and signed by the Contractor, certifying that all employees listed therein have received the following:
 - a. medical monitoring within the previous twelve (12) months, as required in 29 CFR 1926.1101;
 - b. respirator fit testing within the previous twelve (12) months as detailed in 29 CFR 1910.134 (for all employees who must also don a tight-fitting face piece respirator).

4. Copies of the EPA/State-approved certificates for the proposed asbestos landfill.
- (c) No abatement shall commence until a copy of all required submittals have been received and found acceptable to the Engineer. Those employees added to the Contractor's original list will be allowed to perform work only upon submittal to, and receipt of, all required paperwork by the Engineer.

(2) Asbestos Abatement Provisions:

(a) General Requirements

The Abatement Contractor/Subcontractor shall possess a valid State of Connecticut Asbestos Contractor License. Should any portion of the work be subcontracted, the subcontractor must also possess a valid State of Connecticut Asbestos Contractor License. The Asbestos Abatement Site Supervisor employed by the Contractor shall be in control on the job site at all times during asbestos abatement work. All employees of the Contractor who shall perform work (i.e. Asbestos Abatement Site Supervisor, Asbestos Abatement Worker) shall be properly certified/licensed by the State of Connecticut to perform such duties.

All labor, materials, tools, equipment, services, testing, insurance (with specific coverage for work on asbestos), and incidentals which are necessary or required to perform the work in accordance with applicable governmental regulations, industry standards and codes, and these Specifications shall be provided by the Contractor. The Contractor shall be prepared to work all shifts and weekends throughout the course of this project.

Prior to beginning work, the Engineer and Contractor shall perform a visual survey of each work area and review conditions at the site for safety reasons. In addition, the Contractor shall instruct all workers in all aspects of personnel protection, work procedures, emergency evacuation procedures and use of equipment including procedures unique to this project.

The Contractor shall:

Shut down and lock out electrical power, including all receptacles and light fixtures, when feasible. The use or isolation of electrical power will be coordinated with all other ongoing uses of electrical power at the site.

When necessary, provide temporary power and adequate lighting and ensure safe installation of electrical equipment, including ground fault protection and power cables, in compliance with applicable electrical codes and OSHA requirements. The Contractor is responsible for proper connection and installation of electrical wiring.

Water service may not be available at the site. Contractor shall supply sufficient water for each shift to operate the decontamination shower units as well as to maintain the work areas adequately wet.

Ladders and/or scaffolds shall be in compliance with OSHA requirements, and of adequate length, strength and sufficient quantity to support the scope of work. Use of ladders/scaffolds shall be in conformance with OSHA 29 CFR 1926 Subpart L and X requirements.

Work performed at heights exceeding six feet (6') shall be performed in accordance with the OSHA Fall Protection Standard 29 CFR 1926 Subpart M including the use of fall arrest systems as applicable.

Data provided regarding asbestos sampling conducted throughout the structure(s) is for informational purposes only. Under no circumstances shall this information be the sole means used by the Contractor for determining the presence and location of all asbestos containing materials. The Contractor shall verify all field conditions affecting performance of the work as described in these Specifications in accordance with OSHA, USEPA, USDOT, DEP standards. Compliance with the applicable requirements is solely the responsibility of the Contractor.

The Engineer will provide a Project Monitor to oversee the activities of the Contractor. No asbestos work shall be performed until the Project Monitor is on-site. Pre-abatement, during abatement and post-abatement air sampling will be conducted as deemed necessary by the Project Monitor. Waste stream testing will be performed, as necessary, by the Project Monitor prior to waste disposal.

(b) Set-Up

The Contractor shall establish contiguous to the Regulated Area, a Worker Decontamination Enclosure System consisting of Equipment Room, Shower Room and Clean Room in series, as detailed below. Access to the Regulated Area shall only be through this enclosure.

Access between rooms in the Worker Decontamination Enclosure System shall be through airlocks. Other effective designs are permissible. The Clean Room, Shower Room and Equipment Room located within the Worker Decontamination Enclosure, shall be contiguously connected with taped airtight edges, thus ensuring the sole source of airflow originates from outside the regulated areas, once the negative pressure differential within the Regulated Area is established.

The Clean Room shall be adequately sized to accommodate workers and shall be equipped with a suitable number of hooks, lockers, shelves, etc., for workers to store personal articles and clothing. Changing areas of the Clean Room shall be suitably screened from areas occupied by the public.

The Shower Room shall be of sufficient capacity to accommodate the number of workers. One shower stall shall be provided for each eight (8) workers. Showers shall be equipped with hot and cold or warm running water through the use of electric hot water heaters supplied by the Contractor. No worker or other person shall leave a Regulated Area without showering. Shower water shall be collected and filtered using best available technology and dumped down an

approved sanitary drain. Shower stalls and plumbing shall include sufficient hose length and drain system or an acceptable alternate.

The Contractor shall ensure that no personnel or equipment be permitted to leave the Regulated Area until proper decontamination procedures (including HEPA vacuuming, wet wiping and showering) to remove all asbestos debris have occurred. No asbestos-contaminated materials or persons shall enter the Clean Room.

Post warning signs meeting the specifications of OSHA 29 CFR 1910.1001 and 29 CFR 1926.1101 at each Regulated Area. In addition, signs shall be posted at all approaches to Regulated Areas so that an employee or building occupant may read the sign and take the necessary protective steps before entering the area. Additional signs may require posting following construction of workplace enclosure barriers.

(c) Alternate set up requirements for exterior non-friable asbestos abatement procedures

In lieu of the establishment of a negative pressure enclosure (NPE) system as described by CTDPH Sections 19a-332a-5(c), 5(d), 5(e), and 5(h), non-friable ACM will be removed from exterior work areas within an outdoor Regulated Area(s). The regulated work area will be established by the use of appropriately labeled barrier tape and postings in compliance with CTDPH 19a-332a-5(a) as well as OSHA 29 CFR 1926.1101. A remote personnel decontamination unit as specified in Section 19a-332a-6 will be required. This method shall only be utilized provided exposure assessment air sampling data collected during the removal of the exterior non-friable materials indicates that the exposure levels during removal of such materials do not exceed 0.1 asbestos f/cc. Should exposure assessment air sampling data exceed this level, and engineering efforts to reduce the airborne fiber levels not be successful in reducing the levels to less than 0.1 f/cc, removal shall occur within these areas under full containment conditions.

(d) Personnel Protection

The Contractor shall utilize all appropriate engineering controls and safety and protective equipment while performing the work in accordance with OSHA, USEPA, USDOT, CTDEEP and CTDPH regulations.

The Contractor shall provide and require all workers to wear protective clothing in the Regulated Areas where asbestos fiber concentrations may reasonably be expected to exceed the OSHA established Permissible Exposure Limits (PEL) or where asbestos contamination exists. Protective clothing shall include impervious coveralls with elastic wrists and ankles, head covering, gloves and foot coverings.

Respiratory protection shall be provided and shall meet the requirements of OSHA as required in 29 CFR 1910.134, and 29 CFR 1926.1101 as well as the requirements of the CTDPH regulations. A formal respiratory protection program must be implemented in accordance with 29 CFR 1926.1101 and 29 CFR 1910.134. The Contractor shall provide respirators from among

those approved as being acceptable for protection by the National Institute for Occupational Safety and Health (NIOSH) under the provisions of 30 CFR Part II.

All other necessary personnel protective equipment (i.e. hardhat, work boots, safety glasses, hearing protection, etc.) required to perform the asbestos abatement work activities shall conform to all applicable federal, state and local regulations.

All other qualified and authorized persons entering into a Regulated Area (i.e. Project Monitor, Regulatory Agency Representative) shall adhere to the requirements of personnel protection as stated in this section.

(e) Asbestos Abatement Procedures

The Asbestos Abatement Site Supervisor, as the OSHA Competent Person shall be at the site at all times.

The Contractor shall not begin abatement work until authorized by the Project Monitor, following a pre-abatement visual inspection.

All workers and authorized persons shall enter and leave the Regulated Area through the Worker Decontamination Enclosure System, leaving contaminated protective clothing in the Equipment Room for reuse or disposal of as asbestos contaminated waste. No one shall eat, drink, smoke, chew gum or tobacco, or apply cosmetics while in a Regulated Area.

The following details the extent of each phase of operation designated for this project. Phase areas may be combined or divided at the direction of the Engineer. Proceed through the sequencing of the work phases under the direction of the Engineer.

Phase 1 - Bridge No. 01185, Danbury

Phase 1 includes the removal of:

- **Hard grey joint caulking (C2) at wing walls and abutments.**
- **Flexible grey joint caulking (C1) at wing walls (over C2)**

A regulated area(s) shall be established at the perimeter of the work area(s), and access shall be controlled by the Contractor. A remote personnel decontamination unit shall be utilized. Removal shall be undertaken in accordance with OSHA Class II and USEPA Asbestos NESHAP requirements.

Phase 2 - Bridge No. 01190, Danbury

Phase 2 includes the removal of:

- **Hard grey joint caulking (C2) at wing walls and abutments.**
- **Flexible grey joint caulking (C1) at wing walls (over C2)**

A regulated area(s) shall be established at the perimeter of the work area(s), and access shall be controlled by the Contractor. A remote personnel decontamination unit shall be utilized. Removal shall be undertaken in accordance with OSHA Class II and USEPA Asbestos NESHAP requirements.

During removal, the Contractor shall spray asbestos materials with amended water using airless spray equipment capable of providing a "mist" application to reduce the release of airborne fibers. Spray equipment shall be capable of mixing wetting agent with water and capable of generating sufficient pressure and volume. Hose length shall be sufficient to reach all of the Regulated Area. Do not "flood" the area with hose type water supply equipment with the potential to create water releases from the regulated area.

The Contractor shall continue to spray the asbestos materials with amended water, as necessary, throughout removal activities to ensure the asbestos materials remain adequately wet. The asbestos materials shall not be allowed to dry out.

In order to minimize airborne asbestos concentrations inside the Regulated Area, the Contractor shall remove the adequately wetted asbestos in manageable sections. In addition, asbestos materials removed from any elevated level shall be carefully lowered to the floor.

The Contractor shall promptly place the adequately wet asbestos material in disposal containers (six (6) mil polyethylene bags/fiber drum/poly-lined dumpsters, etc.) as it is removed. Large components removed intact may be wrapped in two (2) layers of six (6) mil polyethylene sheeting secured with tape. As the disposal containers are filled, the Contractor shall promptly seal the containers, apply caution labels and clean the containers before transportation to the equipment decontamination area. Bags shall be securely sealed to prevent accidental opening and leakage by taping in gooseneck fashion. Small components and asbestos-containing waste with sharp-edged components (e.g. nails, screws, metal lath, tin sheeting) which could tear polyethylene bags and sheeting shall be placed in clean drums and sealed with locking ring tops. All waste containers shall be leak-tight, (typically consisting of two layers of 6 mil poly (or bags)), and shall be properly labeled and placarded with OSHA Danger labels, DOT shipping labels, markings and placards and USEPA NESHAP generators labels. Containers shall be decontaminated by wet cleaning and HEPA vacuuming within the equipment decontamination area prior to exiting the regulated area. Wet clean each container thoroughly before moving to Holding Area.

If at any time during asbestos removal, the Project Monitor should suspect contamination of areas outside the Regulated Area, the Contractor shall immediately stop all abatement work and take steps to decontaminate these areas and eliminate causes of such contamination. Unprotected individuals shall be prohibited from entering contaminated areas until air sampling and/or visual inspections determine decontamination.

After completion of abatement work, all surfaces from which asbestos has been removed shall be wet brushed, using a nylon brush, wet wiped and sponged or cleaned by an equivalent method to remove all visible material (wire brushes are not permitted). During this work the surfaces being cleaned shall be kept wet. Cleaning shall also include the use of HEPA filtered vacuum equipment.

The Contractor shall also remove and containerize all visible accumulations of asbestos-containing and/or asbestos-contaminated debris which may have splattered or collected on the polyethylene engineering controls/barriers.

Once the Regulated Area surfaces have dried, the Project Monitor shall perform a thorough post abatement visual inspection utilizing protocols from the ASTM Standard E1368-90 *Standard Practice for Visual Inspection of Asbestos Abatement Projects*. All surfaces within the Regulated Area, including but not limited to ledges, beams, and hidden locations shall be inspected for visible residue. Evidence of asbestos contamination identified during this inspection will necessitate further cleaning as heretofore specified. The area shall be re-cleaned at the Contractor's expense, until the standard of cleaning is achieved.

Once the area has received a satisfactory post-abatement visual inspection, any equipment, tools or materials not required for completion of the work, shall be removed by the Contractor from the Regulated Area.

(f) Air Monitoring Requirements

1. The Contractor shall:
 - a. Provide air monitoring equipment including sample filter cassettes of the type and quantity required to properly monitor operations and personnel exposure surveillance throughout the duration of the project.
 - b. Conduct personnel exposure assessment air sampling, as necessary, to assure that workers are using appropriate respiratory protection in accordance with OSHA Standard 1926.1101. Documentation of air sampling results must be recorded at the work site within twenty-four (24) hours and shall be available for review until the job is complete.
2. The Project Monitor, acting as the representative of the Engineer during abatement activities, will:

- a. Collect air samples in accordance with the current revision of the NIOSH 7400 Method of Air Sampling for Airborne Asbestos Fibers while overseeing the activities of the Abatement Contractor. Frequency and duration of the air sampling during abatement will be representative of the actual conditions at the abatement site. The size and configuration of the asbestos project will be a factor in the number of samples required to monitor the abatement activities and shall be determined by the Project Monitor. The following schedule of samples may be collected by the Project Monitor:

- 1. Pre-Abatement (Optional)
 - a. Background areas
 - b. Area(s) adjacent to Work Area(s)
 - c. Work Area(s)
- 2. During Abatement (Optional)
 - a. At the exhaust of air filtering device
 - b. Within Regulated Area(s)
 - c. Area(s) adjacent to Regulated Areas(s)
(exterior to critical barriers)
 - d. At the Decontamination Enclosure System

Abatement Activity	Pre-Abatement	During Abatement	Post-Abatement
Exterior Friable/Non-Friable	---	PCM	---

If air samples collected outside of the Regulated Area during abatement activities indicate airborne fiber concentrations greater than original background levels, or greater than 0.1 f/cc, as determined by Phase Contrast Microscopy, whichever is larger, an examination of the Regulated Area perimeter shall be conducted and the integrity of barriers shall be restored. Cleanup of surfaces outside the Regulated Area using HEPA vacuum equipment or wet cleaning techniques shall be done prior to resuming abatement activities.

(g) Post Abatement Work Area Deregulation

The Contractor shall remove all remaining polyethylene, including critical barriers, and Decontamination Enclosure Systems. HEPA vacuum and/or wet wipe any visible residue which is uncovered during this process. All waste generated during this disassembly process shall be discarded as ACM waste.

A final visual inspection of the work area shall be conducted by the Competent Person and the Project Monitor to ensure that all visible accumulations of suspect materials have been removed and that no equipment or materials associated with the abatement project remain.

The Contractor shall restore all work areas and auxiliary areas utilized during work to conditions equal to or better than original. Any damage caused during the performance of the work activity shall be repaired by the Contractor at no additional expense to the Engineer.

(h) Waste Disposal

Unless otherwise specified, all removed materials and debris resulting from execution of this project shall become the responsibility of the Contractor and removed from the premises. Materials not scheduled for reuse shall be removed from the site and disposed of in accordance with all applicable Federal, State and Local requirements.

Waste removal dumpsters and cargo areas of transport vehicles shall be lined with a layer of six (6) mil polyethylene sheeting to prevent contamination from leaking or spilled containers. Floor sheeting shall be installed first, and shall be extended up sidewalls 12-inches. Wall sheeting shall overlap floor sheeting 24-inches and shall be taped into place.

OSHA "Danger" signs must be attached to vehicles used to transport asbestos-containing waste prior to loading ACM waste. The signs must be posted so that they are plainly visible.

Waste haulers and disposal facilities utilized shall match those indicated on the submitted CTDPH notification.

Ensure all waste containers (bags, drums, etc.) are properly packed, sealed and labeled with USEPA NESHAP generator labels, OSHA danger labels and DOT shipping labels. For each shipment of ACM waste, the Contractor shall complete an EPA-approved asbestos waste shipment record.

Authorized representatives signing waste shipment records on behalf of the generator must have USDOT Shipper Certification training in accordance with HMR 49 CFR Parts 171-180.

Transport vehicles hauling ACM waste shall have appropriate USDOT placards visible on all four (4) sides of the vehicle.

The Contractor shall dispose of asbestos-containing and/or asbestos contaminated material at an EPA authorized site and must be in compliance with the requirements of the Special Waste Provisions of the Office of Solid Waste Management, Department of Environmental Protection, State of Connecticut, or other designated agency having jurisdiction over solid waste disposal.

Any asbestos-containing and/or asbestos-contaminated waste materials which also contain other hazardous contaminants shall be disposed of in accordance with the EPA's Resource Conservation and Recovery Act (RCRA), CTDEEP and ConnDOT requirements. Materials may be required to be stored on-site and tested by the Project Monitor to determine proper waste disposal requirements.

(i) Project Closeout Data:

1. Provide the Engineer, within 30 days of completion of asbestos abatement, a compliance package; which shall include, but not be limited to, the following:
 - a. Asbestos Abatement Site Supervisor job log;
 - b. OSHA personnel air sampling data;
 - c. Completed waste shipment records.

The Contractor shall submit the original completed waste shipment records to the Engineer.

Method of Measurement:

No measurement will be made for the work in this Section. The completed work shall be paid as a lump sum.

Basis of Payment:

The lump sum bid price for this item shall include the specialty services of the Asbestos Removal Contractor including: labor, materials, equipment, insurance, permits, notifications, submittals, personal air sampling, personal protection equipment, temporary enclosures, utility costs, incidentals, fees and labor incidental to the removal, transport and disposal of ACM, including close out documentation.

Final payment for asbestos abatement will not be made until all the project closeout data submittals have been completed (including waste shipment record(s) signed by an authorized disposal facility representative) and provided to the Engineer. Once the completed package has been received in its entirety, the Engineer will make the final payment to the Contractor.

<u>Pay Item</u>	<u>Pay Unit</u>
Asbestos Abatement	Lump Sum

ITEM 0020903A – LEAD COMPLIANCE FOR MISCELLANEOUS EXTERIOR TASKS

Description:

Work under this item shall include the special handling measures and work practices required for miscellaneous exterior tasks that impact materials containing or covered by lead paint. Lead paint includes paint found to contain **any** detectable amount of lead by Atomic Absorption Spectrophotometry (AAS) or X-Ray Fluorescence (XRF). Examples of typical miscellaneous exterior tasks includes; work impacting signs, guiderails, minor bridge rehabilitation, catenary structures, canopy structures, spot/localized paint removal, etc.

All activities shall be performed in accordance with the OSHA Lead in Construction Regulations (29 CFR 1926.62), the USEPA RCRA Hazardous Waste Regulations (40 CFR Parts 260 through 274), and the CTDEEP Hazardous Waste Regulations (RCSA 22a-209-1 and 22a-449(c)).

All activities shall be performed by individuals with appropriate levels of OSHA lead awareness and hazard communication training and shall supervised by the Contractors Competent Person on the job site at all times. The Contractors Competent Person is one who is capable of identifying existing and predictable hazards in the surroundings or working conditions which are unsanitary, hazardous or dangerous to employees, and who has authorization to take prompt corrective measures to eliminate them.

Deviations from these Specifications require the written approval of the Engineer.

Materials:

All materials shall be delivered to the job site in the original packages, containers, or bundles bearing the name of the manufacturer, the brand name and product technical description, with MSDS sheets as applicable.

No damaged or deteriorating materials shall be used. If material becomes contaminated with lead, the material shall be decontaminated or disposed of as lead-containing waste material. The cost to decontaminate and dispose of this material shall be at the expense of the Contractor.

The following material requirements are to be met if to be used during the work:

Fire retardant polyethylene sheet shall be in roll size to minimize the frequency of joints, with factory label indicating minimum six (6) mil thickness.

Polyethylene disposable bags shall be minimum six (6) mils thick.

Tape (or equivalent) product capable of sealing joints in adjacent polyethylene sheets and for the attachment of polyethylene sheets to finished or unfinished surfaces must be capable of adhering under both dry and wet conditions.

Cleaning Agents and detergent shall be lead specific, such as TriSodium Phosphate (TSP).

Chemical strippers and chemical neutralizers shall be compatible with the substrate as well as with each other. Such chemical stripper shall contain less than 50% Volatile Organic Compounds (VOCs) by weight in accordance with RCSA 22a-174-40 Table 40-1.

Labels and warning signs shall conform to 29 CFR 1926.62, 40 CFR 260 through 274 and 49 CFR 172 as appropriate.

Air filtration devices and vacuum units shall be equipped with High-Efficiency Particulate Air (HEPA) filters.

Construction Methods:

(1) Pre-Abatement Submittals and Notices

A. Prior to the start of **any** work on a contiguous per site basis that will generate hazardous lead waste above conditionally exempt small quantities (greater than 100 kg/month or greater than 1000 kg at any time), the Contractor shall obtain from the Engineer on a contiguous per site basis a temporary EPA Hazardous Waste Generators ID number, unless otherwise directed by the Engineer.

B. Fifteen (15) working days prior to beginning work that impacts lead paint, the Contractor shall submit the following to the Engineer:

1. Work plan for work impacting lead paint including engineering controls, methods of containment of debris and work practices to be employed, as needed, to minimize employee exposure and prevent the spread of lead contamination outside the Regulated Area.
2. Copies of all employee certificates, dated within the previous twelve (12) months, relating to OSHA lead awareness and hazard communication training and training in the use of lead-safe work practices. SSPC training programs may be accepted as meeting these requirements if it can be demonstrated that such training addressed all required topics.

This information shall be updated and resubmitted annually, or as information changes, for the duration of the activities impacting lead to verify continued compliance.

3. Name and qualifications of Contractor's OSHA Competent Person under 29 CFR 1926.62.

4. Documentation from the Contractor, typed on company letterhead and signed by the Contractor, certifying that all employees listed therein have received the following:
 - a. medical monitoring within the previous twelve (12) months, as required in 29 CFR 1926.62;
 - b. biological monitoring within the previous six (6) months, as required in 29 CFR 1926.62;
 - c. respirator fit testing within the previous twelve (12) months, as required in 29 CFR 1910.134 (for those who don a tight-fitting face piece respirator)

This information shall be updated and resubmitted annually, or as information changes, for the duration of the activities impacting lead to verify continued compliance.

5. Names of the proposed non-hazardous construction and demolition (C&D) lead debris bulky waste disposal facility (CTDEEP-permitted Solid Waste landfill).
6. Names of the proposed scrap metal recycling facilities. The Contractor shall submit to the Engineer all documentation necessary to demonstrate the selected facility is able to accept lead-painted scrap metal.
7. Names of the proposed hazardous waste disposal facility (selected from the Department approved list provided herein), and copies of each facilities acceptance criteria and sampling frequency requirements.
8. Copies of the proposed hazardous waste transporters current USDOT Certificate of Registration for Hazardous Materials Transport, and the proposed transporters current Hazardous Waste Transporter Permits for the State of Connecticut and the waste destination State.
9. Negative exposure assessments conducted within the previous 12 months documenting that employee exposure to lead for each task is below the OSHA Action Level of $30 \mu\text{g}/\text{m}^3$. If a negative exposure assessment has not been conducted, the Contractor shall submit its air monitoring program for the work tasks as part of the Work Plan. Until a negative exposure assessment is developed for each task impacting lead paint, the Contractor shall ensure that all workers and authorized persons entering the Regulated Area wear protective clothing and respirators in accordance with OSHA 29 CFR 1926.62.

No activity shall commence until all required submittals have been received and found acceptable to the Engineer. Those employees added to the Contractor's original list will be allowed to perform work only upon submittal of acceptable documentation to, and review by, the Engineer.

Contractor shall provide the Engineer with a minimum of 48 hours notice in advance of scheduling, changing or canceling work activities.

(2) Lead Abatement Provisions

A. General Requirements:

All employees of the Contractor who perform work impacting lead paint shall be properly trained to perform such duties. In addition, the Contractor shall instruct all workers in all aspects of personnel protection, work procedures, emergency evacuation procedures and use of equipment including procedures unique to this project.

Contractor shall provide all labor, materials, tools, equipment, services, testing, and incidentals which are necessary or required to perform the work in accordance with applicable governmental regulations, industry standards and codes, and these Specifications.

Prior to beginning work, the Engineer and Contractor shall perform a visual survey of each work area and review conditions.

As necessary, the Contractor shall:

Shut down and lock out electrical power, including all receptacles and light fixtures, where feasible. The use or isolation of electrical power will be coordinated with all other ongoing uses of electrical power at the site.

If adequate electrical supply is not available at the site, the Contractor shall supply temporary power. Such temporary power shall be sufficient to provide adequate lighting and power the Contractor's equipment. The Contractor is responsible for proper connection and installation of electrical wiring and shall ensure safe installation of electrical equipment in compliance with applicable electrical codes and OSHA requirements.

If water is not available at the site for the Contractor's use, the Contractor shall supply sufficient water for each shift to operate the wash facility/decontamination shower units in addition to the water needed at the work area.

The Engineer may provide a Project Monitor to monitor compliance of the Contractor and protect the interests of the Department. In such cases, no activity impacting lead paint shall be performed until the Project Monitor is on-site. Where no Project Monitor will be provided, Contractor shall proceed at the direction of the Engineer. Environmental sampling, including ambient air sampling, TCLP waste stream sampling, and dust wipe sampling, will be conducted by the State as it deems necessary throughout the project. Air monitoring to comply with the Contractor's obligations under OSHA remains solely responsibility of the Contractor.

If at any time, procedures for engineering, work practice, administrative controls or other topics are anticipated to deviate from those documented in the submitted and accepted Lead Work Plan,

the Contractor shall submit a modification of its existing plan for review and acceptance by the Engineer prior to implementing the change.

If air samples collected outside of the Regulated Area during activities impacting lead paint indicate airborne lead concentrations greater than original background levels or $30 \mu\text{g}/\text{m}^3$, whichever is larger, or if at any time visible emissions of lead paint extend out from the Regulated Area, an examination of the Regulated Area shall be conducted and the cause of such emissions corrected. Cleanup of surfaces outside the Regulated Area using HEPA vacuum equipment or wet cleaning techniques shall be done prior to resuming work.

Work outside the initial designated area(s) will not be paid for by the Engineer. The Contractor will be responsible for all costs incurred from these activities including repair of any damage.

B. Regulated Area

The Contractor shall establish a Regulated Area through the use of appropriate barrier tape or other means to control unauthorized access into the area where activities impacting lead paint are occurring. Warning signs meeting the requirements of 29 CFR 1926.62 shall be posted at all approaches to Regulated Areas. These signs shall read:

WARNING
LEAD WORK AREA
POISON
NO SMOKING OR EATING

The Contractor shall implement appropriate engineering controls such as poly drop cloths, local exhaust ventilation, wet dust suppression methods, etc. as necessary, and as approved by the Engineer, to prevent the spread of lead contamination beyond the Regulated Area in accordance with the Contractor's approved work plan. Should the previously submitted work plan prove to be insufficient to contain the contamination, the Contractor shall modify its plan and submit it for review by the Engineer.

C. Wash Facilities:

The Contractor shall provide handwash facilities in compliance with 29 CFR 1926.51(f) and 29 CFR 1926.62 regardless of airborne lead exposure.

If employee exposure to airborne lead exceeds the OSHA Permissible Exposure Limit of 50 micrograms per cubic meter ($\mu\text{g}/\text{m}^3$), shower rooms must be provided. The Shower Room shall be of sufficient capacity to accommodate the number of workers. One shower stall shall be provided for each eight (8) workers. Showers shall be equipped with hot and cold or warm running water. Shower water shall be collected and filtered using best available technology and disposed of in accordance with all Federal, State and local laws, regulations and ordinances.

D. Personal Protection:

The Contractor shall initially determine if any employee performing construction tasks impacting lead paint may be exposed to lead at or above the OSHA Action Level of $30 \mu\text{g}/\text{m}^3$. Assessments shall be based on initial air monitoring results as well as other relevant information. The Contractor may rely on historical air monitoring data obtained within the past 12 months under workplace conditions closely resembling the process, type of material, control methods, work practices and environmental conditions used and prevailing in the Contractors current operations to satisfy the exposure assessment requirements. Monitoring shall continue as specified in the OSHA standard until a negative exposure assessment is developed.

Until a negative exposure assessment is developed for each task impacting lead paint, the Contractor shall ensure that all workers and authorized person entering the Regulated Area wear protective clothing and respirators in accordance with OSHA 29 CFR 1926.62. Protective clothing shall include impervious coveralls with elastic wrists and ankles, head covering, gloves and foot coverings. Sufficient quantities shall be provided to last throughout the duration of the project.

Protective clothing provided by the Contractor and used during chemical removal operations shall be impervious to caustic materials. Gloves provided by the Contractor and used during chemical removal shall be of neoprene composition with glove extenders.

Respiratory protective equipment shall be provided and selection shall conform to 42 CFR Part 84, 29 CFR Part 1910.134, and 29 CFR Part 1926.62. A formal respiratory protection program must be implemented in accordance with 29 CFR Part 1926.62 and Part 1910.134.

E. Air Monitoring Requirements

The Contractor shall:

1. Provide air monitoring equipment including sample filter cassettes of the type and quantity required to properly monitor operations and personnel exposure surveillance throughout the duration of the project.
2. Conduct initial exposure monitoring to determine if any employee performing construction tasks impacting lead paint may be exposed to lead at or above the OSHA Action Level of 30 micrograms per cubic meter. Monitoring shall continue as specified in the OSHA standard until a negative exposure assessment is developed.
3. Conduct personnel exposure assessment air sampling, as necessary, to assure that workers are using appropriate respiratory protection in accordance with OSHA Standard 1926.62. Documentation of air sampling results must be recorded at the work site within twenty-four (24) hours and shall be available for review until the job is complete.

F. Lead Abatement Procedures

The Contractor's Competent Person shall be at the job site at all times during work impacting lead.

Work impacting lead paint shall not begin until authorized by the Engineer, following a pre-work visual inspection by the Project Monitor or Engineer to verify existing conditions.

Any activity impacting lead painted surfaces shall be performed in a manner which minimizes the spread of lead dust contamination and generation of airborne lead.

The Contractor shall conduct exposure assessments for all tasks which impact lead paint in accordance with 29 CFR 1926.62(d) and shall implement appropriate personal protective equipment until negative exposure assessments are developed.

All work impacting the materials identified below shall be conducted within an established Regulated Area with a remote wash facility/decontamination system in accordance with "C. Wash Facilities" and the OSHA Lead in Construction Standard. In accordance with 29 CFR 1926.62, engineering controls and work practices shall be utilized to prevent the spread of lead dust and debris beyond the Regulated Area and limit the generation of airborne lead. All wastes containing lead paint shall be properly contained and secured for storage, transportation and disposal.

The Contractor shall ensure proper entry and exit procedures for workers and authorized persons who enter and leave the Regulated Area. All workers and authorized persons shall leave the Regulated Area and proceed directly to the wash or shower facilities where they will HEPA vacuum gross debris from work suit, remove and dispose of work suit, wash and dry face and hands, and vacuum clothes. Lead chips and dust must not be removed by blowing or shaking of clothing. Wash water shall be collected, filtered, and disposed of in accordance with Federal, State and local water discharge standards. Any permit required for such discharge shall be the responsibility of the Contractor.

No one shall eat, drink, smoke, chew gum or tobacco, or apply cosmetics while in the Regulated Area.

Data from the limited lead testing performed by the Engineer is documented in the reports listed in the "Notice to Contractor – Hazardous Materials Investigations" or is presented herein. Under no circumstances shall this information be the sole means used by the Contractor for determining the extent of lead painted materials. The Contractor shall be responsible for verification of all field conditions affecting performance of the work as described in these Specifications in accordance with OSHA, USEPA, USDOT and CTDEEP standards. Compliance with the applicable requirements is solely the responsibility of the Contractor.

The following details the extent of each phase of operation designated for this project. Phase areas may be combined or divided at the direction of the Engineer. Proceed through the sequencing of the work phases under the direction of the Engineer.

Bridge No. 01185, I-84 Interchange, Danbury

- Lead paint was identified on the painted steel/metal surfaces of Bridge No. 01185. XRF readings showed the paint to be lead based.
- No lead paint was identified on the painted concrete surfaces on the abutments of Bridge No. 01185. XRF readings and AAS results identified detectable lead.

Girders, Bearings, Cross Beams, Beam Ends, etc.	Metal	Green	2.2-18.1 mg/cm²
Abutment walls	Concrete	White	ND<0.10% by weight

- TCLP waste stream sampling/analysis of the paint associated with the steel/metal bridge components of Bridge No. 01185 characterized the paint waste as **RCRA Hazardous waste**.

Paint debris	220 mg/l
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- Since the painted concrete surfaces on the abutments of Bridge No. 01185 were not identified as lead based, any projected waste paint debris stream is characterized as **Non-Hazardous** for lead.

Bridge No. 01190, I-84 Interchange, Danbury

- Lead paint was identified on the painted steel/metal surfaces of Bridge No. 01190. XRF readings showed the paint to be lead based.
- No lead paint was identified on the painted concrete surfaces on the abutments of Bridge No. 01190. XRF readings and AAS results identified the paint as not lead based.

Girders, Bearings, Cross Beams, Beam Ends, etc.	Metal	Green	2.4-19.4 mg/cm²
Abutment walls	Concrete	White	ND<0.10% by weight

- TCLP waste stream sampling/analysis of the paint associated with the steel/metal bridge components of Bridge No. 01190 characterized the paint waste as **RCRA Hazardous waste**.

Paint debris	830 mg/l
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- **Since the painted concrete surfaces on the abutments of Bridge No. 01190 were not identified as lead based, any projected waste paint debris stream is characterized as Non-Hazardous for lead.**

While conducting work to the bridges, where it is necessary to impact the painted steel/metal surfaces, the Contractor shall either:

- a. Remove the paint to be impacted prior to impacting the steel/metal in accordance with OSHA Lead in Construction Standard 29CFR 1926.62, or**
- b. Impact the steel/metal using mechanical means with the paint in place in accordance with OSHA Lead in Construction Standard 29CFR 1926.62.**

The Contractor shall submit a Work Plan to ConnDOT outlining the exact procedures that will be used to perform the work, contain the spread of lead debris and protect the employees performing the required renovation work impacting the lead paint. No work shall be started by the Contractor until the Work Plan is approved by the Engineer.

All work impacting the lead paint materials shall be conducted within an established Regulated Area with a remote wash facility/decontamination system in accordance with “C. Wash Facilities” and the OSHA Lead in Construction Standard. In accordance with 29 CFR 1926.62, engineering controls and work practices shall be utilized to prevent the spread of lead dust and debris beyond the Regulated Area and limit the generation of airborne lead. All wastes containing lead paint shall be properly contained and secured for storage, transportation and disposal.

On Bridge No. 01185 and Bridge No. 01190, the Engineer has previously characterized the projected paint waste stream associated with the steel/metal bridge components as RCRA Hazardous waste. If the paint is removed from the metal, the paint shall be handled and disposed of in accordance with USEPA/CTDEEP Hazardous Waste Regulations as described under this Item 0020903A.

All steel and metal components generated from the miscellaneous exterior work tasks (painted or not) shall be segregated and recycled as scrap metal. The recycling of scrap metal (regardless of lead paint concentration) is exempt from USEPA RCRA and CTDEEP Hazardous Waste Regulation.

Should lead contamination be discovered outside of the Regulated Area, the Contractor shall immediately stop all work in the Regulated Area, eliminate causes of such contamination and take steps to decontaminate non-work areas.

Special Requirements:

1. Demolition/Renovation:
 - a. Demolish/renovate in a manner which minimizes the spread of lead contamination and generation of lead dust.
 - b. Implement dust suppression controls, such as misters, local exhaust ventilation, etc. to minimize the generation of airborne lead dust.
 - c. Segregate work areas from non-work areas through the use of barrier tape, drop cloths, etc.
 - d. Clean up immediately after renovation/demolition has been completed

2. Chemical Removal:
 - a. Apply chemical stripper in quantities and for durations specified by manufacturer.
 - b. Where necessary, scrape lead paint from surface down to required level of removal (i.e. stabilized surface, bare substrate with no trace of residual pigment, etc.). Use sanding, hand scraping, and dental picks to supplement chemical methods as necessary.

 - c. Apply neutralizer compatible with substrate and chemical agent to substrate following removal in accordance with manufacturer's instructions.
 - d. Protect adjacent surfaces from damage from chemical removal.
 - e. Maintain a portable eyewash station in the work area.
 - f. Wear respirators that will protect workers from chemical vapors.
 - g. Do not apply caustic agents to aluminum surfaces.

3. Mechanical Paint Removal:
 - a. Provide sanders, grinders, rotary wire brushes, or needle gun removers equipped with a HEPA filtered vacuum dust collection system. Cowling on the dust collection system for orbital-type tools must be capable of maintaining a continuous tight seal with the surface being abated. Cowling on the dust collection system for reciprocating-type tools shall promote an effective vacuum flow of loosened dust and debris. Inflexible cowlings may be used on flat surfaces only. Flexible contoured cowlings are required for curved or irregular surfaces.
 - b. Provide HEPA vacuums that are high performance designed to provide maximum static lift and maximum vacuum system flow at the actual operating vacuum condition with the shroud in use. The HEPA vacuum shall be equipped with a pivoting vacuum head.
 - c. Remove lead paint from surface down to required level of removal (i.e. stabilized surface, bare substrate with no trace of residual pigment, etc.). Use chemical methods, hand scraping, and dental picks to supplement abrasive removal methods as necessary.
 - d. Protect adjacent surfaces from damage from abrasive removal techniques.
 - e. "Sandblasting" type removal techniques shall not be allowed.

4. Component Removal/Replacement:

- a. Wet down components which are to be removed to reduce the amount of dust generated during the removal process.
- b. Remove components utilizing hand tools, and follow appropriate safety procedures during removal. Remove the components by approved methods which will provide the least disturbance to the substrate material. Do not damage adjacent surfaces.
- c. Clean up immediately after component removals have been completed. Remove any dust located behind the component removed.

G. Prohibited Removal Methods:

The use of heat guns in excess of 700 degrees Fahrenheit to remove lead paint is prohibited.

The use of sand, steel grit, air, CO₂, baking soda, or any other blasting media to remove lead or lead paint without the use of a HEPA ventilated contained negative pressure enclosure is prohibited.

Power/pressure washing shall not be used to remove lead paint.

Compressed air shall not be utilized to remove lead paint.

Chemical strippers containing Methylene Chloride are prohibited. Any chemical stripping may be prohibited on a project by project basis.

Power tool assisted grinding, sanding, cutting, or wire brushing of lead paint without the use of cowled HEPA vacuum dust collection systems is prohibited.

Lead paint burning, busting of rivets painted with lead paint, welding of materials painted with lead paint, and torch cutting of materials painted with lead paint is prohibited. Where cutting, welding, busting, or torch cutting of materials is required, lead paint in the affected area must be removed first.

Chemical stripping of coatings from bridge components is generally prohibited unless specifically allowed on a project by project basis.

H. Clean-up and Visual Inspection:

The Contractor shall remove and containerize all lead waste material and visible accumulations of debris, paint chips and associated items.

During clean-up the Contractor shall utilize rags and sponges wetted with lead-specific detergent and water as well as HEPA filtered vacuum equipment.

The Engineer will conduct a visual inspection of the work areas in order to document that all surfaces have been maintained as free as practicable of accumulations of lead in accordance with 29 CFR 1926.62(h). If visible accumulations of waste, debris, lead paint chips or dust are found in the work area, the Contractor shall repeat the cleaning, at the Contractor's expense, until the area is in compliance. The visual inspection will detect incomplete work, damage caused by the abatement activity, and inadequate clean up of the work site.

I. Post-Work Regulated Area Deregulation:

Following an acceptable visual inspection, any engineering controls implemented may be removed.

A final visual inspection of the work area shall be conducted by the Competent Person and the Project Monitor or Engineer to ensure that all visible accumulations of suspect materials have been removed and that no equipment or materials associated with the lead paint removal remain. If this final visual inspection is acceptable, the Contractor will reopen the Regulated Area and remove all signage.

The Contractor shall restore all work areas and auxiliary areas utilized during work to conditions equal to or better than original. Any damage caused during the performance of the work activity shall be repaired by the Contractor at no additional expense to the State.

J. Waste Disposal/Recycling:

Non-metallic building debris waste materials tested and found to be non-hazardous Construction and Demolition (C&D) bulky waste shall be disposed of properly at a CTDEEP approved Solid Waste landfill as described under this Item 0020903A.

Metallic debris shall be segregated and recycled as scrap metal at an approved metal recycling facility.

Concrete, brick, etc. coated with any amount of lead paint cannot be crushed, recycled or buried on-site to minimize waste disposal unless tested and found to meet the RSR GA/Residential standards.

Hazardous lead debris shall be disposed of as described under this Item 0020903A.

The Contractor shall comply with the latest requirements of the USEPA RCRA Hazardous Waste Regulations 40 CFR 260-274 and the DEEP Hazardous/Solid Waste Management Standards 22a-449(c).

Hazardous lead debris shall be transported from the Project by a licensed hazardous waste transporter approved by the Department and disposed of at an EPA-permitted and Department-approved hazardous waste landfill within 90 days from the date of generation.

The Contractor must use one or more of the following Department-approved disposal facilities for the disposal of hazardous waste:

Clean Earth of North Jersey, Inc., (CENJ) 115 Jacobus Avenue, South Kearny, NJ 07105 Phone: (973) 344-4004; Fax: (973) 344-8652	Clean Harbors Environmental Services, Inc. 2247 South Highway 71, Kimball, NE 69145 Phone: (308) 235-8212; Fax: (308) 235-4307
Clean Harbors of Braintree, Inc. 1 Hill Avenue, Braintree, MA 02184 Phone: (781) 380-7134; Fax: (781) 380-7193	Cycle Chem (General Chemical Corp.) 217 South First Street, Elizabeth, NJ 07206 Phone: (908) 355-5800; Fax (908) 355-0562
EnviroSafe Corporation Northeast (former Jones Environmental Services (NE), Inc.) 263 Howard Street, Lowell, MA 01852 Phone: (978) 453-7772; Fax: (978) 453-7775	Environmental Quality Detroit, Inc. 1923 Frederick Street, Detroit, MI 48211 Phone: (800) 495-6059; Fax: (313) 923-3375
Republic Environmental Systems 2869 Sandstone Drive, Hatfield, PA 19440 Phone: (215) 822-8995; Fax: (215) 997-1293	Chemical Waste Management of New York 1550 Balmer Rd., Model City, NY 14107 Phone: (800) 843-3604; Fax: (716) 754-0211
Environmental Quality Company: Wayne Disposal Facility 49350 North I-94 Service Drive Belleville, MI 48111 Phone: (800) 592-5489; Fax: (800) 592-5329	Northland Environmental, Inc. (PSC Environmental Systems) 275 Allens Avenue, Providence, RI 02905 Phone: (401) 781-6340; Fax: (401) 781-9710

The apparent low bidder shall submit in writing, within fourteen days after Bid opening, (1) a letter listing the names of the hazardous waste disposal facilities (from the above list) that the bidder, if it is awarded the Contract, will use to receive hazardous material from this Project, and (2) a copy of each facility's acceptance criteria and sampling frequency requirements.

Any other Contractor which the Department may subsequently designate as the apparent low bidder shall make the aforementioned submissions within fourteen (14) days from the date on which the Department notifies the Contractor that it has become the apparent low bidder. If, however, the Department deems it is necessary for such a subsequent-designated Contractor to make said submissions within a shorter period of time, the Contractor shall make those submissions within the time designated by the Department.

Failure to comply with all of the above requirements may result in the rejection of the bid.

No facility may be substituted for the one(s) designated in the Contractor's submittal without the Engineer's prior approval. If the material cannot be accepted by any of the Contractor's designated facilities, the Department will supply the Contractor with the name(s) of other acceptable facilities.

Prior to the generation of any hazardous waste, the Contractor shall notify the Engineer of its selected hazardous waste transporter and disposal facility. The Contractor must submit to the

Engineer (1) the transporter's current US DOT Certificate of Registration and (2) the transporter's current Hazardous Waste Transporter Permits for the State of Connecticut, the hazardous waste destination state and any other applicable states. The Engineer will then obtain on a contiguous per site basis a temporary EPA Generators ID number for the site that he will forward to the Contractor. Any changes in transporter or facility shall be immediately forwarded to the Engineer for review.

Handling, storage, transportation and disposal of hazardous waste materials generated as a result of execution of this project shall comply with all Federal, State and Local regulations including the USEPA RCRA Hazardous Waste Regulations (40 CFR Parts 260-271), the CTDEEP Hazardous Waste Regulations (22a-209 and 22a-449(c)), and the USDOT Hazardous Materials Regulations (49 CFR Part 171-180).

All debris shall be contained and collected daily or more frequently as directed by the Engineer, due to debris buildup. Debris shall be removed by HEPA vacuum collection. Such debris and paint chips shall be stored in leak-proof storage containers in the secured storage site, or as directed by the Engineer. The storage containers and storage locations shall be reviewed by the Engineer and shall be located in areas not subject to ponding. Storage containers shall be placed on pallets and closed and covered with tarps at all times except during placement, sampling and disposal of the debris.

Hazardous waste materials are to be properly packed and labeled for transport by the Contractor in accordance with EPA, CTDEEP and USDOT regulations. The disposal of debris characterized as hazardous waste shall be completed within 90 calendar days of the date on which it began to be accumulated in the lined containers. Storage of containers shall be in accordance with current DEEP/EPA procedures.

The Contractor shall label hazardous waste storage containers with a 6-inch square, yellow, weatherproof, Hazardous Waste sticker in accordance with USDOT regulations.

Materials other than direct paint related debris which are incidental to the paint removal work activities (tarps, poly, plywood, PPE, gloves, decontamination materials, etc.) which may be contaminated with lead, shall be stored separately from the direct paint debris, and shall be sampled by the Engineer for waste disposal characterization testing. Such materials characterized as hazardous shall be handled/disposed of as described herein, while materials characterized as non-hazardous shall be disposed of as non-hazardous CTDEEP Solid Waste.

Direct paint related debris materials not previously sampled and characterized for disposal, which may be originally presumed to be hazardous waste, shall also be stored separately and sampled by the Engineer for ultimate waste disposal characterization testing and handled/disposed of based on that testing.

Project construction waste materials unrelated to the paint removal operations shall NOT be combined/stored with paint debris waste and/or incidental paint removal materials as they are not

lead contaminated and shall NOT be disposed of as hazardous waste. The Engineer's on-site Inspectors shall conduct inspections to verify materials remain segregated.

The Contractor shall obtain and complete all paperwork necessary to arrange for material disposal, including disposal facility waste profile sheets. It is solely the Contractor's responsibility to co-ordinate the disposal of hazardous materials with its selected treatment/recycling/disposal facility(s). Upon receipt of the final approval from the facility, the Contractor shall arrange for the loading, transport and treatment/recycling/disposal of the materials in accordance with all Federal and State regulations. **No claim will be considered based on the failure of the Contractor's disposal facility(s) to meet the Contractor's production rate or for the Contractor's failure to select sufficient facilities to meet its production rate.**

The Contractor shall process the hazardous waste such that the material conforms with the requirements of the selected treatment/disposal facility, including but not limited to specified size and dimension. Refusal on the part of the treatment/disposal facility to accept said material solely on the basis of non-conformance of the material to the facility's physical requirements is the responsibility of the Contractor and no claim for extra work shall be accepted for reprocessing of said materials to meet these requirements.

All DOT shipping documents, including the Uniform Hazardous Waste Manifests utilized to accompany the transportation of the hazardous waste material shall be prepared by the Contractor and reviewed/signed by an authorized agent representing ConnDOT, as Generator, for each load of hazardous material that is packed to leave the site. The Contractor shall not sign manifests on behalf of the State as Generator. The Contractor shall forward the appropriate original copies of all manifests to the Engineer the same day the material leaves the Project site.

Materials not related to lead paint removal and/or characterized as non-hazardous waste shall NOT be shipped for hazardous waste disposal in accordance with USEPA RCRA hazardous waste minimization requirements.

A load-specific certificate of disposal, signed by the authorized agent representing the waste disposal facility, shall be obtained by the Contractor and promptly delivered to the Engineer for each load.

In addition to all pertinent Federal, State and local laws or regulatory agency polices, the Contractor shall adhere to the following precautions during the transport of hazardous materials off-site:

- All vehicles departing the site are to be properly logged to show the vehicle identification, driver's name, time of departure, destination, and approximate volume, and contents of materials carried. Vehicles shall display the proper USDOT placards for the type and quantity of waste;
- No materials shall leave the site unless a disposal facility willing to accept all of the

- material being transported has agreed to accept the type and quantity of waste;
- Documentation must be maintained indicating that all applicable laws have been satisfied and that the materials have been successfully transported and received at the disposal facility; and,
 - The Contractor shall segregate the waste streams (i.e. concrete, wood, etc.) as directed by the receiving disposal facility.

Any spillage of debris during disposal operations during loading, transport and unloading shall be cleaned up in accordance with EPA 40 CFR 265 Subparts C & D, at the Contractor's expense.

The Contractor is liable for any fines, costs or remediation costs incurred as a result of their failure to be in compliance with this Item and all Federal, State and Local laws.

K. Project Closeout Data:

Provide the Engineer, within thirty (30) days of completion of the project site work, a compliance package; which shall include, but not be limited to, the following:

1. Competent persons (supervisor) job log;
2. OSHA-compliant personnel air sampling data;
3. Completed waste shipment papers for non-hazardous lead construction and demolition (C&D) waste disposal or recycling and scrap metal recycling.
4. Copies of completed Hazardous Waste Manifests (signed by authorized disposal facility representative).

Method of Measurement:

The completed work shall be paid as a lump sum. This item will include all noted services, equipment, facilities, testing and other associated work for up to three (3) ConnDOT project representatives. Services provided to any ConnDOT project representatives in excess of three (3) representatives will be measured for payment in accordance with Article 1.09.04 – “Extra and Cost-Plus Work.”

Basis of Payment:

The lump sum price bid for this item shall include: services, materials, equipment, all permits, notifications, submittals, personal air sampling, personal protection equipment, temporary enclosures, incidentals, fees and labor incidental to activities impacting lead removal, treatment and handling of lead contaminated materials, and the transport and disposal of any hazardous and/or non-hazardous lead construction and demolition (C&D) bulky waste.

Final payment will not be made until all project closeout data submittals have been completed and provided to the Engineer. Once the completed package has been received in its entirety and accepted by the Engineer, final payment will be made to the Contractor.

<u>Pay Item</u>	<u>Pay Unit</u>
Lead Compliance for Miscellaneous Exterior Tasks	Lump Sum

END OF SECTION

ITEM NO. 0101000A - ENVIRONMENTAL HEALTH AND SAFETY

Description:

Under this item, the Contractor shall establish protocols and provide procedures to protect the health and safety of its employees and subcontractors as related to the proposed construction activities performed within the Project AOEC's. Work under this Item consists of the development and implementation of a written HASP that addresses the relative risk of exposure to documented hazards present within Project limits. The HASP shall establish health and safety protocols that address the relative risk of exposure to regulated substances in accordance with 29 CFR 1910.120 and 29 CFR 1926.65. Such protocols shall only address those concerns directly related to site conditions.

Note: The Engineer will prepare a site-specific health and safety plan which is compatible with the Contractor's plan and will be responsible for the health and safety of all Project Inspectors, Department employees and consulting engineers.

Materials:

The Contractor must provide chemical protective clothing (CPC) and personal protective equipment (PPE) as stipulated in the Contractor's HASP during the performance of work in areas identified as potentially posing a risk to worker health and safety for workers employed by the Contractor and all subcontractors.

Construction Methods:

1-Existing Information: The Contractor shall utilize all available information and existing records and data pertaining to chemical and physical hazards associated with any of the regulated substances identified in the environmental site investigations to develop the HASP. A list of documents containing this data is found in "Notice to Contractor – Environmental Investigations".

2-General: The requirements set forth herein pertain to the provision of workers' health and safety as it relates to proposed Project activities when performed in the presence of hazardous or regulated materials or otherwise environmentally sensitive conditions. THE PROVISION OF WORKER HEALTH AND SAFETY PROTOCOLS WHICH ADDRESS POTENTIAL AND/OR ACTUAL RISK OF EXPOSURE TO SITE SPECIFIC HAZARDS POSED TO CONTRACTOR EMPLOYEES IS SOLELY THE RESPONSIBILITY OF THE CONTRACTOR.

The Contractor shall be responsible for the development, implementation and oversight of the HASP throughout the performance of work within the limits of the AOEC's, as identified in the Contract Documents, and in other areas identified by the Engineer or by the HASP where site conditions may pose a risk to worker health and safety and/or the environment. **No physical**

aspects of the work within the AOEC's shall begin until the HASP is reviewed by the Engineer and is determined to meet the requirements of the specifications. However, the Contract time, in accordance with Article 1.03.08, will begin on the date stipulated in the Notice to Proceed.

3-Regulatory Requirements: All construction related activities performed by the Contractor within the limits of the AOEC's or in other areas where site conditions may pose a risk to worker health and safety and/or the environment shall be performed in conformance with 29 CFR 1926, Safety and Health Regulations for Construction and 29 CFR 1910, Safety and Health Regulations for General Industry. Conformance to 29 CFR 1910.120, Hazardous Waste Site Operations and Emergency Response (HAZWOPER) may also be required, where appropriate.

4-Submittals: Three copies of the HASP shall be submitted to the Engineer within four (4) weeks after the Award of Contract or four (4) weeks prior to the start of any work in the AOEC's, whichever is first, but not before the Award of the Contract.

The HASP shall be developed by a qualified person designated by the Contractor. This qualified person shall be a Certified Industrial Hygienist (CIH), Certified Hazardous Material Manager (CHMM), or a Certified Safety Professional (CSP). He/she shall have review and approval authority over the HASP and be identified as the Health and Safety Manager (HSM). The HASP shall bear the signature of said HSM indicating that the HASP meets the minimum requirements of 29 CFR 1910.120 and 29 CFR 1926.65.

The Engineer will review the HASP within four (4) weeks of submittal and provide written comments as to deficiencies in and/or exceptions to the plan(s), if any, to assure consistency with the specifications, applicable standards, policies and practices and appropriateness given potential or known site conditions. Items identified in the HASP which do not conform to the specifications will be brought to the attention of the Contractor, and the Contractor shall revise the HASP to correct the deficiencies and resubmit it to the Engineer for determination of compliance with this item. The Contractor shall not be allowed to commence work activities in the AOEC's, as shown on the Plans, or where site conditions exist which may pose a risk to worker health and safety and/or the environment, until the HASP has been reviewed and accepted by the Engineer. No claim for delay in the progress of work will be considered for the Contractor's failure to submit a HASP that conforms to the requirements of the Contract.

5-HASP Provisions:

(a) General Requirements: The Contractor shall prepare a HASP covering all Project site work regulated by 29 CFR 1910.120(b)/ 1926.65(b) to be performed by the Contractor and all subcontractors under this Contract. The HASP shall establish in detail, the protocols necessary for the recognition, evaluation, and control of all hazards associated with each task performed under this Contract. The HASP shall address site-specific safety and health hazards of each phase of site operation and include the requirements and procedures for employee protection. The level of detail provided in the HASP shall be tailored to the type of work, complexity of operations to be performed, and hazards

anticipated. Details about some activities may not be available when the initial HASP is prepared and submitted. Therefore, the HASP shall address, in as much detail as possible, all anticipated tasks, their related hazards and anticipated control measures.

The HASP shall interface with the Contractor's Safety and Health Program. Any portions of the Safety and Health Program that are referenced in the HASP shall be included as appendices to the HASP. All topics regulated by the 29 CFR 1910.120(b)(4) and those listed below shall be addressed in the HASP. Where the use of a specific topic is not applicable to the Project, the HASP shall include a statement to justify its omission or reduced level of detail and establish that adequate consideration was given the topic.

(b) Elements:

(i) Site Description and Contamination Characterization: The Contractor shall provide a site description and contaminant characterization in the HASP that meets the requirements of 29 CFR 1910.120/1926.65.

(ii) Safety and Health Risk Analysis/Activity Hazard Analysis: The HASP shall address the safety and health hazards on this site for every operation to be performed. The Contractor shall review existing records and data to identify potential chemical and physical hazards associated with the site and shall evaluate their impact on field operations. Sources, concentrations (if known), potential exposure pathways, and other factors as noted in CFR 1910.120/126.65, paragraph (c)(7) employed to assess risk shall be described. The Contractor shall develop and justify action levels for implementation of engineering controls and personal protective equipment upgrades and downgrades for controlling worker exposure to the identified hazards. If there is no permissible exposure limit (PEL) or published exposure level for an identified hazard, available information from other published studies may be used as guidance. Any modification of an established PEL must be fully documented.

The HASP shall include a comprehensive section that discusses the tasks and objectives of the site operations and logistics and resources required to complete each task. The hazards associated with each task shall be identified. Hazard prevention techniques, procedures and/or equipment shall be identified to mitigate each of the hazards identified.

(iii) Staff Organization, Qualifications and Responsibilities: The HASP shall include a list of personnel expected to be engaged in site activities and certify that said personnel have completed the educational requirements stipulated in 29 CFR 1910.120 and 29 CFR 1926.65, are currently monitored under a medical surveillance program in compliance with those regulations, and that they are fit for work under "level C" conditions.

The Contractor shall assign responsibilities for safety activities and procedures. An outline or flow chart of the safety chain of command shall be provided in the HASP. Qualifications, including education, experience, certifications, and training in safety and health for all personnel engaged in safety and health functions shall be documented in the

HASP. Specific duties of each on-site team member should be identified. Typical team members include but are not limited to Team Leader, Scientific Advisor, Site Safety Officer, Public Information Officer, Security Officer, Record Keeper, Financial Officer, Field Team Leader, and Field Team members.

The HASP shall also include the name and qualifications of the individual proposed to serve as Health and Safety Officer (HSO). The HSO shall have full authority to carry out and ensure compliance with the HASP. The Contractor shall provide a competent HSO on-site who is capable of identifying existing and potential hazards in the surroundings or working conditions which are unsanitary, hazardous or dangerous to employees and who has authorization to take prompt corrective measures to eliminate or control them. The qualifications of the HSO shall include completion of OSHA 40-hour HAZWOPER training and 8-hour HAZWOPER supervisory training; a minimum of one year of working experience with the regulated compounds that have been documented to exist within Project limits; a working knowledge of Federal and State safety regulations; specialized training or documented experience (one year minimum) in personal and respiratory protective equipment program implementation; the proper use of air monitoring instruments, air sampling methods and procedures; and certification training in first aid and CPR by a recognized, approved organization such as the American Red Cross.

The primary duties of the HSO shall be those associated with worker health and safety. The Contractor's HSO responsibilities shall be detailed in the written HASP and shall include, but not be limited to the following:

- (A) Directing and implementing the HASP.
- (B) Ensuring that all Project personnel have been adequately trained in the recognition and avoidance of unsafe conditions and the regulations applicable to the work environment to control or eliminate any hazards or other exposure to illness or injury (29 CFR 1926.21). All personnel shall be adequately trained in procedures outlined in the Contractor's written HASP.
- (C) Authorizing Stop Work Orders, which shall be executed upon the determination of an imminent health and safety concern.
- (D) Contacting the Contractor's HSM and the Engineer immediately upon the issuance of a Stop Work order when the HSO has made the determination of an imminent health and safety concern.
- (E) Authorizing work to resume, upon approval from the Contractor's HSM.
- (F) Directing activities, as defined in the Contractor's written HASP, during emergency situations; and

(G) Providing personal monitoring where applicable, and as identified in the HASP.

(iv) Employee Training Assignments: The Contractor shall develop a training program to inform employees, supplier's representatives, and official visitors of the special hazards and procedures (including PPE, its uses and inspections) to control these hazards during field operations. Official visitors include but are not limited to Federal Agency Representatives, State Agency Representatives, Municipal Agency Representatives, Contractors, subcontractors, etc. This program shall be consistent with the requirements of 29 CFR 1910.120 and 29 CFR 1926.65.

(v) Personal Protective Equipment: The plan shall include the requirements and procedures for employee protection and should include a detailed section on respiratory protection. The Contractor shall describe in detail and provide appropriate personal protective equipment (PPE) to insure that workers are not exposed to levels greater than the action level for identified hazards for each operation stated for each work zone. The level of protection shall be specific for each operation and shall be in compliance with all requirements of 29 CFR 1910 and 29 CFR 1926. The Contractor shall provide, maintain, and properly dispose of all PPE.

(vi) Medical Surveillance Program: All on-site Contractor personnel engaged in 29 CFR 1910.120/1926.65 operations shall have medical examinations meeting the requirements of 29 CFR 1910.120(f) prior to commencement of work.

The HASP shall include certification of medical evaluation and clearance by the physician for each employee engaged in 29 CFR 1910.120/1926.65 operations at the site.

(vii) Exposure Monitoring/Air Sampling Program: The Contractor shall submit an Air Monitoring Plan as part of the HASP which is consistent with 29 CFR 1910.120, paragraphs (b)(4)(ii)(E), (c)(6), and (h). The Contractor shall identify specific air sampling equipment, locations, and frequencies in the air-monitoring plan. Air and exposure monitoring requirements shall be specified in the Contractor's HASP. The Contractor's CIH shall specify exposure monitoring/air sampling requirements after a careful review of the contaminants of concern and planned site activities.

(viii) Site Layout and Control: The HASP shall include a map, work zone delineation (support, contamination, reduction and exclusion), on/off-site communications, site access controls, and security (physical and procedural).

(ix) Communications: Written procedures for routine and emergency communications procedures shall be included in the Contractor's HASP.

(x) Personal Hygiene, Personal Decontamination and Equipment Decontamination: Decontamination facilities and procedures for personnel protective equipment, sampling equipment, and heavy equipment shall be discussed in detail in the HASP.

(xi) Emergency Equipment and First Aid Requirements: The Contractor shall provide appropriate emergency first aid kits and equipment suitable to treat exposure to the hazards identified, including chemical agents. The Contractor will provide personnel that have certified first aid/CPR training on-site at all times during site operations.

(xii) Emergency Response Plan and Spill Containment Program: The Contractor shall establish procedures in order to take emergency action in the event of immediate hazards (i.e., a chemical agent leak or spill, fire or personal injury). Personnel and facilities supplying support in emergency procedures will be identified. The emergency equipment to be present on-site and the Emergency Response Plan procedures, as required 29 CFR 1910.120, paragraph (1)(1)(ii) shall be specified in the Emergency Response Plan. The Emergency Response Plan shall be included as part of the HASP. This Emergency Response Plan shall include written directions to the closest hospital as well as a map showing the route to the hospital.

(xiii) Logs, Reports and Record Keeping: The Contractor shall maintain safety inspections, logs, and reports, accident/incident reports, medical certifications, training logs, monitoring results, etc. All exposure and medical monitoring records are to be maintained according to 29 CFR 1910 and 29 CFR 1926. The format of these logs and reports shall be developed by the Contractor to include training logs, daily logs, weekly reports, safety meetings, medical surveillance records, and a phase-out report. These logs, records, and reports shall be maintained by the Contractor and be made available to the Engineer.

The Contractor shall immediately notify the Engineer of any accident/ incident. Within two working days of any reportable accident, the Contractor shall complete and submit to the Engineer an accident report.

(xiv) Confined space entry procedures: Confined space entry procedures, both permit required and non permit required, shall be discussed in detail.

(xv) Pre-entry briefings: The HASP shall provide for pre-entry briefings to be held prior to initiating any site activity and at such other times as necessary to ensure that employees are apprised of the HASP and that this plan is being followed.

(xvi) Inspections/audits: The HSM or HSO shall conduct Inspections or audits to determine the effectiveness of the HASP. The Contractor shall correct any deficiencies in the effectiveness of the HASP.

6-HASP Implementation: The Contractor shall implement and maintain the HASP throughout the performance of work. In areas identified as having a potential risk to worker health and safety, and in any other areas deemed appropriate by the HSO, the Contractor shall be prepared to immediately implement the appropriate health and safety measures, including but not limited to the use of personal protective equipment (PPE), and engineering and administrative controls.

If the Engineer observes deficiencies in the Contractor's operations with respect to the HASP, they shall be assembled in a written field directive and given to the Contractor. The Contractor shall immediately correct the deficiencies and respond, in writing, as to how each was corrected. Failure to bring the work area(s) and implementation procedures into compliance will result in a Stop Work Order and a written directive to discuss an appropriate resolution(s) to the matter. When the Contractor demonstrates compliance, the Engineer shall remove the Stop Work Order. If a Stop Work Order has been issued for cause, no delay claims on the part of the Contractor will be honored.

Disposable CPC/PPE, i.e. disposable coveralls, gloves, etc., which come in direct contact with hazardous or potentially hazardous material shall be placed into 55 gallon USDOT 17-H drums and disposed of in accordance with Federal, State, and local regulations. The drums shall be temporarily staged and secured within the WSA until the material is appropriately disposed.

7-HASP Revisions: The HASP shall be maintained on-site by the Contractor and shall be kept current with construction activities and site conditions under this Contract. The HASP shall be recognized as a flexible document which shall be subject to revisions and amendments, as required, in response to actual site conditions, changes in work methods and/or alterations in the relative risk present. All changes and modifications shall be signed by the Contractor's HSM and shall require the review and acceptance by the Engineer prior to the implementation of such changes.

Should any unforeseen hazard become evident during the performance of the work, the HSO shall bring such hazard to the attention of the Contractor and the Engineer as soon as possible. In the interim, the Contractor shall take action, including Stop Work Orders and/or upgrading PPE as necessary to re-establish and maintain safe working conditions and to safeguard on-site personnel, visitors, the public and the environment. The HASP shall then be revised/amended to reflect the changed condition.

Method of Measurement:

1-Within thirty (30) calendar days of the award of the Contract, the Contractor shall submit to the Engineer for acceptance a breakdown of its lump sum bid price for this item detailing:

- (a) The development costs associated with preparing the HASP in accordance with these Specifications.
- (b) The cost per month for the duration of the Project to implement the HASP and provide the services of the HSM and the HSO.

2-If the lump sum bid price breakdown is unacceptable to the Engineer; substantiation showing that the submitted costs are reasonable shall be required.

3-Upon acceptance of the payment schedule by the Engineer, payments for work performed will be made as follows:

- (a) The lump sum development cost will be certified for payment.
- (b) The Contractor shall demonstrate to the Engineer monthly that the HASP has been kept current and is being implemented and the monthly cost will be certified for payment.
- (c) Any month where the HASP is found not to be current or is not being implemented, the monthly payment for the Environmental Health and Safety Item shall be deferred to the next monthly payment estimate. If the HASP is not current or being implemented for more than thirty calendar days, there will be no monthly payment.
- (d) Failure of the Contractor to implement the HASP in accordance with this Specification shall result in the withholding of all Contract payments.

Basis of Payment:

This work will be paid for at the Contract lump sum price for “Environmental Health and Safety” which price shall include all materials, tools, equipment and labor incidental to the completion of this item for the duration of the Project to maintain, revise, monitor and implement the HASP. Such costs include providing the services of the HSM and HSO, Contractor employee training, chemical protective clothing (CPC), personal protective equipment (PPE), disposal of PPE and CPC, medical surveillance, decontamination facilities, engineering controls, monitoring and all other HASP protocols and procedures established to protect the Health and Safety for all on-site workers.

Pay Item	Pay Unit
Environmental Health and Safety	L.S.

ITEM NO. 0101117A - CONTROLLED MATERIALS HANDLING

Description:

Work under this Item is intended to provide specific procedural requirements to be followed by the Contractor during the excavation of controlled materials from within any AOEC, as shown on the Project Plans. This supplements Specifications Section 2.02, 2.03, 2.05, and 2.06 and Contract Special Provisions for excavation wherever contaminated materials are encountered. Work under this item shall include transporting and stockpiling materials at the WSA; and covering, securing, and maintaining the stockpiled materials throughout the duration of the Project. All materials, excluding the existing pavement structure (asphalt and subbase), rock, ledge, and concrete excavated within AOEC's are to be considered controlled materials. If the vertical limits of the existing subbase cannot be determined visually, subbase will be presumed to extend 12" below the bottom of the existing pavement.

Controlled materials consisting of non-hazardous levels of regulated substances have been documented to exist within the Project. Such contamination is documented in the reports listed in the "Notice to Contractor – Environmental Investigations". Where contaminated soils are excavated, such soil will require special handling, disposal and documentation procedures. Excavated material from the AOEC's, if suitable, may be re-used within the AOEC from which it was excavated, in accordance with the following conditions: (1) such soil is deemed to be structurally suitable for use as fill by the Engineer; (2) such soil is not placed below the water table; (3) the CTDEEP groundwater classification of the area where the soil is to be reused as fill does not preclude said reuse; and (4) such soil is not placed in an area subject to erosion. Materials removed from any excavation within an AOEC which cannot be immediately re-used within the same AOEC shall be transported directly from their point of origin on the Project to the WSA.

Materials:

The required materials are detailed on the Project Plans. All materials shall conform to the requirements of the Contract.

Plastic Sheet: Polyethylene plastic sheeting for underlayment shall be at least 30 mil thick. Polyethylene plastic sheeting for covering excavated material shall be a thickness of 10 mil. Both shall be at least 10 feet wide.

Covers for roll-off/storage containers shall be made of polyethylene plastic, or similar water-tight material, that is of sufficient size to completely cover top opening and can be securely fastened to the container.

Sand Bags: Sandbags used to secure polyethylene covers shall be at least 30 pounds.

Sorbent Boom: Shall be 8 inches in diameter and 10 feet long and possess petrophilic and hydrophilic properties. Sorbent booms shall also have devices (i.e. clips, clasps, etc.) for connection to additional lengths of boom.

Construction Methods:

A. General

When controlled materials are encountered during the course of the work, health and safety provisions shall conform to the appropriate sections of the Contract. Provisions may include implementation of engineering controls, air and personal monitoring, the use of chemical protective clothing (CPC), personal protective equipment (PPE), implementation of engineering controls, air and personal monitoring, and decontamination procedures.

Excavated material from the AOECs, if suitable, may be re-used within the AOEC from which it was excavated, in accordance with the following conditions: (1) such soil is deemed to be structurally suitable for use as fill by the Engineer; (2) such soil is not placed below the water table; (3) the CTDEEP groundwater classification of the area where the soil is to be reused as fill does not preclude said reuse; and (4) such soil is not placed in an area subject to erosion. Materials removed from any excavation within an AOEC which cannot be immediately re-used within the same AOEC shall be transported directly from their point of origin on the Project to the WSA. The stockpiles of excavated controlled materials shall be maintained as shown on the Project Plans. The Contractor shall plan excavation activities within AOEC's in consideration of the capacity of WSA, and the material testing and disposal requirements of the applicable Contract item. **No claims for delay shall be considered based on the Contractor's failure to coordinate excavation activities as specified herein.**

The Engineer will sample the stockpiled controlled materials at a frequency and for the constituents to meet the acceptance criteria of the treatment/recycling/disposal facilities submitted by the Contractor. The Contractor is hereby notified that laboratory turnaround time is expected to be fifteen (15) working days. Turnaround time is the period of time beginning when the Contractor notifies the Engineer which facility it intends to use and that the stockpile is ready for sampling and ending with the Contractor's receipt of the laboratory analytical results. Any change of intended treatment/recycling/disposal facility may prompt the need to resample and will therefore restart the time required for laboratory turnaround. The laboratory will furnish such results to the Engineer. Upon receipt, the Engineer will make available to the Contractor the results of the final waste characterization determinations. **No delay claim will be considered based upon the Contractor's failure to accommodate the laboratory turnaround time as identified above.**

B. Transportation and Stockpiling

In addition to following all pertinent Federal, State and local laws or regulatory agency policies, the Contractor shall adhere to the following precautions during transport of non-hazardous materials:

- Transported controlled materials are to be covered prior to leaving the point of generation and are to remain covered until the arrival at the WSA;
- All vehicles departing the site are properly logged to show the vehicle identification, driver's name, time of departure, destination, and approximate volume and content of materials carried;
- All vehicles shall have secure, watertight containers free of defects for material transportation;
- No material shall leave the site until there is adequate lay down area prepared in the WSA; and,
- Documentation must be maintained indicating that all applicable laws have been satisfied and that the materials have been successfully transported and received at the WSA.

Construction of the WSA shall be completed prior to the initiation of construction activities generating Controlled Materials. Plastic polyethylene sheeting and bedding sand or existing/new pavement shall underlay all excavated controlled materials as shown on the Contract Plans. Measures shall be implemented to divert rainfall away from the WSA.

No controlled materials shall be excavated or transported to the WSA until registration under the General Permit for Contaminated Soil and/or Sediment Management (Staging and Transfer) has been obtained by ConnDOT.

Placement of sorbent boom along the perimeter of the WSA shall be conducted when soil is saturated with petroleum product.

Excavated materials shall be staged as shown on the Project Plans or as directed by the Engineer.

C. WSA Maintenance

The Contractor shall provide all necessary materials, equipment, tools and labor for anticipated activities within the WSA. Such activities include, but are not limited to, handling and management of stockpiles and drummed CPC/PPE; uncovering and recovering stockpiles; maintenance of WSA; replacement of damaged components (i.e. sand bags, plastic polyethylene sheeting, etc.); and waste inventory record management. The Contractor shall manage all

materials in the WSA in such a way as to minimize tracking of potential contaminated materials across the site and off-site, and minimize dust generation.

Each stockpile shall be securely covered when not in active use with a cover of sufficient size to prevent generation of dust and infiltration of precipitation.

The staged stockpiles shall be inspected at least daily by the Contractor to ensure that the cover and containment have not been damaged and that there is no apparent leakage from the pile. If the cover has been damaged, or there is evidence of leakage from the piles, the Contractor shall immediately replace the cover or containment as needed to prevent the release of materials to the environment from the piles.

An inventory of stockpiled materials and drummed CPC/PPE shall be conducted on a daily basis. Inventory records shall indicate the approximate volume of material/drums stockpiled per day; the approximate volume of material/drums stockpiled to date; material/drums loaded and transported off-site for disposal; any materials loaded and transported for on-site reuse; and identification of stockpiles relative to their points of generation.

Following the removal of all stockpiled controlled materials, residuals shall be removed from surfaces of the WSA as directed by the Engineer. This operation shall be accomplished using dry methods such as shovels, brooms, mechanical sweepers or a combination thereof. Residuals shall be disposed of as Controlled Materials.

D. Dewatering

Dewatering activities shall conform to Items in pertinent articles of the Contract.

E. Decontamination

All equipment shall be provided to the work site free of contamination. The Engineer may prohibit from the site any equipment that in his opinion has not been thoroughly decontaminated prior to arrival. Any decontamination of the Contractor's equipment prior to arrival at the site shall be at the expense of the Contractor. The Contractor is prohibited from decontaminating equipment on the Project that has not been thoroughly decontaminated prior to arrival.

The Contractor shall furnish labor, materials, tools and equipment for decontamination of all equipment and supplies that are used to handle Controlled Materials. Decontamination shall be conducted at an area designated by the Engineer and may be required prior to equipment and supplies leaving the Project, between stages of the work, or between work in different AOEC's.

Dry decontamination procedures are recommended. Residuals from dry decontamination activities shall be collected and managed as Controlled Materials. If dry methods are unsatisfactory as determined by the Engineer, the Contractor shall modify decontamination procedures as required subject to the Engineer's approval.

F. Dust Control

The Contractor shall implement a fugitive dust suppression program in accordance with the Contract to prevent the off-site migration of particulate matter and/or dust resulting from excavation, loading and operations associated with Controlled Materials. It shall be the Contractor's responsibility to supervise fugitive dust control measures and to monitor airborne particulate matter. The Contractor shall:

1. Employ reasonable fugitive dust suppression techniques.
2. Visually observe the amounts of particulate and/or fugitive dust generated during the handling of controlled materials. If the apparent amount of fugitive dust and/or particulate matter is not acceptable to the Engineer, the Engineer may direct the Contractor to implement corrective measures at his discretion, including, but not limited to, the following:
 - (a) apply water to pavement surfaces
 - (b) apply water to equipment and excavation faces; and
 - (c) apply water during excavation, loading and dumping.

G. Permit Compliance

The Contractor shall comply with the terms and conditions of the DEEP "General Permit for Contaminated Soil and/or Sediment Management (Staging and Transfer)", including the General Operating Conditions and the Specific Operating Conditions, except that the Engineer will conduct all soil/sediment characterization and perform all record keeping. In particular, the Contractor shall:

1. Operate, maintain and repair the WSA in conformance with the requirements of the General Permit.
2. Maintain a communications system capable of summoning fire, police, and/or other emergency service personnel.
3. Prevent unauthorized entry onto the stockpiles by the use of fences, gates, or other natural or artificial barriers.
4. Separate incidental excavation waste to the satisfaction of the receiving facility or to an extent that renders the contaminated soil and/or sediment suitable for its intended reuse.
5. Isolate and temporarily store incidental waste in a safe manner prior to off-site transport to a facility lawfully authorized to accept such waste.
6. Not store more than 100 cubic yards of incidental waste at any one time.
7. Sort, separate and isolate all hazardous waste from contaminated soil and/or sediment.
8. Prevent or minimize the transfer or infiltration of contaminants from the stockpiles to the ground as detailed in "B. Transportation and Stockpiling" above.
9. Securely cover each stockpile of soil as detailed in "C. WSA Maintenance" above.
10. Minimize wind erosion and dust transport as detailed in "F. Dust Control" above.

11. Use anti-tracking measures at the WSA to ensure the vehicles do not track soil from the WSA onto a public roadway at any time.
12. Instruct the transporters of contaminated soil and/or sediment of best management practices for the transportation of such soil (properly covered loads, removing loose material from dump body, etc.).
13. Control all traffic related to the operation of the facility in such a way as to mitigate the queuing of vehicles off-site and excessive or unsafe traffic impact in the area where the facility is located.
14. Ensure that except as allowed in section 22a-174-18(b)(3)(C) of the Regulations of Connecticut State Agencies, trucks are not left idling for more than three (3) consecutive minutes.

Method of Measurement:

The work of Controlled Material Handling will be measured for payment by the number of cubic yards of controlled material excavated within the AOEC's, taken to the WSA, and stockpiled within the storage bins for sampling by the Engineer or temporarily stockpiled for later reuse. Material kept in proximity to the site of the excavation and reused as it is generated will not be measured for payment under this item. This measurement shall be in accordance with and in addition to the quantity measured for payment of the applicable excavation item in Specification Sections 2.02, 2.03, 2.05, 2.06, or the Contract Special Provisions, as applicable. Excess excavations made by the Contractor beyond the payment limits specified in the Contract will not be measured for payment and the Contractor assumes all costs associated with the appropriate handling, management and disposal of this material.

Equipment decontamination, the collection of residuals, and the collection and disposal of liquids generated during equipment decontamination activities will not be measured separately for payment.

Basis of Payment:

This work shall be paid for at the Contract unit price, which shall include all transportation from the excavation site to the final WSA, including any intermediate handling steps; stockpiling controlled materials at the WSA; covering, securing, and maintaining the individual stockpiles within the WSA throughout the duration of the Project; and all tools, equipment, material and labor incidental to this work.

This price shall also include equipment decontamination; the collection of residuals generated during decontamination and placement of such material in the WSA; and the collection and disposal of liquids generated during equipment decontamination activities.

All materials, labor and equipment associated with compliance with the General Permit for Contaminated Soil and/or Sediment Management (Staging and Transfer) will not be measured separately, but will be considered incidental to the item "Controlled Materials Handling".

Securing, construction and dismantling of the WSA shall be paid for under Item 101128A. Payment for dust control activities shall be made under the appropriate Contract items.

Pay Item

Pay Unit

Controlled Materials Handling

C.Y.

ITEM NO. 0101128A - SECURING, CONSTRUCTION AND DISMANTLING OF A WASTE STOCKPILE AND TREATMENT AREA

Description:

Work under this Item shall consist of the securing, construction and dismantling of the temporary Waste Stockpile Area at the location designated on the Project Plans and in accordance with the Contract. All controlled materials excavated during construction activities shall be stockpiled in the WSA. The WSA shown on the Plans is to be used exclusively for temporary stockpiling of excavated materials from within Project AOEC's and excess excavated materials from within the Project LLAOEC's and LLAOEC-SED for determination of disposal classification.

Materials:

The required materials are detailed on the Project Plans. All materials shall conform to the requirements of the Contract.

Construction blocks shall be solid precast rectangular concrete six feet in length, three feet in height, and two feet in depth.

Polyethylene plastic sheeting for underlayment shall be a thickness of 30 mil and minimum width of ten feet. Polyethylene plastic sheeting for covering shall be a thickness of 10 mil and minimum width of ten feet.

Sand bags used to secure polyethylene sheeting soil covers shall have a minimum weight of thirty pounds.

Bedding sand shall conform to Section 6.51.02 of the Specifications.

Processed Aggregate Base shall conform to Section 3.04 of the Specifications.

Hay bales shall conform to the requirements of Section 2.18 of the Specifications.

Bituminous Concrete shall conform to Section 4.06 of the Specifications.

Roll-off/Storage Containers shall be of watertight, steel-body construction, of the size specified and able to handle the storage and subsequent transportation of material to the disposal facility.

Precast Concrete Barrier Curb shall conform to Section 8.22 of the Specifications.

Construction Methods:

The WSA shall be constructed in accordance with the Contract at the location shown on the Project Plans.

Construction of the WSA shall be completed prior to the initiation of construction activities generating Controlled Materials. The Contractor is responsible for the maintenance and protection of all utilities potentially affected during WSA construction. The Contractor shall locate and mark all existing utilities potentially affected prior to initiating WSA construction.

The proposed location of the WSA shall be cleared of any debris and vegetation as directed by the Engineer. Any objectionable materials, which may result in damage to the polyethylene sheeting underlayment, shall be removed prior to stockpiling excavated controlled materials.

The Contractor shall comply with the terms and conditions of the DEEP “General Permit for Contaminated Soil and/or Sediment Management (Staging and Transfer)”, including the General Operating Conditions and the Specific Operating Conditions, except that the Engineer will conduct all soil/sediment characterization and perform all record keeping. In particular, the Contractor shall:

1. Construct and repair the WSA in conformance with the requirements of the General Permit.
2. Prevent unauthorized entry onto the stockpiles by the use of fences, gates, or other natural or artificial barriers.
3. Install anti-tracking measures at the WSA to ensure the vehicles do not track soil from the WSA onto a public roadway at any time.
4. Post and maintain a sign that is visible from a distance of at least 25’ at the WSA identifying the name of the permittee (State of CT, Department of Transportation), the DOT field office phone number, the hours of operation for the WSA, and the phrase, “Temporary Soil Staging Area”. Lettering shall be at least one inch (1”) high with a minimum overall sign dimension of four (4) feet wide by two (2) feet high.

Following the removal of all stockpiled material, the Contractor shall use dry decontamination procedures for all surfaces of the WSA as directed by the Engineer. Residual materials shall be disposed of as Controlled Materials. If the results from dry methods are unsatisfactory to the Engineer, the Contractor shall modify decontamination procedures as required.

The Contractor shall be responsible for the collection and treatment/recycling/disposal of any liquid wastes that may be generated by its decontamination activities in accordance with applicable regulations.

Upon completion of the Project and following removal of all residual Controlled Materials, the Contractor shall dismantle the WSA and return the area to original condition. During dismantling, the Contractor shall remove all materials such as polyethylene sheeting and sand bags. Materials shall be disposed of by the Contractor as solid waste in accordance with the Contract and all Federal, State and local regulations.

Operation and maintenance of the WSA shall be included under Item 101117A “Controlled Material Handling”.

Method of Measurement:

This work will be measured for payment at the Lump Sum cost for securing, construction, and dismantling of a WSA.

Basis of Payment:

This work will be paid for at the Contract Lump Sum, which shall include all materials, tools, labor, equipment, permits, and work needed to secure, construct, decontaminate and dismantle the WSA, including all clearing, grubbing, grading, clean up, site restoration and seeding.

All materials, labor and equipment associated with compliance with the General Permit for Contaminated Soil and/or Sediment Management (Staging and Transfer) will not be measured separately, but will be considered incidental to the item “Securing, Construction and Dismantling of a Waste Stockpile and Treatment Area”.

Pay Item	Pay Unit
Securing, Construction and Dismantling Of a Waste Stockpile and Treatment Area	L.S.

ITEM #0101130A - ENVIRONMENTAL WORK - SOLIDIFICATION

Description:

Under this item, the Contractor shall be responsible for the solidification of controlled materials containing free draining liquids, as may be necessary during the performance of work operations prior to off-site disposal. Materials shall be dewatered prior to the addition of solidification material.

The Contractor shall submit within seven (7) days of the Notice to Proceed, for the Engineer's review, a detailed methodology and plan of operation for the solidification of materials.

Materials:

The materials used for solidification shall be a naturally occurring material such as diatomaceous earth or other material as approved by the Engineer. Said material shall be in a dry state prior to use in solidification operations. No polymers or other synthetic materials shall be allowed.

Construction Methods:

Submittals:

The Contractor shall submit for the Engineer's review, a plan showing the location of solidification material storage and proposed mixing location as well as a detailed narrative describing the equipment, materials and methodology to be used. The Contractor shall also include its planned methods to remove or drain away free water prior to the addition of any solidification materials to controlled materials. The methodology shall completely describe the Contractor's proposed plan for removal of free liquids (as determined by ASTM) from the excavated materials. Should solidification fail to eliminate free liquids as proposed, the Contractor will be required to revise the solidification plan at no additional cost to the State.

Upon visual examination, if controlled materials have free liquids present, the Contractor may, with concurrence of the Engineer, add dry materials to absorb free-standing liquids, utilizing a methodology accepted by the Engineer. The Contractor shall dewater controlled materials prior to the addition of solidification materials to the satisfaction of the Engineer. All dewatering fluids shall be handled in accordance with the Contract. Solidification procedures shall be subject to monitoring by the Engineer.

The maximum quantity of solidification material that may be used by the Contractor shall be limited to twenty (20) percent, by volume, of the material being solidified. Should this procedure be demonstrated as not effective in the elimination of the presence of free-standing liquids, the Contractor shall submit methods for the removal of free-standing water. The Contractor shall also submit the additional costs of the proposed alternative to the Engineer for review. No alternative methods of solidification shall be initiated until reviewed and accepted by the Engineer.

Method of Measurement:

This work will be measured for payment as the actual weight of solidification material used by the Contractor. The Contractor shall demonstrate the amount of solidification material used by the original weight tickets from a certified scale. The weight tickets shall show the weight of the material brought to the site and subsequently used in solidification operations.

If no certified scale is available, the Engineer may allow for the calculation of the weight by a summation of sealed, pre-measured bags.

Basis of Payment:

This work will be paid for at the Contract unit price for solidification material used and accepted by the Engineer. Such price shall include all labor, materials, tools, and equipment incidental to the work including transportation of the materials to the Project and the addition of solidification material to excavated materials.

Pay Item	Pay Unit
Environmental Work - Solidification	Ton

ITEM NO. 0202315A - DISPOSAL OF CONTROLLED MATERIALS

Description:

Work under this item shall consist of the loading, transportation and final off-site disposal/recycling/treatment of controlled materials (excluding dewatering fluids) that have been generated from various excavations within the AOEC(s), brought to the WSA and determined to be contaminated with regulated substances at non-hazardous levels. This contamination is documented in the reports listed in the “Notice to Contractor – Environmental Investigations”. The controlled materials, after proper characterization by the Engineer, shall be taken from the WSA, loaded, transported to and treated/recycled/disposed of at a permitted treatment/recycle/disposal facility listed herein.

The Contractor must use one or more of the following Department-approved treatment/recycle/disposal facilities for the disposal of non-hazardous materials:

Phoenix Soil LLC P.O. Box 1750 Waterbury, CT 06721 (800) 586-4774; Sue Brenner	Northampton Landfill 170 Glendale Road Florence, MA 01062 413-498-0099
ESMI of New York 304 Towpath Road Fort Edward, New York 12828 (800) 511-3764; Peter Hanson	Waste Management of New Hampshire P.O. Box 27065 97 Rochester Neck Road Gonic, NH 03839 (603) 330-2170; Ellen Bellio
Ted Ondrick Company, LLC 58 Industrial Road Chicopee, MA 01020 (413) 592-2566; Alan Desrosiers	ESMI of New Hampshire 67 International Drive Loudon, NH 03307 (603) 783-0228; Stephen Raper
Greenwood Street Landfill 30 Nipp Napp Trail Worcester, MA 01067 (508) 755-4604; Scott Sampson	South Hadley Landfill, LLC 12 Industrial Drive South Hadley, MA 01075 413-535-3095
Waste Management – Chicopee Sanitary Landfill 161 New Lombard Road Chicopee, MA 01020 413-534-8741	Waste Management – Granby Sanitary Landfill 11 New Ludlow Road Granby, MA 01033 413-467-3200

Upton Landfill – Upton Site Remediation, LLC Maple Avenue Upton, MA 413-522-3688; Paul Mahoney	Allied Waste Niagra Fall Landfill, LLC 5600 Niagra Falls Blvd. Niagra, NY 14304 716-285-3398; David Hanson
Clean Earth of Philadelphia 3201 S. 61 Street Philadelphia, PA 19153 215-724-5520; Mike Kelly	Clean Earth of Carteret 24 Middlesex Avenue Carteret, NJ 07008 732-541-8909; Cheryl Coffee
Cranston Sanitary Landfill 1690 Pontiac Avenue Cranston, RI 02920 413-552-3688; Paul Mahoney	Moretown Landfill 187 Palisades Park Waterbury, VT 05676 802-244-1100 x 226
The Southbridge Recycling and Disposal Park 165 Barefoot Road Southbridge, MA 508-765-9723	Cumberland County Landfill 135 Vaughn Road Shippensburg, PA 17257 717-729-2060; Don Demkoviz

Construction Methods:

A. Submittals

The apparent low bidder shall submit in writing, within fourteen days after Bid opening, (1) a letter listing the names of the treatment/recycle/disposal facilities (from the list above) which the bidder, if it is awarded the Contract, will use to receive controlled material from this Project, (2) a copy of the attached “Disposal Facility Material Acceptance Certification” form from each facility, which shall be signed by an authorized representative of each treatment/recycle/disposal facility, and (3) a copy of the facility acceptance criteria and facility sampling frequency requirements from each facility.

Any other Contractor which the Department may subsequently designate as the apparent low bidder shall make the aforementioned submissions within fourteen (14) days from the date on which the Department notifies the Contractor that it has become the apparent low bidder. If, however, the Department deems it is necessary for such a subsequent-designated Contractor to make said submissions within a shorter period of time, the Contractor shall make those submissions within the time designated by the Department.

Failure to comply with all of the above requirements may result in the rejection of the bid.

No facility may be substituted for the one(s) designated in the Contractor’s submittal without the Engineer’s prior approval. If the material cannot be accepted by any of the Contractor’s

designated facilities, the Department will supply the Contractor with the name(s) of other acceptable facilities.

Disposal Facility Materials Acceptance Certification

Project Number _____

Project Location _____

Facility Name _____ Telephone _____

Facility Address _____ Fax _____

The Contractor has supplied the analytical data contained in the report concerning the site investigation performed by the Designer. I have personally reviewed this data and intend to accept the following:

Controlled materials as described in Item # 202315A Disposal of Controlled Materials for the subject Project at a cost of \$ _____ per ton for treatment/disposal and an additional \$ _____ per ton for transportation from the Project to the facility (if applicable).

This intent to accept the material will be subject to and dependent upon the facility's subsequent evaluation of waste characterization determination documentation to be provided to the Contractor by the Engineer.

Authorized Facility
Representative _____ / _____
Printed/Typed Name Title

Signature Date

Note: The facility shall attach the acceptance criteria and facility sampling frequency requirements to this document.

DO NOT ALTER FORM IN ANY WAY. FORM MUST BE COMPLETED IN ENTIRETY.

B. Material Disposal

The Engineer will sample materials stored at the WSA at a frequency established by the selected treatment/recycling/disposal facilities. The Contractor shall designate to the Engineer which facility it intends to use prior to samples being taken. The Contractor is hereby notified that laboratory turnaround time is expected to be fifteen (15) working days. Turnaround time is the period of time beginning when the Contractor notifies the Engineer which facility it intends to use and that the bin within the WSA is full and ready for sampling and ending with the Contractor's receipt of the laboratory analytical results. Any change of intended treatment/recycling/disposal facility may prompt the need to resample and will therefore restart the time required for laboratory turnaround. The laboratory will furnish such results to the Engineer. Upon receipt, the Engineer will make available to the Contractor the results of the final waste characterization determinations. **No delay claim will be considered based upon the Contractor's failure to accommodate the laboratory turnaround time as identified above.**

The Contractor shall obtain and complete all paperwork necessary to arrange for material disposal (such as disposal facility waste profile sheets). It is solely the Contractor's responsibility to co-ordinate the disposal of controlled materials with its selected treatment/recycling/disposal facility(s). Upon receipt of the final approval from the facility, the Contractor shall arrange for the loading, transport and treatment/recycling/disposal of the materials in accordance with all Federal and State regulations. **No claim will be considered based on the failure of the Contractor's selected disposal facility(s) to meet the Contractor's production rate or for the Contractor's failure to select sufficient facilities to meet its production rate.**

All manifests or bills of lading utilized to accompany the transportation of the material shall be prepared by the Contractor and signed by an authorized Department representative, as Generator, for each truck load of material that leaves the site. The Contractor shall forward the appropriate original copies of all manifests or bills of lading to the Engineer the same day the material leaves the Project.

A load-specific certificate of treatment/recycling/disposal, signed by the authorized agent representing the disposal facility, shall be obtained by the Contractor and promptly delivered to the Engineer for each load.

C. Material Transportation

In addition to all pertinent Federal, State and local laws or regulatory agency polices, the Contractor shall adhere to the following precautions during the transport of controlled materials off-site:

- Transported controlled materials are to be covered sufficiently to preclude the loss of

material during transport prior to leaving the site and are to remain covered until the arrival at the selected treatment/recycling/disposal facility.

- All vehicles departing the site are to be properly logged to show the vehicle identification, driver's name, time of departure, destination, and approximate volume, and contents of materials carried.
- No materials shall leave the site unless a treatment/recycling/disposal facility willing to accept all of the material being transported has agreed to accept the type and quantity of waste.

D. Equipment Decontamination

All equipment shall be provided to the work site free of gross contamination. The Engineer may prohibit from the site any equipment that in his opinion has not been thoroughly decontaminated prior to arrival. Any decontamination of the Contractor's equipment prior to arrival at the site shall be at the expense of the Contractor. The Contractor is prohibited from decontaminating equipment on the Project that has not been thoroughly decontaminated prior to arrival.

The Contractor shall furnish labor, materials, tools and equipment for decontamination of all equipment and supplies that are used to handle Controlled Materials. Decontamination shall be conducted at an area designated by the Engineer and shall be required prior to equipment and supplies leaving the Project, between stages of the work, and between work in different AOEC's.

The Contractor shall use dry decontamination procedures. Residuals from dry decontamination activities shall be collected and managed as Controlled Materials. If the results from dry methods are unsatisfactory to the Engineer, the Contractor shall modify decontamination procedures as required.

The Contractor shall be responsible for the collection and treatment/recycling/disposal of any liquid wastes that may be generated by its decontamination activities in accordance with applicable regulations.

Method of Measurement:

The work of "DISPOSAL OF CONTROLLED MATERIALS" will be measured for payment as the actual net weight in tons of material delivered to the treatment/recycling/disposal facility. Such determinations shall be made by measuring each hauling vehicle on the certified permanent scales at the treatment/recycling/disposal facility. Total weight will be the summation of weight bills issued by the facility specific to this Project. Excess excavations made by the Contractor beyond the payment limits specified in Specification Sections 2.02, 2.03, 2.05, 2.06, or the Contract Special Provisions (as appropriate) will not be measured for payment and the Contractor assumes responsibility for all costs associated with the appropriate handling, management and disposal of this material.

The disposal of excavated materials, originally anticipated to be controlled materials, but determined by characterization sampling not to contain concentrations of regulated chemicals (non-polluted or “clean” materials) will not be measured for payment under this item but will be considered as surplus excavated materials and will be paid in accordance with Article 1.04.05.

Any materials, which are determined through characterization sampling to be contaminated but reusable in accordance with the Remediation Standard Regulations, and which are reused within Project limits, will not be measured for payment under this item. This material will be paid for under Item 0202318A – Management of Reusable Controlled Material or in accordance with Article 1.04.05 in the item’s absence.

Equipment decontamination, the collection of residuals, and the collection and disposal of liquids generated during equipment decontamination activities will not be measured separately for payment.

Basis of Payment:

This work will be paid for at the Contract unit price, which shall include the loading and transportation of controlled materials from the WSA to the treatment/recycling/disposal facility; the fees paid to the facility for treatment/recycling/disposal; the preparation of all related paperwork; and all equipment, materials, tools, and labor incidental to this work. **This unit price will be applicable to all of the Contractor-selected disposal facilities and will not change for the duration of the Project.**

This price shall also include equipment decontamination; the collection of residuals generated during decontamination and placement of such material in the WSA; and the collection and disposal of liquids generated during equipment decontamination activities.

Pay Item	Pay Unit
Disposal of Controlled Materials	Ton

ITEM NO. 0202318A MANAGEMENT OF REUSABLE CONTROLLED MATERIAL

Description:

Work under this item shall include all materials, equipment, tools and labor required to load, transport from the WSA, place, and compact reusable controlled materials in fill areas located within the Project limits. "Reusable controlled material" is soil that contains contaminant concentrations above analytical detection limits, but below the applicable regulatory criteria and controlled material stockpiled at the WSA and later reused within the AOEC from which it was excavated.

Construction Methods:

Controlled material stored within the WSA which is determined to be reusable following analytical testing shall be loaded, transported, placed and compacted at fill areas located within the Project limits in accordance with the following conditions: (1) such soil is deemed to be structurally suitable for use as fill by the Engineer; (2) such soil is not placed below the water table; 3) the CTDEEP groundwater classification of the area where the soil is to be reused as fill does not preclude said reuse; and (4) such soil is not placed in an area subject to erosion.

Method of Measurement:

"Management of Reusable Controlled Material" will be measured for payment by the number of cubic yards of material loaded and transported from the WSA and placed at fill areas located within the Project limits in accordance with the Contract.

Basis of Payment:

"Management of Reusable Controlled Material" will be paid for at the Contract unit price, which shall include all materials, equipment, tools and labor necessary to load and transport reusable controlled materials from the WSA to fill areas located within the Project limits and to place and compact the reusable material. This price shall include any decontamination of soil handling equipment, and the treatment/recycling/disposal of wastes generated in conjunction with such decontamination.

No separate payment will be made for consolidating previously tested individual stockpiles that have been deemed reusable, but shall be considered incidental to the work.

The disposal of any reusable controlled material that fails to meet material testing requirements for the intended use in accordance with the Contract requirements, as well as any excess reusable material, will be paid under Item 202315A, "Disposal of Controlled Material".

Pay Item	Pay Unit
Management of Reusable Controlled Materials	C.Y.

ITEM #0202479A - REMOVAL OF HMA WEARING SURFACE

Description: Work under this item shall consist of the complete removal and disposal of the existing HMA wearing surface, membrane waterproofing and bond breaker covering the reinforced concrete bridge deck as shown on the plans, as ordered by the Engineer and in accordance with these specifications.

Construction Methods: The Contractor shall remove the HMA wearing surface, membrane waterproofing and bond breaker using means acceptable to the Engineer to completely expose the underlying concrete deck, without damaging the deck, roadway materials, and structures which are to remain intact.

Acceptable mechanical method for removal of HMA surface on a structure can be one of the following:

Micro-milling - Micro-milling equipment shall consist of Cold Plane or Rotomill Grinders using carbide cutting tools in a rotary drum. The equipment shall provide a tool spacing of not more than $\frac{3}{16}$ inch, capable of leaving a smooth, uniform pattern of striations with a maximum forward speed of 45 feet/minute.

Fine Milling – Fine milling equipment shall consist of Cold Plane or Rotomill Grinders using carbide cutting tool in a rotary drum. The equipment shall provide a tool spacing of not more than $\frac{5}{16}$ inch, capable of leaving a smooth, uniform pattern of striations with a maximum forward speed of 45 feet/minute.

Alternate methods may be submitted to the Engineer for review and acceptance. Demonstration of the alternate removal method shall be performed prior to consideration.

All particles and aggregate adhering to the exposed concrete that could, in the Engineer's opinion, cause failure of/or puncture the new membrane shall be removed. The existing HMA wearing surface, membrane waterproofing, and bond breaker that are removed shall be disposed of offsite by the Contractor unless otherwise noted in the contract documents or as directed by the Engineer.

Prior to removal of HMA wearing surface the Contractor shall conduct a survey. A minimum of four (4) representative depth measurements shall be taken per span for a span up to 100 feet in length to predetermine the overlay thickness. An additional measurement shall be taken for each 25 feet in span length. If depth of overlay varies across the structure, it shall be clearly marked to aid in the removal operation. Survey locations shall be filled with bituminous material if milling operation is not scheduled within five (5) days or at the direction of the Engineer.

The existing HMA wearing surface and membrane waterproofing shall be removed in its entirety to the limits shown on the plans. The removal operations shall not begin until the Contractor is prepared to perform the permanent patching and/or repair to the underlying concrete within five

(5) working days. If this in conflict with "Prosecution and Progress", "Maintenance and Protection of Traffic", or other contract requirements, the more stringent specification shall apply.

Protection shall be provided around existing catch basin inlets, bridge scuppers, manholes, utility valve boxes, median barriers, parapets, and other roadway structures. Any damage to such structures as a result of removal operations is the Contractor's responsibility and shall be repaired at the Contractor's expense.

A uniform textured riding surface shall be provided and maintained. The surface shall be free from gouges, longitudinal grooves and ridges, oil film, and other imperfections that are a result of defective equipment, improper use of equipment, poor workmanship, or inadequate survey. Any unsatisfactory surfaces caused by the removal operations are the Contractor's responsibility and shall be corrected at the Contractor's expense and to the satisfaction of the Engineer prior to opening the surface to traffic.

Any raised structures shall be clearly marked by high visibility paint and delineated with traffic control devices, as directed by the Engineer. Installation of traffic control devices will be included under the costs for "Maintenance and Protection of Traffic"; payment for the devices will be under their applicable items.

No vertical faces, transverse or longitudinal, shall be left exposed to traffic. If any vertical face is formed in an area exposed to traffic a temporary paved transition will be established according to the requirements shown on the plans. If the milling machine is used to form a temporary transition, the length of the temporary transition shall conform to, Section 4.06 – Bituminous Concrete, "Transitions for Roadway Surface", the requirements shown on the plans, or as directed by the Engineer. At all permanent limits of removal, a clean vertical face shall be established prior to paving by saw cutting.

The sweeper shall be equipped with a water tank and be capable of removing the millings and loose debris from the surface. Other sweeping equipment may be provided in lieu of the sweeper where acceptable by the Engineer.

Method of Measurement: This work will be measured for payment by the number of square yards of HMA wearing surface removed to expose the underlying concrete deck. No area deductions will be made for minor unmilled areas such as scuppers, joints, and any similar structures.

Basis of Payment: This work will be paid for at the contract unit price per square yard for "Removal of HMA Wearing Surface", complete and accepted, which price shall include the removal of membrane waterproofing and bond breaker, saw cutting, and all equipment, tools and labor.

Pay Item
Removal of HMA Wearing Surface

Pay Unit
S.Y.

ITEM #0204401A - HANDLING WATER (SITE NO. 1)

Description: This work shall consist of the construction of temporary bypass piping, or other such bypass facilities and methods as are necessary for maintaining flow during drainage installation. This shall include all temporary flow diversion barriers necessary to perform any project work that are not specifically included in the contract documents under other pay items such as “Structure Excavation – Earth (Excluding Cofferdam and Dewatering)” and/or “Cofferdam and Dewatering”. If a cofferdam is required for any project work within a stream or wetland area and it is not specifically included elsewhere, it shall be assumed to be included in this item for handling water. The handling of flood flows, the protection of existing structures and any or all of the finished construction during high water, as well as the protection of the stream environment and wildlife habitat, shall be included in the scope of the work under this item.

If a separate pay item is not provided, this work shall also include installation and maintenance of temporary sedimentation and basins for pump discharge water prior to release back to the stream area. The handling of water shall be in accordance with the requirements of Section 1.10, Environmental Compliance.

Construction Methods: The Contractor shall investigate and verify existing stream conditions, and evaluate the need for, and the type of bypass facilities required for maintaining flow, providing that bypass facilities meet the minimum requirements shown on the contract plans and required by the contract specifications. All facilities shall be in accordance to the local Inland Wetlands permit, ACOE permit, DEEP Flood Management Certification, and any other applicable permits. Before commencing construction, the Contractor shall furnish the Engineer with a separate detailed Handling Water Plan, including working drawings, computations and details of the plan and methods he proposed to use for temporary bypass piping for handling water, as well as accomplishing the work. The furnishing of such plans and methods shall not relieve the Contractor of any of his responsibilities for the safety of the work, effectiveness of the temporary bypass facilities, or for the successful completion of the project.

The capacity of temporary bypass piping shall be elected by the Contractor to provide reasonable protection from flooding, but in no case shall they be less that required for the 2-year event as specified herein. All such temporary flow diversion facilities shall be safely designed, and be of such dimensions and water-tightness so as to divert stream flow or wetland water around the work area and their construction and location shall be such as to permit all construction activities without impediment, of the permanent work to the limits shown on the plans. Movement or failures of the temporary bypass facilities, or any portions thereof, which prevents proper completion of the permanent work shall be corrected and/or relocated at the sole expense of the Contractor.

The Contractor shall dewater the cofferdam interior (including any stormwater discharges into the work area) through a dewatering settling basin using best management practices in accordance with his approved erosion and sedimentation control plan. Any pumping from within

the areas of construction shall be done in such a manner as to prevent the possibility of movement of water through any fresh concrete. No pumping will be permitted during placing of concrete or for a period of 24 hours thereafter, unless it will be done from a suitable sump properly located and with sufficient pumping capacity to protect against damage from sudden rising of water. Any pumped water must be discharged to a sedimentation basin or other approved sediment removal device prior to discharging to any wetland area. All discharging of pumped water must be performed in accordance with the requirements of Section 1.10. The number and size of the sedimentation basin(s) or other approved sediment removal device(s) shall be appropriate for volume and flow of discharge from the work area. At no time shall pumped discharge be allowed to contribute sedimentation or degradation of the waterway.

Unless otherwise provided, or directed, all such temporary bypass piping work shall be removed and disposed of or regarded in an approved manner when no longer required. Restoration and construction of slopes not specifically described elsewhere which are disturbed by the installation and removal of the temporary bypass shall be graded, stabilized and restored using the special seed mix found in the turf establishment item.

The Contractor shall be responsible for the scheduling of work under this item so as not to interfere with any sequence of operation developed for this project. Delays as a result of work required under this item shall not constitute a claim for an extension of contract time.

Any scheme for water handling presented in the contract documents represents the minimum requirements that must be met; however, the Contractor must submit his own plan for handling water, along with supporting documentation and computations. If the Contractor proposes a water handling method different from the scheme presented in the contract drawings, the Contractor will be required to obtain approval from the Engineer, and ConnDOT's Office of Environmental Planning and make any necessary modifications to the permits, including State Flood Management Certification.

Interchange 6: Second Avenue / Route 37 Trunk line, Second Ave. Sta. 48+35:

At the proposed 36" RCP at Outlet Wall 103 located at the end of Second Avenue baseline station 48+35, the Contractor shall provide temporary drainage pipes to convey discharges and shall be sized as follows:

For the existing 24" trunk line, which conveys flows from Route 37, I-84 and Second Avenue and which outlets to Padanaram Brook at approximate station 48+35, any temporary conduit used shall convey the 2-year flood of 22 cfs. A 24" circular conduit with a Manning's "n" of .012 would meet this criterion

Refer to the construction staging plans and notes for the sequence of the culvert installation.

Method of Measurement: This item shall be paid on a lump sum basis, and as such, will not be separately measured for payment.

The collection and disposal of materials and liquids generated during maintenance of contractor owned equipment, including decontamination activities, will not be measured for separate payment.

Basis of Payment: Payment for this item will be included in the contract lump sum price for “Handling Water (Site No. 1)”, complete and accepted, which price shall include all tools, material, equipment, labor and work incidental to installing temporary bypass piping to conduct stream water around and/or beyond the work area, as well as properly conveying and releasing work area discharge outside of the work area. This work shall include construction, reconstruction, relocation as necessary for stage construction or repair (if required) of all flow diversions (including piping or open channels), as well as conduction of water out of the work area and beyond the limits of construction, including all planning, calculations, engineering, drawings and meetings incidental thereto. Payment shall also include the removal and disposal of all bypass channels or piping facilities; and damages resulting from the handling of water, including those incurred by the Contractor; damage to existing facilities or to the work in progress, damage to the stream environment and wildlife habitat, and damage to public or private property.

If no separate pay item is provided, payment shall include the de-watering of the various work areas during construction operations as necessary for the disposal of water pumped or otherwise removed from the various construction areas and release of this water into wetland areas (including pumping and any related environmental controls used in dewatering or handling water operations, as well as, handling of the stream flow).

If no separate pay item is provided, this item shall also include the construction or installation and maintenance of temporary sedimentation basins or devices to be used for discharge of pumped water, as well as adequate discharge areas for these basins or devices.

<u>Pay Item</u>	<u>Pay Unit</u>
Handling Water (Site No. 1)	L.S.

ITEM #0204402A - HANDLING WATER (SITE NO. 2)

Description: This work shall consist of the construction of temporary bypass piping, or other such bypass facilities and methods as are necessary for maintaining flow during drainage installation. This shall include all temporary flow diversion barriers necessary to perform any project work that are not specifically included in the contract documents under other pay items such as “Structure Excavation – Earth (Excluding Cofferdam and Dewatering)” and/or “Cofferdam and Dewatering”. If a cofferdam is required for any project work within a stream or wetland area and it is not specifically included elsewhere, it shall be assumed to be included in this item for handling water. The handling of flood flows, the protection of existing structures and any or all of the finished construction during high water, as well as the protection of the stream environment and wildlife habitat, shall be included in the scope of the work under this item.

If a separate pay item is not provided, this work shall also include installation and maintenance of temporary sedimentation and basins for pump discharge water prior to release back to the stream area. The handling of water shall be in accordance with the requirements of Section 1.10, Environmental Compliance.

Construction Methods: The Contractor shall investigate and verify existing stream conditions, and evaluate the need for, and the type of bypass facilities required for maintaining flow, providing that bypass facilities meet the minimum requirements shown on the contract plans and required by the contract specifications. All facilities shall be in accordance to the local Inland Wetlands permit, ACOE permit, DEEP Flood Management Certification, and any other applicable permits. Before commencing construction, the Contractor shall furnish the Engineer with a separate detailed Handling Water Plan, including working drawings, computations, and details of the plan and methods he proposed to use for temporary bypass piping for handling water, as well as accomplishing the work. The furnishing of such plans and methods shall not relieve the Contractor of any of his responsibilities for the safety of the work, effectiveness of the temporary bypass facilities, or for the successful completion of the project.

The capacity of temporary bypass piping shall be elected by the Contractor to provide reasonable protection from flooding, but in no case shall they be less that required for the 2-year event as specified herein. All such temporary flow diversion facilities shall be safely designed, and be of such dimensions and water-tightness so as to divert stream flow or wetland water around the work area and their construction and location shall be such as to permit all construction activities without impediment, of the permanent work to the limits shown on the plans. Movement or failures of the temporary bypass facilities, or any portions thereof, which prevents proper completion of the permanent work shall be corrected and/or relocated at the sole expense of the Contractor.

The Contractor shall dewater the cofferdam interior (including any stormwater discharges into the work area) through a dewatering settling basin using best management practices in accordance with his approved erosion and sedimentation control plan. Any pumping from within

the areas of construction shall be done in such a manner as to prevent the possibility of movement of water through any fresh concrete. No pumping will be permitted during placing of concrete or for a period of 24 hours thereafter, unless it will be done from a suitable sump properly located and with sufficient pumping capacity to protect against damage from sudden rising of water. Any pumped water must be discharged to a sedimentation basin or other approved sediment removal device prior to discharging to any wetland area. All discharging of pumped water must be performed in accordance with the requirements of Section 1.10. The number and size of the sedimentation basin(s) or other approved sediment removal device(s) shall be appropriate for volume and flow of discharge from the work area. At no time shall pumped discharge be allowed to contribute sedimentation or degradation of the waterway.

Unless otherwise provided, or directed, all such temporary bypass piping work shall be removed and disposed of or regarded in an approved manner when no longer required. Restoration and construction of slopes not specifically described elsewhere which are disturbed by the installation and removal of the temporary bypass shall be graded, stabilized, and restored using the special seed mix found in the turf establishment item.

The Contractor shall be responsible for the scheduling of work under this item so as not to interfere with any sequence of operation developed for this project. Delays as a result of work required under this item shall not constitute a claim for an extension of contract time.

Any scheme for water handling presented in the contract documents represents the minimum requirements that must be met; however, the Contractor must submit his own plan for handling water, along with supporting documentation and computations. If the Contractor proposes a water handling method different from the scheme presented in the contract drawings, the Contractor will be required to obtain approval from the Engineer, and ConnDOT's Office of Environmental Planning and make any necessary modifications to the permits, including State Flood Management Certification.

Interchange 6: I-84 Eastbound 24" CMP Outlet, EB On-Ramp Sta. 110+62 RT:

At the existing 24" CMP outlet into the existing in situ channel the Contractor shall provide temporary pipes to convey discharges and shall be sized as follows:

For the existing 24" CMP which conveys flows from I-84 Eastbound and which outlets to an existing channel via 24" MCE replacement of the existing outlet at approximate station 110+62 Rt. Any temporary conduit shall convey the 2-year flood of 13.3 fps. A 24" circular conduit with a Mannings "n" of .024 would meet this criterion. For installation of the proposed 24" CME a flow diversion barrier shall be constructed to an elevation of 399.7', which is 1' above the 2-year storm event.

Method of Measurement: This item shall be paid on a lump sum basis, and as such, will not be separately measured for payment.

The collection and disposal of materials and liquids generated during maintenance of contractor owned equipment, including decontamination activities, will not be measured for separate payment.

Basis of Payment: Payment for this item will be included in the contract lump sum price for “Handling Water (Site No. 2)”, complete and accepted, which price shall include all tools, material, equipment, labor and work incidental to installing temporary bypass piping to conduct stream water around and/or beyond the work area, as well as properly conveying and releasing work area discharge outside of the work area. This work shall include construction, reconstruction, relocation as necessary for stage construction or repair (if required) of all flow diversions (including piping or open channels), as well as conduction of water out of the work area and beyond the limits of construction, including all planning, calculations, engineering, drawings and meetings incidental thereto. Payment shall also include the removal and disposal of all bypass channels or piping facilities; and damages resulting from the handling of water, including those incurred by the Contractor; damage to existing facilities or to the work in progress, damage to the stream environment and wildlife habitat, and damage to public or private property.

If no separate pay item is provided, payment shall include the de-watering of the various work areas during construction operations as necessary for the disposal of water pumped or otherwise removed from the various construction areas and release of this water into wetland areas (including pumping and any related environmental controls used in dewatering or handling water operations, as well as, handling of the stream flow).

If no separate pay item is provided, this item shall also include the construction or installation and maintenance of temporary sedimentation basins or devices to be used for discharge of pumped water, as well as adequate discharge areas for these basins or devices.

<u>Pay Item</u>	<u>Pay Unit</u>
Handling Water (Site No. 2)	L.S.

ITEM #0204403A - HANDLING WATER (SITE NO. 3)

Description: This work shall consist of the construction of temporary bypass piping, or other such bypass facilities and methods as are necessary for maintaining flow during drainage installation. This shall include all temporary flow diversion barriers necessary to perform any project work that are not specifically included in the contract documents under other pay items such as “Structure Excavation – Earth (Excluding Cofferdam and Dewatering)” and/or “Cofferdam and Dewatering”. If a cofferdam is required for any project work within a stream or wetland area and it is not specifically included elsewhere, it shall be assumed to be included in this item for handling water. The handling of flood flows, the protection of existing structures and any or all of the finished construction during high water, as well as the protection of the stream environment and wildlife habitat, shall be included in the scope of the work under this item.

If a separate pay item is not provided, this work shall also include installation and maintenance of temporary sedimentation and basins for pump discharge water prior to release back to the stream area. The handling of water shall be in accordance with the requirements of Section 1.10, Environmental Compliance.

Construction Methods: The Contractor shall investigate and verify existing stream conditions, and evaluate the need for, and the type of bypass facilities required for maintaining flow, providing that bypass facilities meet the minimum requirements shown on the contract plans and required by the contract specifications. All facilities shall be in accordance to the local Inland Wetlands permit, ACOE permit, DEEP Flood Management Certification, and any other applicable permits. Before commencing construction, the Contractor shall furnish the Engineer with a separate detailed Handling Water Plan, including working drawings, computations, and details of the plan and methods he proposed to use for temporary bypass piping for handling water, as well as accomplishing the work. The furnishing of such plans and methods shall not relieve the Contractor of any of his responsibilities for the safety of the work, effectiveness of the temporary bypass facilities, or for the successful completion of the project.

The capacity of temporary bypass piping shall be elected by the Contractor to provide reasonable protection from flooding, but in no case shall they be less that required for the 2-year event as specified herein. All such temporary flow diversion facilities shall be safely designed, and be of such dimensions and water-tightness so as to divert stream flow or wetland water around the work area and their construction and location shall be such as to permit all construction activities without impediment, of the permanent work to the limits shown on the plans. Movement or failures of the temporary bypass facilities, or any portions thereof, which prevents proper completion of the permanent work shall be corrected and/or relocated at the sole expense of the Contractor.

The Contractor shall dewater the cofferdam interior (including any stormwater discharges into the work area) through a dewatering settling basin using best management practices in accordance with his approved erosion and sedimentation control plan. Any pumping from within

the areas of construction shall be done in such a manner as to prevent the possibility of movement of water through any fresh concrete. No pumping will be permitted during placing of concrete or for a period of 24 hours thereafter, unless it will be done from a suitable sump properly located and with sufficient pumping capacity to protect against damage from sudden rising of water. Any pumped water must be discharged to a sedimentation basin or other approved sediment removal device prior to discharging to any wetland area. All discharging of pumped water must be performed in accordance with the requirements of Section 1.10. The number and size of the sedimentation basin(s) or other approved sediment removal device(s) shall be appropriate for volume and flow of discharge from the work area. At no time shall pumped discharge be allowed to contribute sedimentation or degradation of the waterway.

Unless otherwise provided, or directed, all such temporary bypass piping work shall be removed and disposed of or regarded in an approved manner when no longer required. Restoration and construction of slopes not specifically described elsewhere which are disturbed by the installation and removal of the temporary bypass shall be graded, stabilized, and restored using the special seed mix found in the turf establishment item.

The Contractor shall be responsible for the scheduling of work under this item so as not to interfere with any sequence of operation developed for this project. Delays as a result of work required under this item shall not constitute a claim for an extension of contract time.

Any scheme for water handling presented in the contract documents represents the minimum requirements that must be met; however, the Contractor must submit his own plan for handling water, along with supporting documentation and computations. If the Contractor proposes a water handling method different from the scheme presented in the contract drawings, the Contractor will be required to obtain approval from the Engineer, and ConnDOT's Office of Environmental Planning and make any necessary modifications to the permits, including State Flood Management Certification.

Interchange 6: Route 37 / Padanaram Road, Route 37 Sta. 327+27:

At the proposed 18" RCP outlet into an existing box culvert that carries Padanaram Brook baseline station 327+27 Rt. the Contractor shall provide temporary pipes to convey discharges and shall be sized as follows:

For the existing 15" CMP which conveys flows from Route 37 and which outlets to Padanaram Brook at approximate station 327+27 Rt., any temporary conduit used shall convey the 5-year flood of 12.7 fps. A 15" circular conduit with a Manning's "n" of .013 would meet this criterion. For construction formwork and installation of the proposed 18" RCP a flow diversion barrier shall be constructed to an elevation of 402.9', which is 1' above the 5-year storm event.

Method of Measurement: This item shall be paid on a lump sum basis, and as such, will not be separately measured for payment.

The collection and disposal of materials and liquids generated during maintenance of contractor owned equipment, including decontamination activities, will not be measured for separate payment.

Basis of Payment: Payment for this item will be included in the contract lump sum price for “Handling Water (Site No. 3)”, complete and accepted, which price shall include all tools, material, equipment, labor and work incidental to installing temporary bypass piping to conduct stream water around and/or beyond the work area, as well as properly conveying and releasing work area discharge outside of the work area. This work shall include construction, reconstruction, relocation as necessary for stage construction or repair (if required) of all flow diversions (including piping or open channels), as well as conduction of water out of the work area and beyond the limits of construction, including all planning, calculations, engineering, drawings and meetings incidental thereto. Payment shall also include the removal and disposal of all bypass channels or piping facilities; and damages resulting from the handling of water, including those incurred by the Contractor; damage to existing facilities or to the work in progress, damage to the stream environment and wildlife habitat, and damage to public or private property.

If no separate pay item is provided, payment shall include the de-watering of the various work areas during construction operations as necessary for the disposal of water pumped or otherwise removed from the various construction areas and release of this water into wetland areas (including pumping and any related environmental controls used in dewatering or handling water operations, as well as, handling of the stream flow).

If no separate pay item is provided, this item shall also include the construction or installation and maintenance of temporary sedimentation basins or devices to be used for discharge of pumped water, as well as adequate discharge areas for these basins or devices.

<u>Pay Item</u>	<u>Pay Unit</u>
Handling Water (Site No. 3)	L.S.

ITEM #0204404A - HANDLING WATER (SITE NO. 4)

Description: This work shall consist of the construction of temporary bypass piping, or other such bypass facilities and methods as are necessary for maintaining flow during drainage installation. This shall include all temporary flow diversion barriers necessary to perform any project work that are not specifically included in the contract documents under other pay items such as “Structure Excavation – Earth (Excluding Cofferdam and Dewatering)” and/or “Cofferdam and Dewatering”. If a cofferdam is required for any project work within a stream or wetland area and it is not specifically included elsewhere, it shall be assumed to be included in this item for handling water. The handling of flood flows, the protection of existing structures and any or all of the finished construction during high water, as well as the protection of the stream environment and wildlife habitat, shall be included in the scope of the work under this item.

If a separate pay item is not provided, this work shall also include installation and maintenance of temporary sedimentation and basins for pump discharge water prior to release back to the stream area. The handling of water shall be in accordance with the requirements of Section 1.10, Environmental Compliance.

Construction Methods: The Contractor shall investigate and verify existing stream conditions, and evaluate the need for, and the type of bypass facilities required for maintaining flow, providing that bypass facilities meet the minimum requirements shown on the contract plans and required by the contract specifications. All facilities shall be in accordance to the local Inland Wetlands permit, ACOE permit, DEEP Flood Management Certification, and any other applicable permits. Before commencing construction, the Contractor shall furnish the Engineer with a separate detailed Handling Water Plan, including working drawings, computations, and details of the plan and methods he proposes to use for temporary bypass piping for handling water, as well as accomplishing the work. The furnishing of such plans and methods shall not relieve the Contractor of any of his responsibilities for the safety of the work, effectiveness of the temporary bypass facilities, or for the successful completion of the project.

The capacity of temporary bypass piping shall be elected by the Contractor to provide reasonable protection from flooding, but in no case shall they be less than required for the storm event as specified herein. All such temporary flow diversion facilities shall be safely designed, and be of such dimensions and water-tightness so as to divert stream flow or wetland water around the work area and their construction and location shall be such as to permit all construction activities without impediment of the permanent work to the limits shown on the plans. Movement or failures of the temporary bypass facilities, or any portions thereof, which prevents proper completion of the permanent work shall be corrected and/or relocated at the sole expense of the Contractor.

The Contractor shall dewater the cofferdam interior (including any stormwater discharges into the work area) through a dewatering settling basin using best management practices in accordance with his approved erosion and sedimentation control plan. Any pumping from within

the areas of construction shall be done in such a manner as to prevent the possibility of movement of water through any fresh concrete. No pumping will be permitted during placing of concrete or for a period of 24 hours thereafter, unless it will be done from a suitable sump properly located and with sufficient pumping capacity to protect against damage from sudden rising of water. Any pumped water must be discharged to a sedimentation basin or other approved sediment removal device prior to discharging to any wetland area. All discharging of pumped water must be performed in accordance with the requirements of Section 1.10. The number and size of the sedimentation basin(s) or other approved sediment removal device(s) shall be appropriate for volume and flow of discharge from the work area. At no time shall pumped discharge be allowed to contribute sedimentation or degradation of the waterway.

Unless otherwise provided, or directed, all such temporary bypass piping work shall be removed and disposed of or regarded in an approved manner when no longer required. Restoration and construction of slopes not specifically described elsewhere which are disturbed by the installation and removal of the temporary bypass shall be graded, stabilized, and restored using the special seed mix found in the turf establishment item.

The Contractor shall be responsible for the scheduling of work under this item so as not to interfere with any sequence of operation developed for this project. Delays as a result of work required under this item shall not constitute a claim for an extension of contract time.

Any scheme for water handling presented in the contract documents represents the minimum requirements that must be met; however, the Contractor must submit his own plan for handling water, along with supporting documentation and computations. If the Contractor proposes a water handling method different from the scheme presented in the contract drawings, the Contractor will be required to obtain approval from the Engineer and ConnDOT's Office of Environmental Planning and make any necessary modifications to the permits, including State Flood Management Certification.

Interchange 5: I-84 Westbound 42" RCP Inlet, WB Off-Ramp Sta. 561+75 Rt.

At the existing 42" headwall inlet receiving flow from the adjacent existing wetland swale at approximate station 561+75 Rt. The existing 42" endwall will be removed, the existing 42" RCP extended and a new 42" concrete endwall inlet constructed to match the fill slope. The Contractor shall provide temporary flow diversion as follows:

The height of any flow diversion barrier shall be 1 foot above the 2 year event elevation. (2 year event elevation = 403.07')

Method of Measurement: This item shall be paid on a lump sum basis, and as such, will not be separately measured for payment.

The collection and disposal of materials and liquids generated during maintenance of contractor owned equipment, including decontamination activities, will not be measured for separate payment.

Basis of Payment: Payment for this item will be included in the contract lump sum price for “Handling Water (Site No. 4)”, complete and accepted, which price shall include all tools, material, equipment, labor and work incidental to installing temporary bypass piping to conduct stream water around and/or beyond the work area, as well as properly conveying and releasing work area discharge outside of the work area. This work shall include construction, reconstruction, relocation as necessary for stage construction or repair (if required) of all flow diversions (including piping or open channels), as well as conduction of water out of the work area and beyond the limits of construction, including all planning, calculations, engineering, drawings and meetings incidental thereto. Payment shall also include the removal and disposal of all bypass channels or piping facilities; and damages resulting from the handling of water, including those incurred by the Contractor; damage to existing facilities or to the work in progress, damage to the stream environment and wildlife habitat, and damage to public or private property.

If no separate pay item is provided, payment shall include the de-watering of the various work areas during construction operations as necessary for the disposal of water pumped or otherwise removed from the various construction areas and release of this water into wetland areas (including pumping and any related environmental controls used in dewatering or handling water operations, as well as, handling of the stream flow).

If no separate pay item is provided, this item shall also include the construction or installation and maintenance of temporary sedimentation basins or devices to be used for discharge of pumped water, as well as adequate discharge areas for these basins or devices.

<u>Pay Item</u>	<u>Pay Unit</u>
Handling Water (Site No. 4)	L.S.

ITEM #0210100A - ANTI -TRACKING PAD

Description:

Work under this item shall consist of furnishing, installing, maintaining and removing a crushed stone anti-tracking pad on filter fabric and returning to the original condition upon completion at the location and details shown on the plans or ordered by the Engineer.

Materials:

Materials for this work shall conform to the requirements of Article M.01.01, No.3 for crushed stone, and Article M.08.01-26 for geotextile filter fabric.

Construction Methods:

Clear area of anti-tracking pad of all vegetation and excavate to a minimum depth of 6". Place geotextile filter fabric over the full width and length of excavated area and cover with No. 3 crushed stone to a depth of no less than 6".

The anti-tracking pad shall be uniformly graded to produce the entry and exit path to the site for all construction equipment. The pad shall be maintained of sufficient grading and stone surface to capture all soils and sediment from equipment tires prior to such exiting from the site.

Stone shall be replenished or replaced as necessary or as ordered by the Engineer to assure sufficient capture of sediment at the construction site. Any sediment tracked off the site shall be immediately cleaned, swept and removed by the Contractor at no cost to the State.

Method of Measurement:

This work will be measured for payment by the number of square yards of accepted anti-tracking pad completed as shown on the plans or ordered by the Engineer.

Basis of Payment:

This work will be paid for at the contract unit price per square yard for "Anti-Tracking Pad," which price shall include furnishing, placing, maintaining, removing all anti-tracking pad materials and returning location back to the original condition upon completion, equipment, tools and labor incidental thereto as well as cleaning, sweeping any sediment tracked off site. Clearing and grubbing required to install anti-tracking pad be paid under item "Clearing and Grubbing".

Pay Item

Anti-Tracking Pad

Pay Unit

SY

ITEM #0216000A – PERVIOUS STRUCTURE BACKFILL

Description: Pervious structure backfill shall include the furnishing, placing, and compaction of pervious material adjacent to structures. This item shall also consist of furnishing and placing crushed stone or gravel in burlap bags at the inlet ends of weep holes in structures to the dimensions indicated on the plans or as ordered by the Engineer.

Material: Pervious structure backfill shall conform to the requirements of Article M.02.05.

The materials for bagged stone shall conform to the following requirements:

- (a) The crushed stone or gravel shall conform to the grading requirements of Article M.01.01 for No. 3 or No. 4 coarse aggregate or a mixture of both.
- (b) The bag shall be of burlap and shall be large enough to contain one cubic foot of loosely packed granular material.

Construction Methods: Pervious structure backfill shall be placed adjacent to abutments, retaining walls, box culverts, and elsewhere as called for. It shall be placed above a plane extending on a 2 to 1 slope from the upper edge of the footing to the top of the embankment, or as shown on the plans. Where the face of undisturbed material is above or beneath this slope plane, the amount of pervious structure backfill shall be decreased or increased accordingly, if ordered by the Engineer.

In filling behind abutments, retaining walls, box culverts, or other structures, the fill is placed against undisturbed material, or against compacted embankments having a length in a direction at right angles to the abutment wall or culvert not less than twice the height of the structure against which the fill is placed. The slope of the embankment on which the pervious structure backfill is to be placed shall be plowed deeply or cut into steps before and during the placing of pervious structure backfill so both types of material will be thoroughly bonded and compacted.

Each layer of pervious structure backfill shall be spread to a thickness not exceeding 6 inches in depth after compaction and shall be thoroughly compacted as directed by the Engineer by the use of power rollers or other motorized vehicular equipment, by tamping with mechanical rammers or vibrators, or by pneumatic tampers. Any equipment not principally manufactured for compaction purposes and equipment, which is not in proper working order in all respects, shall not be used within the area described above.

Special attention shall be given to compaction in places close to walls where motorized vehicular equipment cannot reach. Within 3 feet of the back face of walls and within a greater distance at angle points of walls, each layer of pervious structure backfill shall be compacted by mechanical rammers, vibrators, or pneumatic tampers.

The dry density of each layer of pervious structure backfill formed from broken or crushed stone, broken or crushed gravel or reclaimed miscellaneous aggregate free of bituminous concrete shall have a dry density after compaction that is no less than 100 percent of the dry density for that material when tested in accordance with AASHTO T180, Method D. If a layer formed from reclaimed miscellaneous aggregate containing bituminous concrete is placed as pervious structure backfill, the wet density of this layer after compaction shall not be less than 100 percent of the wet density of that material when tested in accordance with AASHTO T180, Method D.

In this test, material retained on the ¾ inch sieve shall be replaced with material retained on the number 4 sieve, as noted as an option in the specifications for this test.

Each layer of the pervious structure backfill shall be compacted at optimum moisture content. No Subsequent layer shall be placed until the specified compaction is obtained for the pervious layer.

Where weep holes are installed, bagged stone shall be placed around the inlet end of each weep hole, to prevent movement of the pervious material into the weep hole. Approximately one cubic foot of crushed stone or gravel shall be enclosed in each of the burlap bags. All bags shall then be securely tied at the neck with cord or wire so that the enclosed material is contained loosely. The filled bags shall be stacked at the weep holes to the dimensions shown on the plans or as directed by the Engineer. The bags shall be unbroken at the time pervious material is placed around them, and bags which are broken or burst prior to or during the placing of the pervious material shall be replaced at the expense of the contractor.

Method of Measurement: Payment lines for pervious structure backfill shall coincide with the limits of the compacted pervious structure backfill as actually placed and ordered by the Engineer. There shall be no direct payment for bagged stone, but the cost thereof shall be considered as included in the cost of the work for “Pervious Structure Backfill”.

Basis of Payment: Pervious structure backfill will be paid for the contract unit price per cubic yard for “Pervious Structure Backfill”, complete in place.

<u>Pay Item</u>	<u>Pay Unit</u>
Pervious Structure Backfill	C.Y.

ITEM #0406267A - MILLING OF HMA (0" TO 4")

Description: This work shall consist of the milling, removal, and disposal of existing HMA pavement.

Materials: The existing HMA surface shall be disposed of offsite by the Contractor at an approved disposal facility unless otherwise stated in the contract documents.

Construction Methods: The Contractor shall remove the HMA material using means acceptable to the Engineer. The pavement surface shall be removed to the line, grade, and existing or typical cross-section shown on the plans or directed by the Engineer.

The equipment for milling the pavement surface shall be designed and built for milling flexible pavements. It shall be self propelled with sufficient power, traction, and stability to maintain depth and slope and shall be capable of removing the existing HMA pavement.

The milling machine shall be equipped with a built-in automatic grade averaging control system that can control the longitudinal profile and the transverse cross-slope to produce the specified results. The longitudinal controls shall be capable of operating from any longitudinal grade reference, including string line, contact ski (30 feet minimum), non-contact ski (20 feet minimum), or mobile string line (30 feet minimum). The transverse controls shall have an automatic system for controlling cross-slope at a given rate. The Engineer may waive the requirement for automatic grade or slope controls where the situation warrants such action.

The rotary drum of the machine shall utilize carbide tip tools spaced not more than $\frac{5}{8}$ inches apart. The forward speed of the milling machine shall be limited to no more than 45 feet/minute. The tools on the revolving cutting drum must be continually maintained and shall be replaced as warranted to provide a uniform pavement texture. The Contractor may request to perform a test strip to demonstrate that the same surface tolerance can be attained at an increased forward speed. The test strip shall be a maximum length of 500 feet and shall have the same criteria for surface tolerance as noted in this specification. The final decision for implementing the increased forward speed will be at the discretion of the Engineer.

The machine shall be equipped with an integral pickup and conveying device to immediately remove material being milled from the surface of the roadway and discharge the millings into a truck, all in one operation. The machine shall also be equipped with a means of effectively limiting the amount of dust escaping from the milling and removal operation.

When milling smaller areas or areas where it is impractical to use the above described equipment, the use of a lesser equipped milling machine may be permitted when approved by the Engineer.

Protection shall be provided around existing catch basin inlets, manholes, utility valve boxes, and any similar structures. Any damage to such structures as a result of the milling operation is the Contractor's responsibility and shall be repaired at the Contractor's expense.

To prevent the infiltration of milled material into the storm drainage system, the Contractor shall take special care to prevent the milled material from falling into the inlet openings or inlet grates. Any milled material that has fallen into inlet openings or inlet grates shall be removed at the Contractor's expense.

Surface Tolerance: The milled surface shall provide a satisfactory riding surface with a uniform textured appearance. The milled surface shall be free from gouges, longitudinal grooves and ridges, oil film, and other imperfections that are a result of defective equipment, improper use of equipment, or poor workmanship. The Contractor, under the direction of the inspector, shall perform random spot-checks with a Contractor supplied ten-foot straightedge to verify surface tolerances at a minimum of five locations per day. The variation of the top of two ridges from the testing edge of the straightedge, between any two ridge contact points, shall not exceed $\frac{3}{8}$ inch. The variation of the top of any ridge to the bottom of the groove adjacent to that ridge shall not exceed $\frac{3}{8}$ inch. Any unsatisfactory surfaces produced are the responsibility of the Contractor and shall be corrected at the Contractor's expense and to the satisfaction of the Engineer.

The depth of removal will be verified by taking a measurement every 250 feet per each pass of the milling machine, or as directed by the Engineer. These depth measurements shall be used to monitor the average depth of removal.

Where a surface delamination between HMA layers or a surface delamination of HMA on Portland cement concrete causes a non-uniform texture to occur, the depth of milling shall be adjusted in small increments to a maximum of a $\pm \frac{1}{2}$ inch to eliminate the condition.

When removing a HMA pavement entirely from an underlying Portland cement concrete pavement, all of the HMA pavement shall be removed leaving a uniform surface of Portland cement concrete, unless otherwise directed by the Engineer.

Any unsatisfactory surfaces produced by the milling operation are the Contractor's responsibility and shall be corrected at the Contractor's expense and to the satisfaction of the Engineer.

No vertical faces, transverse or longitudinal, shall be left exposed to traffic unless it meets the requirements below. This shall include roadway structures (catch basins, manholes, utility valve boxes, etc.). If any vertical face is formed in an area exposed to traffic a temporary paved transition will be established according to the requirements shown on the plans. If the milling machine is used to form a temporary transition, the length of the temporary transition shall conform to Special Provision Section 4.06 - Bituminous Concrete, "Transitions for Roadway Surface", the requirements shown on the plans, or as directed by the Engineer. At all permanent limits of removal, a clean vertical face shall be established by saw cutting prior to paving.

Roadway structures shall not have a vertical face of greater than 1 inch exposed to traffic as a result of milling. All structures within the roadway that are exposed to traffic and greater than 1 inch above the milled surface shall receive a transition meeting the following requirements:
For roadways with a posted speed limit of 35 mph or less*:

1. Round structures with a vertical face of greater than 1 inch to 2.5 inches shall be transitioned with a hard rubber tapered protection ring of the appropriate inside diameter designed specifically to protect roadway structures.
2. Round structures with a vertical face greater than 2.5 inches shall receive a transition of bituminous concrete formed at a minimum 24 to 1 taper.
3. All rectangular structures shall receive a transition of bituminous concrete formed at a minimum 24 to 1 taper.

*Bituminous concrete tapers at a minimum 24 to 1 taper may be substituted for the protection rings if approved by the Engineer.

For roadways with a posted speed limit of greater than 35 mph:

1. All structures shall receive a transition of bituminous concrete meeting the temporary transition requirements in Special Provision Section 4.06- Bituminous Concrete, "Transitions for Roadway Surface".

The milling operation shall proceed in accordance with the requirements of the "Maintenance and Protection of Traffic" and "Prosecution and Progress" specifications, or other contract requirements. The more stringent specification shall apply.

Prior to opening an area which has been milled to traffic, the pavement shall be thoroughly swept with a sweeper. The sweeper shall be equipped with a water tank and be capable of removing the millings and loose debris from the surface. Other sweeping equipment may be provided in lieu of the sweeper where acceptable by the Engineer.

Any milled area that will not be exposed to live traffic for a minimum of 48 hours prior to paving shall require a vacuum sweeper truck in addition to, or in lieu of, mechanical sweeping. The vacuum sweeper truck shall have sufficient power and capacity to completely remove all millings from the roadway surface including any fine particles within the texture of the milled surface. Vacuum sweeper truck hose attachments shall be used to clean around pavement structures or areas that cannot be reached effectively by the main vacuum. Compressed air may be used in lieu of vacuum attachments if approved by the Engineer.

Method of Measurement: This work will be measured for payment by the number of square yards of area from which the milling of asphalt has been completed and the work accepted. No area deductions will be made for minor unmilled areas such as catch basin inlets, manholes, utility boxes and any similar structures.

The depth of removal will be calculated by taking a measurement at a minimum every 250 feet per each pass of the milling machine, or as directed by the Engineer. The average depth of each section will determine which payment item is applicable.

Basis of Payment: This work will be paid for at the contract unit price per square yard for “Milling of HMA (0 to 4 inches)”. This price shall include all equipment, tools, labor, and materials incidental thereto.

No additional payments will be made for multiple passes with the milling machine to remove the bituminous surface.

No separate payments will be made for cleaning the pavement prior to paving; providing protection and doing handwork removal of bituminous concrete around catch basin inlets, manholes, utility valve boxes and any similar structures; repairing surface defects as a result of the Contractors negligence; providing protection to underground utilities from the vibration of the milling operation; removal of any temporary milled transition; removal and disposal of millings; furnishing a sweeper and sweeping after milling. The costs for these items shall be included in the contract unit price.

Pay Item	Pay Unit
Milling of HMA (0” to 4”)	Sq. Yd

ITEM #0406287A RUMBLE STRIPS - AUTOMATED

Description: Work under this item shall consist of installing rumble strips on asphalt highway shoulders where shown on the plans or where directed by the Engineer, and in conformance with these specifications.

Construction Methods: The Contractor shall pre-mark the location of the edge of the cut, and the beginning and ending points of the sections, prior to the installation of the rumble strips. The Engineer shall review and approve the locations.

The Contractor shall arrange for a technical representative, from the company which produces the milling machine to be used on the project, who will be required to be on-site from the beginning of the operation in order to ensure results that meet the requirements of the plans and specifications until such time the Engineer is satisfied.

Rumble strips should not be installed on bridge decks, in acceleration and deceleration lanes, at drainage structures, at loop detector sawcut locations, or in other areas identified by the Engineer.

Automated (Wide Shoulders): The equipment shall be able to install the rumble strips in sections where the shoulder width from the edge line to an obstruction is greater than or equal to 4 feet. Where there are no obstructions, the equipment shall be used in sections where the shoulder width from the edge line is a minimum of 3 feet. The equipment shall consist of a rotary type cutting head with a maximum outside diameter of 24" and shall be a minimum of 16" long. The cutting head(s) shall have the cutting tips arranged in such a pattern as to provide a relatively smooth cut (approximately 1/16 of an inch between peaks and valleys) in one pass. The cutting head shall be on its own independent suspension from that of the power unit to allow the tool to self align with the slope of the shoulder or any irregularities in the shoulder surface. The equipment shall include suitable provisions for the application of water to prevent dusting. The Contractor shall use a machine capable of creating the finished pattern at a minimum output of 60 rumble strips per minute.

Manual (Narrow Shoulders): The equipment shall be able to install the rumble strips in sections where the shoulder width from the edge line to an obstruction is between 3 feet and 4 feet. The cutting head(s) shall have the cutting tips arranged in such a pattern as to provide a relatively smooth cut (approximately 1/16 of an inch between peaks and valleys) in one pass. The equipment shall include suitable provisions for the application of water to prevent dusting.

Finished Cut (Automated or Manual): The rumble strips shall have finished dimensions of 7" (+/- 1/2") wide in the direction of travel and shall be a 16" (+/- 1/2") long measured perpendicular to the direction of travel. The depressions shall have a concave circular shape with a minimum 1/2" depth at center (maximum allowable depth is 5/8" measured to a valley). The rumble strips shall be placed in relation to the roadway according to the patterns shown in the

plans or on the Rumble Strip Details. Alignment of the edge of the cut shall be checked and verified by the Engineer.

The cutting tool shall be equipped with guides to provide consistent alignment of each cut in relation to the roadway.

The Contractor shall pick up any waste material resulting from the operation in a manner acceptable to the Engineer. This waste material shall be disposed of in accordance with Subarticle 2.02.03-10(a).

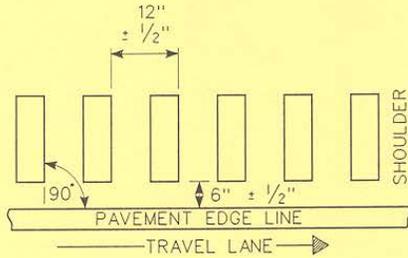
The work area shall be returned to a debris-free state prior to re-opening to traffic.

The Contractor shall provide all traffic control according to the Maintenance and Protection of Traffic Specification included elsewhere in the contract.

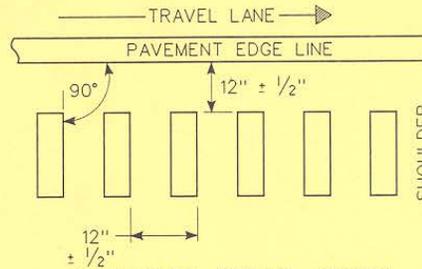
Method of Measurement: This work will be measured for payment by the actual number of feet of shoulder where the rumble strips are placed and accepted. This distance shall be measured longitudinally along the edge of pavement with deductions for bridge decks, acceleration and deceleration lanes, drainage structures, loop detector sawcut locations, and other sections where the rumble strips were not installed.

Basis of Payment: This work will be paid for at the Contract unit price per foot for "Rumble Strips - Automated". The price shall include furnishing all equipment, tools, labor, a technical representative and work incidental thereto and also disposal of any waste material resulting from the operation. The Contractor will not be paid under the item "Rumble Strips - Manual" if the field conditions allow for the use of the "Rumble Strips - Automated" item, even if the manual method was used.

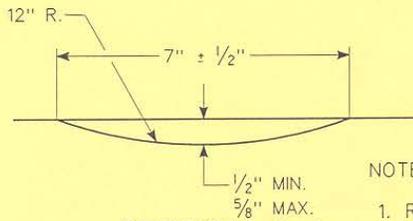
DETAILS AND SECTIONS OF RUMBLE STRIPS



LOCATION DETAIL (TYP.)
LEFT SHOULDER



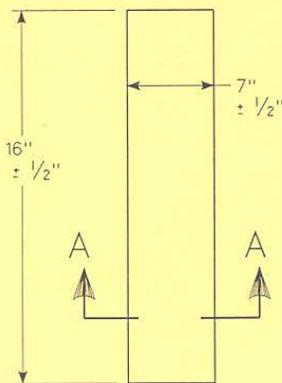
LOCATION DETAIL (TYP.)
RIGHT SHOULDER



SECTION A-A
NO SCALE

NOTES:

1. RUMBLE STRIP ALIGNMENT SHALL GENERALLY BE STRAIGHT AND OFFSET APPROXIMATELY 6" IN THE LEFT SHOULDER AND 12" IN THE RIGHT SHOULDER FROM THE OUTER EDGE OF THE EDGE LINE AND SHALL BE AT LEAST 12" FROM THE LONGITUDINAL JOINT IN COMPOSITE PAVEMENTS. THIS OFFSET MAY BE ADJUSTED TO ACCOMMODATE VARIATIONS IN THE EDGE LINE AND THE SHOULDER WIDTH.



PLAN DETAIL

FILE: RUMBLE.MDS

CONNECTICUT
DEPARTMENT OF TRANSPORTATION
BUR. OF ENGINEERING & HWY. OPERATIONS
DIVISION OF TRAFFIC ENGINEERING

RUMBLE STRIP DETAILS

ENGINEER *Erika B. Smith* DATE 10-18-99

SUBMITTED *Stephen J. Masich* DATE 10-20-99
TRAFFIC SUPERVISING ENGR.

APPROVED *[Signature]* DATE 10-20-99
PRINCIPAL ENGINEER

SCALE - NONE

ITEM # 0406287A

ITEM # 0406288A

TYPICAL TREATMENTS FOR INSTALLING RUMBLE STRIPS

Left Shoulder: RUMBLE STRIPS IN LEFT SHOULDER, IF APPLICABLE

Ramps: END RUMBLE STRIPS AT BEGINNING OF TAPER OF DECELERATION LANE; RESUME RUMBLE STRIPS AT BEGINNING OF PHYSICAL GORE AND END RUMBLE STRIPS AT END OF PHYSICAL GORE; RESUME RUMBLE STRIPS AT END OF TAPER OF ACCELERATION LANE

Obstructions: TYPICAL TREATMENT FOR OBSTRUCTIONS (I.E. CATCH BASINS OR MANHOLES). RUMBLE STRIPS (TYP.) are placed 1.5 FT. from the PAVEMENT EDGE LINE and 1.5 FT. from the obstruction.

Obstruction Note: (1) FOR DISTANCES OF 3 FT. OR MORE, CONTINUE RUMBLE STRIPS ALONG SHOULDER.

File: RUMBLE.MDS

TYPICAL TREATMENTS FOR BRIDGES

Expansion Joints: 3 FT. spacing between rumble strips.

Guide Rail Approach: 3 FT. spacing between rumble strips.

Note: NARROW SHOULDERS APPROACHING BRIDGES MAY RESULT IN ENDING THE RUMBLE STRIPS AT THE GUIDE RAIL APPROACH

TYPICAL TREATMENT FOR SAWCUT LOCATIONS

1.5 FT. (TYP.)

TYPICAL TREATMENT FOR OBSTRUCTIONS (I.E. CATCH BASINS OR MANHOLES)

1.5 FT. (TYP.)

TYPICAL TREATMENTS FOR INSTALLATION OF RUMBLE STRIPS

CONNECTICUT
DEPARTMENT OF TRANSPORTATION
BUR. OF ENGINEERING & HWY. OPERATIONS
DIVISION OF TRAFFIC ENGINEERING

ENGINEER: *Erica B. Smith* DATE: 10-18-99
 SUBMITTED BY: *Stephen J. Paschetta* DATE: 10-20-99
 TRAFFIC SUPERVISING ENGR.
 APPROVED: *[Signature]* DATE: 10-20-99
 PRINCIPAL ENGINEER

SCALE - NONE

ITEM #0406289A - REMOVAL OF RUMBLE STRIPS

Description:

Work under this item shall consist of removing rumble strips through milling and repaving the bituminous concrete where shown on the plans or where directed by the Engineer, and in conformance with these specifications.

Materials:

The materials for the bituminous concrete mixture, tack coat, sources of supply, formula for the mix, mix tolerances, approval of mix formula, and control of the mixture shall conform to the requirements of Section M.04. The class of Hot Mix Asphalt to be used is Class 2 or Superpave 0.375 inch mix for the respective design level.

Construction Methods:

The Contractor shall pre-mark the location of the beginning and ending points of the sections, prior to the removal of the rumble strips. The Engineer shall review and approve the limits of removal.

The Contractor shall remove the surface of the existing bituminous pavement between the approved limits to the width and depth indicated elsewhere in this specification or as directed by the Engineer. Precaution should be taken to avoid damage to the existing roadway materials that are to remain in place. If damage occurs, it must be repaired by the Contractor at no additional cost to the State. The methods employed in performing the work and all equipment, tools, machinery and plant used in handling material and executing any part of the work shall be subject to the approval of the Engineer before the work is started; and whenever found unsatisfactory, it shall be changed and improved as required by the Engineer.

The milling machine must include dust control equipment during the removal process.

The removal shall consist of milling the rumble strips for a width of 18 inches and a depth of 1-1/2 to 2 inches from the roadway surface and then resurfacing the milled area.

Tack coat shall be applied in accordance with Subarticle 4.06.03 – 8(a), prior to resurfacing.

The milled area shall be resurfaced with bituminous concrete in conformance with Article 4.06 of the Standard Specifications and any supplementals dated thereto.

The Contractor shall resurface the milled area prior to opening the roadway to traffic.

The Contractor shall pick up any waste material resulting from the operation in a manner acceptable to the Engineer. This waste material shall be disposed of in accordance with Subarticle 2.02.03-10(a).

Method of Measurement:

This work will be measured for payment by the actual number of linear feet of rumble strips removed. This distance shall be measured longitudinally along the edge of pavement with deductions for bridge decks, acceleration and deceleration lanes, drainage structures, loop detector sawcut locations, and other sections where the rumble strips were not previously installed.

Basis of Payment:

This work will be paid for at the Contract unit price per linear foot for "Removal of Rumble Strips." The price shall include the removal of the existing rumble strips, furnishing all materials (including tack coat), placement, and compaction of the HMA, equipment, tools, labor, and work incidental thereto and also disposal of any waste material resulting from the operation.

Pay item
Removal of Rumble Strips

Pay Unit
L.F.

ITEM #0406999A - ASPHALT ADJUSTMENT COST

The Asphalt Price is available on the Department of Transportation web site at:

<http://www.ct.gov/dot/asphaltadjustment>

The asphalt adjustment cost will be based on the variance in price for the performance-graded binder component of hot mix asphalt (HMA), Polymer Modified Asphalt (PMA), and Ultra-Thin Bonded Hot-Mix Asphalt mixtures completed and accepted in the contract.

An asphalt adjustment cost will be applied only if all of the following conditions are met:

- I. For HMA and PMA mixtures:
 - a. The HMA or PMA mixture in which the adjustment is being applied is listed as a contract item with a pay unit of tons or metric tons.
 - b. The total quantity for all HMA and PMA mixtures in a contract or individual purchase order (Department of Administrative Service contract awards) exceeds 1000 tons or more.
 - c. The difference between the posted *Asphalt Base Price* and *Asphalt Period Price* varies by more than \$5.00.
- II. For Ultra-Thin Bonded HMA mixtures:
 - a. The Ultra-Thin Bonded HMA mixture in which the adjustment is being applied is listed as a contract item.
 - b. The total quantity for Ultra-Thin Bonded HMA mixture in a contract exceeds:
 - i. 800 tons (727 metric tons) if Ultra-Thin Bonded HMA is listed as a contract item with a pay unit of tons or metric tons.
 - ii. 30,000 square yards (25,080 square meters) if Ultra-Thin Bonded HMA is listed as a contract item with a pay unit of square yards or square meters.

Note: The quantity of Ultra-Thin Bonded HMA measured in tons shall be determined from the material documentation requirements set forth in the Ultra-Thin Bonded HMA Special Provision.
 - c. The difference between the posted *Asphalt Base Price* and *Asphalt Period Price* varies by more than \$5.00.
 - d. No Asphalt Adjustment Cost shall be applied to the liquid emulsion that is specified as part of the Ultra-Thin Bonded HMA mixture system.

- III. Regardless of the binder used in all HMA and/or PMA mixtures, the Asphalt Adjustment Cost will be based on PG 64-22.

The Connecticut Department of Transportation (ConnDOT) shall post on its website, the average per ton selling price (asphalt price) of the performance-graded binder. The average is based on the high and low selling price published in the most recent available issue of the **Asphalt Weekly Monitor**® furnished by Poten & Partners, Inc. under the “East Coast Market – New England, New Haven, Connecticut area”, F.O.B. manufacturer’s terminal.

The selling price furnished from the Asphalt Weekly Monitor ® is based on a standard ton (US\$/ST). The metric ton price is determined by applying a factor of 1.1023 (US\$/ST x 1.1023 = US\$/mton). Example: \$150.00/ton x 1.1023 = \$165.34/mton

Formula:
$$\text{HMA} \times \frac{\text{PG}\%}{100} \times [(\text{Period Price} - \text{Base Price})] = \$ \text{ _____ } , \text{ where}$$

- **HMA:**
 1. For HMA, PMA, and Ultra-Thin Bonded HMA mixtures with pay units of mass:
The quantity (tons or metric tons) of accepted HMA, PMA, or Ultra-Thin Bonded HMA mixture measured and accepted for payment.
 2. For Ultra-Thin Bonded HMA mixtures with pay units of area:
The quantity of Ultra-Thin Bonded HMA mixture delivered, placed, and accepted for payment, calculated in tons or metric tons as documented according to the Material Documentation provision (section E) of the Ultra-Thin Bonded HMA Special Provision.

- **Asphalt Base Price:** The asphalt price that is posted on the ConnDOT website 28 days before the actual bid opening posted.

- **Asphalt Period Price:** The asphalt price that is posted on the ConnDOT website for the period in which the HMA, PMA mixture is placed.

- Performance-Graded Binder percentage (**PG%**)
 1. For HMA or PMA mixes:

$$\text{PG}\% = \underline{4.5}$$
 - For Superpave 1.5 inch (37.5mm), Superpave 1.0 inch (25.0mm), PMA S1, HMA S1, and Class 4

$$\text{PG} \% = \underline{5.0}$$
 - For Superpave 0.50 inch (12.5mm), HMA S0.5, PMA S0.5, and Class 1

- PG % = 6.0
- For Superpave 0.375 inch (9.5mm), HMA S0.375, PMA S0.375, Superpave 0.25 inch (6.25mm), HMA S0.25, PMA S0.25, Superpave #4 (4.75mm) and Class 2
2. For Ultra-Thin Bonded HMA mixes:
PG% = Design % PGB (Performance Graded Binder) in the approved job mix formula, expressed as a percentage to one decimal point (e.g. 5.1%)

The adjustment shall not be considered as a changed condition in the contract because of this provision and because the Contractors are being notified before submission of bids.

Basis of Payment: The "Asphalt Adjustment Cost" will be calculated using the formula indicated above. A payment will be made for an increase in costs. A deduction from monies due the Contractor will be made for a decrease in costs.

The sum of money shown on the estimate, and in the itemized proposal as "Estimated Cost", for this item will be considered the bid price although payment will be made as described above. The estimated cost figure is not to be altered in any manner by the bidder. If the bidder should alter the amount shown, the altered figure will be disregarded and the original cost figure will be used to determine the amount of the bid for the Contract.

ITEM #0503420A – REMOVAL OF CONCRETE DECK (BRIDGE)

Work under this item shall conform to the requirements of Section 5.03 of the Standard Specifications, Form 816, amended as follows:

Description: Delete the first two paragraphs of Article 5.03.01 and add the following:

Work under this item shall consist of the removal and satisfactory disposal of the concrete bridge deck as the limits shown on the plans. Also included in this work is the sawcutting of the concrete deck and the modification to existing reinforcing bars. Those items to be removed and disposed of shall include, but not be limited to: concrete deck, parapets and bituminous wearing surface as shown on the plans or as directed by the Engineer.

Construction Methods: The following is added to Article 5.03.03:

Removal of Concrete Deck (Bridge): All work shall proceed as directed by and to the satisfaction of the Engineer in accordance with the details shown on the plans and the requirements of Special Provision Sections 9.71, "Maintenance and Protection of Traffic" and Section 1.08, "Prosecution and Progress".

Material that is not specified for salvage shall be removed by methods that shall not cause damage to the salvaged material.

The removal shall not result in damage to any permanent construction (new or existing), to utilities, or to adjoining property. If any damage occurs it shall be repaired by the Contractor to the satisfaction of the Engineer at no additional expense to the State.

The Contractor shall prepare and submit to the Engineer for review in accordance with Article 1.05.02 working drawings, computations and written procedures for the removal of the existing superstructure. Accepting of the Contractor's plans shall not be considered as relieving the Contractor of any responsibility.

Method of Measurement: Delete the entire article and add the following to Article 5.03.04:

This work will be measured for payment by the number of square yards of concrete bridge deck removed. Measurement width will be taken as the outside face of parapet to the sawcut.

Basis of Payment: Payment will be made at the contract unit price per square yard for "Removal of Concrete Deck (Bridge)" which price shall include all equipment, tools and labor necessary thereto.

ITEM #0507171A -HYDRODYNAMIC SEPARATOR (SITE NO. 1)

Description: Hydrodynamic separators are proprietary devices manufactured for stormwater treatment. The hydrodynamic separator shall be a precast concrete structure and include an internal chamber with features that induce a swirling, circular, or spiraling flow pattern in the stormwater flow that separate and trap sediment and pollutants in a chamber that can be accessed for later removal.

This item will consist of furnishing and construction of a hydrodynamic separator, a flow diversion structure, manholes and pipes in the location, grades, treatment capacity and to the dimensions and details shown on the contract drawings, and in accordance with these specifications or as directed by the Engineer. The work also includes the preparation of hydraulic design calculations for the hydrodynamic separator(s) and flow diversion structure(s) as specified herein.

The hydrodynamic separator shall be assembled and installed in strict compliance with the Manufacturer's instructions unless otherwise directed by these specifications or by the Engineer. Internal flow controls / diversion components, external appurtenances, concrete manhole riser sections, manhole frames and covers, reinforcing, threaded inserts, lifting and seating fixtures, non-shrink grout, and all other necessary materials and equipment to complete the work shall be included.

This item shall also include the cleaning of the hydrodynamic separator of all sediment and debris every 90 days, or as needed, from when they are put into service, until final acceptance of the project.

Approved Products and Manufacturer Information: Proprietary hydrodynamic separators currently approved by the Department are listed in Table 1 "**CONNDOT LIST OF APPROVED HYDRODYNAMIC SEPARATORS**". Company contact information is provided for convenience. *As the company information frequently changes, the Department is not responsible for its accuracy.*

The Engineer will reject any proposed hydrodynamic separator that is not listed in Table 1.

The listed products have been approved for use on Department projects based on only a general review of the product's construction, function and treatment capabilities. **Therefore, the approved list shall not be construed to mean that all products appearing on the list are suitable to any specific project site or drainage design.**

Performance: The stormwater treatment performance of the selected hydrodynamic separator shall be based on the water quality flow (WQF) as defined and calculated in accordance with the Department's current version of the Drainage Manual.

The hydrodynamic separator shall be designed to treat the entire WQF as indicated on the contract drawings or specifications, without bypass, either through the separator's internal components or at the flow diversion structure.

TABLE 1 – CONNDOT LIST OF APPROVED HYDRODYNAMIC SEPARATORS

HYDRODYNAMIC SEPARATOR PRODUCT NAME	COMPANY INFORMATION
Downstream Defender	Hydro International 94 Hutchins Drive Portland, Maine 04102 (207) 756-6200 http://www.hydrointernational.biz/us/index_us.php
FloGard Dual-Vortex Hydrodynamic Separator	KriStar Enterprises, Inc. 4020 Riverclub Drive Cumming, Georgia 30041 (770)-889-4338 http://www.kristar.com/
High Efficiency CDS	Contech Stormwater Solutions 200 Enterprise Drive Scarborough, Maine 04074 (800)-925-5240 http://www.contech-cpi.com/stormwater/13
Vortechs	
Vortsentry	
Hydroguard	Hydroworks, LLC 525Boulevard Kenilworth, NJ 07033 (888)-290-7900 / (908)-272-4411 http://www.hydroworks.org/
Stormceptor OSR	Rinker Materials – Stormceptor 69 Neck Road Westfield, MA 01085 (800)-909-7763 / (413) 246-7144 www.rinkerstormceptor.com
Stormceptor STC	
V2B1	Environment 21 8713 Read Road, P.O. Box 55 East Pembroke, New York 14056-0055 (800)-809-2801 / (585)-815-4700 www.env21.com

Hydrodynamic separator systems and models that have been pre-approved for use on Department projects and their corresponding maximum allowable WQF's for stormwater treatment are shown in **Table 2, "PERFORMANCE MATRIX FOR CONNDOT APPROVED HYDRODYNAMIC SEPARATORS"**. The Engineer will reject any proposed hydrodynamic separator system/model that is not listed in Table 2.

For more severe storm events that produce flows up to and including the drainage design flow (DDF) and which result in flows greater than the WQF being directed to the hydrodynamic separator from the flow diversion structure, the hydrodynamic separator shall be capable of conveying the portion of the DDF directed to it without surcharging the upstream storm drainage system and re-suspending previously trapped sediment.

The WQF to be treated and the portion of the DDF directed to the hydrodynamic separator when the drainage system is operating at its design flow are shown on the Hydrodynamic Separator

Design Data Sheets (Form A - Design). A separate form for each hydrodynamic separator site on the project is attached to this specification.

Sediment Storage Capacity: Settleable solids shall accumulate in a location within the hydrodynamic separator structure that is accessible for cleaning and maintenance but not susceptible to resuspension. Direct access through openings in the precast concrete unit shall be provided to the sediment storage chamber and all other chambers to facilitate maintenance.

The standard sediment storage capacities for Department pre-approved hydrodynamic separator systems/models are shown in **Table 3, “STANDARD SEDIMENT STORAGE CAPACITY FOR CONNDOT APPROVED HYDRODYNAMIC SEPARATORS”**. The sediment storage capacities listed in Table 3 are values based on standard structure dimensions and anticipated maintenance requirements.

Some standard hydrodynamic separator models may be modified as determined by the Manufacturer to increase the sediment storage capacity. When a modification is proposed by increasing the depth of the standard structure, the sediment storage capacity of the proposed structure shall be determined in accordance with **Table 4, “SEDIMENT STORAGE CAPACITY CALCULATION”**.

The Contractor shall be responsible for verifying the standard sediment storage capacity of the hydrodynamic separator unit(s) and coordinating any proposed modifications to increase sediment storage capacity with the Manufacturer(s). All proposed modifications and revised sediment storage capacity determinations shall be clearly documented in the working drawing submission to the Department.

The minimum sediment storage capacities required for each hydrodynamic separator site on the project are shown on the Hydrodynamic Separator Design Data Sheets (Form A – Design) attached to this specification.

Hydraulic Design: The Contractor shall prepare or have prepared a hydraulic grade line (HGL) analysis for an evaluation of the selected hydrodynamic separator and the design of the flow diversion structure as described in this section. The HGL analysis shall be performed for both the WQF and the DDF. The analysis shall be consistent with the methodology described in Section 11.12 of the Department’s Drainage Manual.

Head loss coefficients, to be used in the HGL analysis, shall be determined in accordance with Section 11.12.6 for all structures except the hydrodynamic separator, which shall be obtained from the Manufacturer. Documentation shall be submitted demonstrating how the coefficient was derived either through calculation and/or testing data. A benching factor of 1.0 shall be applied to the flow diversion structure.

The HGL analysis (or portion of) that was performed for the design of the storm drainage systems and preparation of the construction plans, including the design of the flow diversion structure and evaluation of a “generic” hydrodynamic separator, is shown on the Hydrodynamic Separator Design Data Forms (Form A – Design) attached to this specification.

TABLE 2 - PERFORMANCE MATRIX FOR CONNDOT APPROVED HYDRODYNAMIC SEPARATORS

Maximum WQF (cfs)	Product Model								
	<i>Downstream Defender</i>	<i>Flogard</i>	<i>High Eff. CDS</i>	<i>Hydroguard</i>	<i>Stormceptor OSR</i>	<i>Stormceptor STC</i>	<i>Vortechs</i>	<i>Vortsentry</i>	<i>V2B1</i>
0.4	4-ft	DVS-36	2015-4G; 2015-4	HG 4	065	450	1000	VS30	2
0.5	4-ft	DVS-36	2015-4G; 2015-4	HG 4	065	900	1000	VS30	2
0.6	4-ft	DVS-36	2015-4G; 2015-4	HG 4	065	900	1000	VS40	2
0.7	4-ft	DVS-48	2015-4G; 2015-4	HG 4	140	900	1000	VS40	2
0.8	4-ft	DVS-48	2015-4G; 2015-4	HG 4	140	900	1000	VS40	2
0.9	4-ft	DVS-48	2015-4G; 2015-4	HG 4	140	1200	1000	VS40	3
1.0	4-ft	DVS-48	2015-4G; 2015-4	HG 4	140	1800	1000	VS40	3
1.1	4-ft	DVS-48	2015-4G; 2015-4	HG 4	140	1800	1000	VS40	4
1.2	6-ft	DVS-48	2015	HG 5	140	2400	1000	VS50	4
1.3	6-ft	DVS-60	2015	HG 5	140	2400	1000	VS50	4
1.4	6-ft	DVS-60	2015	HG 5	140	2400	2000	VS50	4
1.5	6-ft	DVS-60	2020	HG 5	140	2400	2000	VS50	6
1.6	6-ft	DVS-60	2020	HG 5	140	2400	2000	VS50	6
1.7	6-ft	DVS-60	2020	HG 5	250	2400	2000	VS50	6
1.8	6-ft	DVS-60	2020	HG 6	250	2400	2000	VS50	7
1.9	6-ft	DVS-60	2020	HG 6	250	3600	2000	VS60	7
2.0	6-ft	DVS-60	2020	HG 6	250	3600	2000	VS60	7
2.1	6-ft	DVS-60	2020	HG 6	250	3600	2000	VS60	9
2.2	6-ft	DVS-72	2025	HG 6	250	3600	2000	VS60	8
2.3	6-ft	DVS-72	3020, 3020-D	HG 6	250	3600	2000	VS60	8
2.4	6-ft	DVS-72	3035; 3035-D	HG 6	250	4800	2000	VS60	8
2.5	6-ft	DVS-72	3035; 3035-D	HG 6	250	4800	3000	VS60	10
2.6	6-ft	DVS-72	3035; 3035-D	HG 6	250	4800	3000	VS60	11
2.7	6-ft	DVS-72	3035; 3035-D	HG 7	250	4800	3000	VS60	11
2.8	6-ft	DVS-72	3035; 3035-D	HG 7	250	4800	3000	VS70	11
2.9	6-ft	DVS-72	3035; 3035-D	HG 7	250	4800	3000	VS70	12
3.0	6-ft	DVS-72	3035; 3035-D	HG 7	390	4800	3000	VS70	12

TABLE 2 - PERFORMANCE MATRIX FOR CONNDOT APPROVED HYDRODYNAMIC SEPARATORS (continued)

Maximum WQF (cfs)	Product Model								
	<i>Downstream Defender</i>	<i>Flogard</i>	<i>High Eff. CDS</i>	<i>Hydroguard</i>	<i>Stormceptor OSR</i>	<i>Stormceptor STC</i>	<i>Vortechs</i>	<i>Vortsentry</i>	<i>V2B1</i>
3.1	8-ft	DVS-72	3035; 3035-D	HG 7	390	4800	3000	VS70	12
3.2	8-ft	DVS-72	3035; 3035-D	HG 7	390	4800	3000	VS70	12
3.3	8-ft	DVS-72	3035; 3035-D	HG 7	390	4800	3000	VS70	14
3.4	8-ft	DVS-72	3035; 3035-D	HG 7	390	6000	3000	VS70	14
3.5	8-ft	DVS-72	3030; 3030-DV, 3030-D; 4030-D	HG 7	390	6000	3000	VS70	14
3.6	8-ft	DVS-72	4030	HG 7	390	6000	3000	VS70	14
3.7	8-ft	DVS-84	4030	HG 8	390	6000	3000	VS70	14
3.8	8-ft	DVS-84	4030	HG 8	390	6000	4000	VS70	13
3.9	8-ft	DVS-84	4030	HG 8	390	7200	4000	VS70	15
4.0	8-ft	DVS-84	4030	HG 8	390	7200	4000	VS80	15
4.1	8-ft	DVS-84	4030	HG 8	390	7200	4000	VS80	15
4.2	8-ft	DVS-84	4030	HG 8	390	7200	4000	VS80	16
4.3	8-ft	DVS-84	4030	HG 8	390	7200	4000	VS80	16
4.4	8-ft	DVS-84	4030	HG 8	390	7200	4000	VS80	16
4.5	8-ft	DVS-84	4030	HG 8	390	7200	4000	VS80	16
4.6	8-ft	DVS-84	5640-D	HG 8	390	7200	4000	VS80	17
4.7	8-ft	DVS-84	5640-D	HG 8	390	7200	4000	VS80	17
4.8	8-ft	DVS-84	5640-D	HG 8	390	7200	4000	VS80	17
4.9	8-ft	DVS-84	5640-D	HG 8	390	11000s	4000	VS80	17
5.0	8-ft	DVS-84	5640-D	HG 9	390	11000s	4000	VS80	19
5.2	8-ft	DVS-84	4040-D	HG 9	390	11000s	4000	VS80	20
5.4	8-ft	DVS-96	4040-D	HG 9	390	11000s	4000	VS100	20
5.5	8-ft	DVS-96	4045-D	HG 9	390	11000s	5000	VS100	18
5.6	8-ft	DVS-96	4045-D	HG 9	560	11000s	5000	VS100	18
6.0	8-ft	DVS-96	4040	HG 9	560	11000s	5000	VS100	18
6.1	8-ft	DVS-96	4040	HG 9	560	11000s	5000	VS100	21

TABLE 2 - PERFORMANCE MATRIX FOR CONNDOT APPROVED HYDRODYNAMIC SEPARATORS (continued)

Maximum WQF (cfs)	Product Model								
	<i>Downstream Defender</i>	<i>Flogard</i>	<i>High Eff. CDS</i>	<i>Hydroguard</i>	<i>Stormceptor OSR</i>	<i>Stormceptor STC</i>	<i>Vortechs</i>	<i>Vortsentry</i>	<i>V2B1</i>
6.3	8-ft	DVS-96	4040	HG 9	560	11000s	5000	VS100	25
6.4	10-ft	DVS-96	4040	HG 9	560	11000s	5000	VS100	25
6.5	10-ft	DVS-96	4040	HG 10	560	11000s	5000	VS100	25
6.9	10-ft	DVS-96	4040	HG 10	560	11000s	5000	VS100	25
7.0	10-ft	DVS-96	4040	HG 10	560	11000s	5000	VS100	22
7.1	10-ft	DVS-96	5042-D	HG 10	560	11000s	5000	VS100	22
7.2	10-ft	DVS-96	5042-D	HG 10	560	13000s	5000	VS100	22
7.3	10-ft	DVS-96	4045	HG 10	560	13000s	5000	VS100	22
7.5	10-ft	DVS-96	5653-D	HG 10	560	13000s	7000	VS100	22
7.7	10-ft	DVS-120	5653-D	HG 10	560	13000s	7000	VS100	22
7.8	10-ft	DVS-120	5653-D	HG 10	560	13000s	7000	VS100	50
7.9	10-ft	DVS-120	5653-D	HG 10	780	13000s	7000	VS100	50
8.0	10-ft	DVS-120	5658-D	HG 10	780	13000s	7000	VS100	50
8.2	10-ft	DVS-120	5658-D	HG 10	780	16000s	7000	VS100	50
8.5	10-ft	DVS-120	5658-D	HG 12	780	16000s	7000	VS100	50
8.6	10-ft	DVS-120	5658-D	HG 12	780	16000s	7000	VS100	50
8.9	10-ft	DVS-120	5678-D	HG 12	780	16000s	7000	VS100	50
9.0	10-ft	DVS-120	5678-D	HG 12	780	16000s	7000	VS120	50
9.2	10-ft	DVS-120	5678-D	HG 12	780	16000s	7000	VS120	50
9.5	10-ft	DVS-120	5050-DV	HG 12	780	16000s	7000	VS120	50
9.6	10-ft	DVS-120	5050-DV	HG 12	780	16000s	7000	VS120	50
10.0	10-ft	DVS-120	5050-DV	HG 12	780	16000s	9000	VS120	50
10.1	10-ft	DVS-120	5050-DV	HG 12	780	16000s	9000	VS120	50
10.5	10-ft	DVS-120	5050-DV	HG 12	780		9000	VS120	50
10.9	10-ft	DVS-120	5050-DV	HG 12	780		9000	VS120	50
11.0	10-ft	DVS-120	7070-DV	HG 12	780		9000	VS120	50
11.2	10-ft	DVS-120	7070-DV	HG 12	1125		9000	VS120	50

TABLE 2 - PERFORMANCE MATRIX FOR CONNDOT APPROVED HYDRODYNAMIC SEPARATORS (continued)

Maximum WQF (cfs)	Product Model								
	<i>Downstream Defender</i>	<i>Flogard</i>	<i>High Eff. CDS</i>	<i>Hydroguard</i>	<i>Stormceptor OSR</i>	<i>Stormceptor STC</i>	<i>Vortechs</i>	<i>Vortsentry</i>	<i>V2B1</i>
11.5		DVS-120	7070-DV	HG 12	1125		9000	VS120	50
11.8		DVS-120	7070-DV	HG 12	1125		9000	VS120	50
11.9		DVS-120	7070-DV	HG 12	1125		9000	VS120	60
12.0		DVS-120	7070-DV	HG 12	1125		9000	VS120	60
12.1		DVS-120	7070-DV	HG 12	1125		9000	VS120	60
12.5		DVS-120	7070-DV	HG 12	1125		11000	VS120	60
13.0		DVS-120	7070-DV		1125		11000	VS120	60
13.5		DVS-120	7070-DV		1125		11000	VS120	60
13.6		DVS-120	7070-DV		1125		11000	VS120	60
14.0		DVS-144	7070-DV		1125		11000	VS120	60
14.5		DVS-144	7070-DV		1125		11000		60
14.9		DVS-144	7070-DV		1125		11000		60
15.0		DVS-144	7070-DV		1125		16000		60
15.5		DVS-144	7070-DV		1125		16000		60
15.7		DVS-144	7070-DV		1125		16000		60
16.0		DVS-144	7070-DV				16000		60
16.5		DVS-144	7070-DV				16000		60
17.0		DVS-144	7070-DV				16000		
17.5		DVS-144	7070-DV				16000		
18.0		DVS-144	7070-DV				16000		
18.5		DVS-144	7070-DV				16000		
19.0		DVS-144	7070-DV				16000		
19.7		DVS-144	7070-DV				16000		
20.0		DVS-144	10060-DV				16000		
21.5		DVS-144	10060-DV				16000		
22.3		DVS-144	10060-DV				1319		
25.0			10060-DV				1319		
25.2			10060-DV				1319		

TABLE 2 - PERFORMANCE MATRIX FOR CONNDOT APPROVED HYDRODYNAMIC SEPARATORS (continued)

Maximum WQF (cfs)	Product Model								
	<i>Downstream Defender</i>	<i>Flogard</i>	<i>High Eff. CDS</i>	<i>Hydroguard</i>	<i>Stormceptor OSR</i>	<i>Stormceptor STC</i>	<i>Vortechs</i>	<i>Vortsentry</i>	<i>V2B1</i>
27.6			10060-DV				1421		
29.3			10080-DV				1421		
30.0			10080-DV				1522		
31.2			10080-DV				1522		
33.6			100100-DV				1522		
35.0			100100-DV				1624		
38.2			100100-DV				1624		
40.0			100100-DV				1726		
43.2			100100-DV				1726		
49.3			100100-DV						

TABLE 3 - STANDARD SEDIMENT STORAGE CAPACITY FOR CONNDOT APPROVED HYDRODYNAMIC SEPARATORS

Sediment Storage (cubic yards)	Product Model								
	<i>Downstream Defender</i>	<i>Flogard</i>	<i>High Eff. CDS</i>	<i>Hydroguard</i>	<i>Stormceptor OSR</i>	<i>Stormceptor STC</i>	<i>Vortechs</i>	<i>Vortsentry</i>	<i>V2B1</i>
0.3		DVS-36					1000		
0.5	4-ft								
0.6							2000		
0.7		DVS-48		HG 4					
0.8					065	450		VS30	2; 3
0.9			2015-4G; 2015-4						
1.0 (minimum)							3000		
1.1					140	900			
1.2				HG 5					
1.3		DVS-60							
1.4							4000	VS40	
1.5			2015; 2020; 2025						
1.6									4
1.7				HG 6					
1.8	6-ft					1200			
1.9							5000		
2.0									
2.1									
2.2		DVS-72						VS50	
2.3				HG 7					
2.4									6; 7
2.5							7000		
2.6			3020, 3020-D; 3030, 3030-DV, 3030-D; 3035, 3035-D						
2.9					250	2400			

TABLE 3 - STANDARD SEDIMENT STORAGE CAPACITY FOR CONNDOT APPROVED HYDRODYNAMIC SEPARATORS (continued)

Sediment Storage (cubic yards)	Product Model								
	<i>Downstream Defender</i>	<i>Flogard</i>	<i>High Eff. CDS</i>	<i>Hydroguard</i>	<i>Stormceptor OSR</i>	<i>Stormceptor STC</i>	<i>Vortechs</i>	<i>Vortsentry</i>	<i>V2B1</i>
3.0				HG 8					
3.1							9000	VS60	
3.2									8; 9
3.3						1800			
3.4									
3.5		DVS-84							
3.6									
3.7	8-ft		5640-D						
3.8				HG 9					
3.9							11000		
4.0									
4.2									10; 11; 12
4.3			4030-D; 4040-D; 4045-D					VS70	
4.5									
4.6									
4.7									13
5.0				HG 10					
5.1									
5.3		DVS-96	5042-DV; 5050-DV						
5.5									
5.6			4030; 4040; 4045; 5653-D; 5658-D; 5678-D				16000	VS80	
5.7									
6.0						3600			
6.5									

TABLE 3 - STANDARD SEDIMENT STORAGE CAPACITY FOR CONNDOT APPROVED HYDRODYNAMIC SEPARATORS (continued)

Sediment Storage (cubic yards)	Product Model								
	<i>Downstream Defender</i>	<i>Flogard</i>	<i>High Eff. CDS</i>	<i>Hydroguard</i>	<i>Stormceptor OSR</i>	<i>Stormceptor STC</i>	<i>Vortechs</i>	<i>Vortsentry</i>	<i>V2B1</i>
6.6							1319		
6.9									
7.0									
7.1									
7.2									
7.3									14; 15; 16; 17; 18
7.5				HG 12					
7.6							1421		
7.7									
8.0									
8.3									
8.4			7070-DV						
8.6						4800			
8.7	10-ft				390		1522	VS100	
9.0									
9.5									
9.6									
9.9							1624		
10.0									
10.3		DVS-120							
10.5									19; 20
11.0									
11.2							1726		
11.3						6000			
11.5									21; 22
11.8									

TABLE 3 - STANDARD SEDIMENT STORAGE CAPACITY FOR CONNDOT APPROVED HYDRODYNAMIC SEPARATORS (continued)

Sediment Storage (cubic yards)	Product Model								
	<i>Downstream Defender</i>	<i>Flogard</i>	<i>High Eff. CDS</i>	<i>Hydroguard</i>	<i>Stormceptor OSR</i>	<i>Stormceptor STC</i>	<i>Vortechs</i>	<i>Vortsentry</i>	<i>V2B1</i>
12.0									
12.6								VS120	25
12.9					560				
13.0									
13.4						7200			
15.0									
17.5					780				
17.8		DVS-144	10060-DV;10080-DV; 100100-DV						
20.0									
22.3									50
25.0									
25.8					1125				
26.1						11000s			
26.2									
30.0									
34.1						13000s			
34.9									60
35.0									
38.7									
40.0									
40.7						16000s			

TABLE 4 - SEDIMENT STORAGE CAPACITY CALCULATION

Product	Sediment Storage Capacity (Volume) Calculation (cubic feet)
Downstream Defender	Inside Diameter (ft ²) of Structure x Distance (ft) from Bottom of Benching Skirt to Inside Floor of Structure
FloGard® Dual-Vortex	Inside Diameter (ft ²) of Structure x 1/2 Distance (ft) from Bottom of Vortex Tube to Inside Floor of Structure
High Efficiency CDS	Inside Diameter (ft ²) of Structure x Depth (ft) of Solids Storage Sump
Hydroguard	Inside Diameter (ft ²) of Structure x 1/2 Depth (ft) Below Outer Baffle Wall
Stormceptor STC	Inside Diameter (ft ²) of Structure x 1/2 Depth (ft) Below Drop Tee Inlet Pipe
Stormceptor OSR	Inside Diameter (ft ²) of Structure x 1/2 Depth (ft) Below Drop Tee Inlet Pipe
Vortechs	Inside Diameter (ft ²) of Grit Chamber x 1/2 Depth (ft) Below Opening in Swirl Wall
Vortsentry	Inside Diameter (ft ²) of Structure x Depth (ft) of Sediment Storage Sump
V2B1	Inside Diameter (ft ²) of Structure (D1) x 1/2 Depth (ft) Below Pipe Invert
<i>Note: 1 cubic foot = 0.037 cubic yard or 1 cubic yard = 27 cubic feet</i>	

Since the selected hydrodynamic separator and associated connecting pipes and structures may be different in type, configuration and performance than the one assumed in the design phase of the project, the hydraulic calculations performed for the drainage design must be replicated and revised to reflect any adjustments necessary to the drainage design for installation of the selected system, such as different flow-line elevations, head loss coefficient, pipe sizes, etc. The selected hydrodynamic separator shall be designed so as not to change the drainage system upstream of the flow diversion structure or to increase the HGL elevation upstream of the flow diversion structure. Any modifications necessary to the overall drainage design as a result of the Contractor selected hydrodynamic separator shall be the responsibility of the Contractor.

The new HGL analysis must demonstrate the following conditions:

1. The hydrodynamic separator can treat the WQF with no bypass. The HGL elevation at the flow diversion structure for the WQF shall be below the weir elevation and/or elevation of flow bypass that is listed in the design data form or shown in the plans, so that all of the WQF is directed to the hydrodynamic separator for treatment. The HGL elevation in the hydrodynamic separator at the WQF shall be below the elevation of internal bypass so that all of the WQF is treated by the system.
2. When the drainage system is operating at the DDF, the hydraulic computations must show that the HGL elevation at the flow diversion structure is lower than or equal to the HGL elevation shown on Form A for the DDF and the HGL elevation in the hydrodynamic separator must be a minimum of one foot below the top (ground) elevation of the structure. A HGL elevation in the flow diversion structure for the DDF which is higher than the corresponding HGL elevation shown on Form A may be approved by the Engineer only if hydraulic computations are submitted showing that the higher HGL elevation will provide a minimum of one foot of freeboard below the top (ground) elevation of the flow diversion structure and the upstream drainage structures, satisfying the design criteria stated in the Connecticut Department of Transportation Drainage Manual. To demonstrate compliance, the hydraulic analysis shall be extended to a point upstream in the drainage system that is not influenced by the proposed changes and where the results converge with the previous design analysis. In such a case, the Contractor shall request a copy of the design analysis from the Department. A freeboard less than one foot may be accepted by the Engineer on a case by case basis provided that a justification of the reason has been included with the HGL analysis.
3. When the drainage system is operating at the DDF, the resulting HGL elevation and flow split at the flow diversion structure has been designed such that the portion of the DDF directed to the hydrodynamic separator does not exceed the maximum flow shown on the Hydrodynamic Separator Design Data Sheets (Form A - Design). Documentation, however, must be provided that the flow in excess of the WQF can pass through the device without washout of the previously captured sediment or the device is equipped with an internal bypass to route the excess flow around the treatment chamber.

Upon conclusion of the HGL analysis, the Hydrodynamic Separator Design Data Sheets (Form B – Contractor Proposal) shall be completed by entering the HGL analysis data and other required information.

Hydrodynamic Separator Selection: To ensure compliance with the special provision, the selection process of a proprietary hydrodynamic separator for installation on a Department project is outlined by the following steps:

1. First, select the available product(s) from Table 2 (**PERFORMANCE MATRIX FOR CONNDOT APPROVED HYDRODYNAMIC SEPARATORS**) that meet or exceed the WQF treatment specified on the Hydrodynamic Separator Design Data Sheets (Form A - Design) attached to this specification. **The Engineer shall reject any proposed hydrodynamic separator system/model that is not listed in Table 2.**
2. Using Table 3 (**STANDARD SEDIMENT STORAGE CAPACITY FOR CONNDOT APPROVED HYDRODYNAMIC SEPARATORS**), check whether the initially selected product(s) in Step 1, meet or exceed the minimum sediment storage requirement specified on the Hydrodynamic Separator Design Data Sheets (Form A - Design). In some cases, the required sediment storage capacity will govern the model size required for the project. In lieu of selecting a larger model to accommodate the sediment storage requirement, the Contractor may submit working drawings as recommended by the Manufacturer, showing how a standard model has been modified to satisfy the sediment storage requirement. When a modification is proposed by increasing the depth of the standard structure, **Table 4 (SEDIMENT STORAGE CAPACITY CALCULATION)** shall be utilized to determine the sediment storage capacity of the proposed structure.
3. **Hydrodynamic separator system/models pre-approval by the Department shall not be construed to mean that all products appearing on Tables 2 and 3 are suitable to any specific project site or drainage design.** The Contractor shall verify the constructability of the selected hydrodynamic separator in relation to dimensional, structural, geotechnical and right-of-way constraints at each installation site. If revisions to the drainage design, including the system layout, are required to accommodate the selected separator, the Contractor shall provide working drawings showing the revised layout, including the position of the hydrodynamic separator and the number, positions and types of connecting structures, the design of the flow diversion structure, and any other components of the system within the pay limits. The working drawings shall be prepared in sufficient detail to perform a hydraulic analysis and confirm that the layout will fit the constraints of each site.
4. Upon determination that the WQF, sediment storage and constructability requirements have been met, the Contractor shall prepare or have prepared, a HGL analysis in accordance with the hydraulic requirements of this special provision, that includes the selected hydrodynamic separator and any revisions to the drainage design needed for the installation.

5. The Hydrodynamic Separator Design Data Sheets (Form B – Contractor Proposal) shall be completed and signed by a professional engineer licensed by the State of Connecticut.
6. *Acceptance of the computations by the Engineer must be obtained by the Contractor prior to the purchase or installation of any units.*

Materials: Materials utilized to fabricate, construct and install the precast concrete hydrodynamic separator including but not limited to precast concrete units, brick, concrete masonry units, manhole frames and covers shall meet the requirements specified in the Standard Specifications, Form 816, Article M.08.02, except that the 28 day compressive strength specified in Subarticle M.08.02-4, shall be a minimum of 4000 psi (27.6 MPa).

The Contractor shall provide a Materials Certificate in accordance with 1.06.07 for each unit delivered to the project. Upon request, the Contractor shall also provide Certified Test Reports for the fine and coarse aggregates and all cementitious materials, and the concrete mix design indicating the weight of each component, used in the construction of the precast units for review. The structures shall not be shipped until released by the Contractor's Quality Control Manager or designee.

The wall and slabs of the precast concrete units shall be designed to sustain HS20-44 (MS18) loading requirements.

Manholes and Catch Basins shall conform to Section 5.07 of Form 816.

Granular fill shall conform to the requirements of Article M.02.01 of Form 816.

Non-shrink grout shall conform to the requirements of Subarticle M.03.01-12 of Form 816.

Drainage pipe, sealant and gaskets shall conform to the requirements of Article M.08.01 of Form 816.

Mortar shall conform to the requirements of Article M.11.04 of Form 816.

Sealant used for the hydrodynamic separator unit(s) shall be resistant to oil and other hydrocarbons and conform to the requirements of ASTM C-443.

Working Drawings: Working drawings in accordance with Article 1.05.02 – 2 shall be required for the system selected by the Contractor. The working drawings shall include the HGL analysis and all other computations in strict accordance with the "Hydraulic Design" section of this special provision, including a completed Form B – Contractor Proposal.

If revisions to the layout of the system within the payment limits of this item are required to accommodate the selected separator, the working drawings shall also include plans that show the required revisions. These plans shall show the revised position of the hydrodynamic separator unit(s), and all revisions to connecting structures, pipes, elevations, and details, including the design within the flow diversion structure. The revised plans shall also include the pay limit showing all the components of the system that are included in this lump sum pay item.

Working drawings shall also show details for construction, reinforcing joints, internal and external components, any cast-in-place appurtenances, locations and elevations of pipe openings, access manhole locations and elevations, and type / method of sealing pipe entrances.

Working drawings for each hydrodynamic separator on the project shall have all appropriate vertical dimensions referenced with elevations that are consistent with the project plans. In addition to any other structural, material or installation requirements, the working drawings shall clearly indicate the following information:

1. The elevation and flow rate when internal flow bypass would occur within the device.
2. The location, dimensions and volume (capacity) of the sediment storage area within the device.

The working drawings shall be sealed by a professional engineer licensed in the state where the devices are manufactured and that said engineer shall certify the device meets the minimum requirements of the ConnDOT Standards.

The working drawing submission by the Contractor shall consist of the following documents:

1. Working drawings for each hydrodynamic separator proposed for installation on the project.
2. Hydraulic design calculations including the head loss documentation and completed Hydrodynamic Separator Design Data Sheets (Form B – Contractor Proposal) with professional engineer signature for each hydrodynamic separator.
3. Copies of the pertinent construction plan, profile, cross section and detail sheets that have been annotated with any proposed drainage revisions that are required for the installation of the proposed hydrodynamic separator(s). If no changes are required, the submittal shall note same.
4. An Operations and Maintenance Manual for each hydrodynamic separator describing operations, inspection, maintenance procedures and any applicable warranty information.

Acceptance of the working drawing submission by the Engineer must be obtained by the Contractor prior to the fabrication of each hydrodynamic separator and diversion structure.

Construction Methods: The Contractor shall inspect the hydrodynamic separator and any accessory equipment upon delivery for general appearance, dimensions, soundness or damage in a manner acceptable to the Engineer. If any defects or damage are identified by the inspection, the unit shall be rejected by the Contractor and a new undamaged hydrodynamic separator shall be supplied. Any required adjustments of the separator shall be completed in accordance with Manufacturer's recommendations. A Manufacturer's representative and the Engineer will inspect the hydrodynamic separator before installation.

The Contractor shall install the hydrodynamic separator structure in accordance with the Manufacturer's recommendations unless otherwise directed by this specification or by the Engineer. The hydrodynamic separator shall be installed plumb, level and aligned both vertically and horizontally with the inlet and outlet piping. The hydrodynamic separator shall be placed on a compacted granular fill base in accordance with the Manufacturer's specifications or a minimum thickness of 6" (150mm) whichever is larger. Anchoring systems shall be installed, where needed, to resist buoyancy forces. Care shall be taken not to damage the hydrodynamic separator during backfill and compaction.

Pipe openings in the hydrodynamic separator shall be sized to accept pipes of the specified size(s) and material(s) as shown on the contract drawings and shall be sealed by the Contractor in accordance with the requirements of this specification. The inlet and outlet pipe connections shall be watertight. The hydrodynamic separator shall be tested for leakage according to the Manufacturer's specifications and to the satisfaction of the Engineer. Any leaks must be found and corrected to the satisfaction of the Engineer prior to acceptance of the structure.

Access openings with manhole frames and covers shall be provided to all chambers of the hydrodynamic separator. The access openings and pipe openings shall be detailed on the working drawings to be submitted by the Contractor for review and acceptance by the Engineer.

All connecting structures and pipes included within the payment limits for this work shall be constructed in accordance with the applicable requirements of Article 5.07.03 and Article 6.51.03.

Method of Measurement: Design, construction, furnishing, installation and cleaning of the hydrodynamic separator, the flow diversion structure, manholes and pipes as shown on the contract drawings, including all internal and external appurtenances and materials used, will be paid for on a lump sum basis per site.

Basis of Payment: This work will be paid for at the contract lump sum for "HYDRODYNAMIC SEPARATOR", complete in place, which price shall include all work within the pay limits shown on the contract drawings for hydrodynamic separator. If revisions to the layout of the system within the payment limits for this item are required to accommodate the selected separator, the lump sum price shall also include all additional or revised connecting structures and pipes. The contract lump sum shall include, but not be limited to, the following:

1. Design, preparation, revisions of working drawings and hydraulic computations.
2. Concrete and reinforcing steel, sealant, cement, mortar, flexible rubber sleeves, internal and external components, brick and masonry, frames and covers used to construct access manholes.
3. Flow diversion structure, manholes and pipes as shown on the contract drawings, or as revised and shown on submitted working drawings accepted by the Engineer.
4. Structure excavation, back fill, and disposal of surplus material.
5. Compacted granular fill.

6. Trench excavation and bedding material.
7. Cleaning of the Hydrodynamic Separator, flow diversion structure, manholes and pipes as shown on the contract drawings (of all debris every 90 days, or as needed), during the duration of the project, shall also be included in the price of this item.
8. The Operations and Maintenance Manual for each hydrodynamic separator.

The price shall include but not be limited to all materials, testing, equipment, tools and labor incidental thereto.

Attachments: The following documents are attached to this specification:

1. Hydrodynamic Separator Design Data Sheets (Form A – Design), Sheets 1 & 2 of 2.
2. Hydrodynamic Separator Design Data Sheets (Form B – Contractor Proposal), Sheets 1 & 2 of 2 (blank), to be completed and submitted with the working drawings.

CONNECTICUT DEPARTMENT OF TRANSPORTATION HYDRODYNAMIC SEPARATOR DESIGN DATA SHEETS (FORM A - DESIGN)							
Project No	34-313	Route No.	I-84	Prepared By:	N.Rolfe	Date:	12/5/2012
Town	Danbury	Location/Station	Second Ave.	Checked By:		Date:	
HYDROLOGIC DATA				Company:	AECOM		
Drainage Area (Acres)	17.55						
Percent Impervious Area %	60						
Time of Concentration (min.)	12						
Drainage Design Flow (cfs)	46.2						
Drainage Design Frequency (yr)	10						
Water Quality Flow (cfs)	9.09						
HYDRODYNAMIC SEPARATOR (HS)							
Coordinates:		Datum:					
X:	807243.284	Horiz.	CT Coord Sys NAD83				
Y:	710350.263	Vert.	NAVD-1988				
Head loss coefficient	1.75						
Sediment Storage Capacity (cy):		HGL Elevation:					
Required	5.3	@ WQF	389.65				
		@ Design Q	389.89				
Maximum Flow to HS at Drainage Design Flow (cfs)		22.7					
Comments:							
FLOW DIVERSION STRUCTURE							
Type	Bypass Manhole						
Weir and/or Bypass Elev.	390.80						
Weir Length (ft.)	6	Weir Coeff. (C)	3.3				
HGL Elevation:		Flow Split @ Drainage Design Flow					
@ WQF	389.67	To HS	13.9				
@ Design Q	390.84	Bypassing HS	32.34				
Comments:							
				Sketch (NTS) - Indicate Pay limits			
Sheet 1 of 2							

CONNECTICUT DEPARTMENT OF TRANSPORTATION HYDRODYNAMIC SEPARATOR DESIGN DATA SHEETS (FORM B - CONTRACTOR PROPOSAL)					
Project No		Route No.		PE Signature:	
Town		Location/Station			
HYDROLOGIC DATA (Copy from FORM A - DESIGN)				Name:	Date:
Drainage Area (Acres)				License No:	State:
% Impervious Area				Company:	
Time of Concentration (min.)					
Drainage Design Flow (cfs)					
Drainage Design Frequency (yr)					
Water Quality Flow (cfs)					
HYDRODYNAMIC SEPARATOR (HS)					
Manufacturer					
Model Name					
Model No.					
Coordinates:		Datum:			
X:		Horiz.			
Y:		Vert.			
Sediment Storage Capacity (cy):		HGL Elevation:			
Required		@ WQF			
Installed		@ Design Q			
Head loss coefficient					
FLOW DIVERSION STRUCTURE					
Type					
Weir and/or Bypass Elev.					
Weir Length (ft.)		Weir Coeff. (C)			
HGL Elevation:		Flow Split @ Drainage Design Flow			
@ WQF		To HS			
@ Design Q		Bypassing HS			
Comments:					
Sketch (NTS)					
<i>Sheet 1 of 2</i>					

ITEM #0520036A - ASPHALTIC PLUG EXPANSION JOINT SYSTEM

Description: Work under this item shall consist of furnishing and installing an asphaltic plug expansion joint system (APJ) in conformance with ASTM D6297, as shown on the plans, and as specified herein.

Work under this item shall also consist of the removal and disposal of bituminous concrete, membrane waterproofing, existing joint components and sealing elements, cleaning and sealing median barrier joints, parapet joints, and sidewalk joints.

Work under this item excludes the removal of Portland cement concrete headers.

Materials: The APJ component materials shall conform to ASTM D6297 and the following:

Aggregate: The aggregate shall meet the following requirements:

- a) Loss on abrasion: The material shall show a loss on abrasion of not more than 25% using AASHTO Method T96.
- b) Soundness: The material shall not have a loss of more than 10% at the end of five cycles when tested with a magnesium sulfate solution for soundness using AASHTO Method T 104.
- c) Gradation: The aggregate shall meet the requirements of Table A below:
- d) Dust: aggregate shall not exceed 0.5% of dust passing the #200 sieve when tested in accordance with AASHTO T-11.

Table A

<u>Square Mesh Sieves</u>	1" (25.0 mm)	3/4" (19.0 mm)	1/2" (12.5 mm)	3/8" (9.5 mm)	No. 4 (4.75 mm)
% passing	100	90 - 100	20 - 55	0 - 15	0 - 5

A sample of the aggregate shall be submitted to the Department with a Certified Test Report in accordance with Article 1.06.07 for each 20 tons of loose material or its equivalent number of bags delivered to the job site. The Certified Test report must include a gradation analysis resulting from a physical test performed on the actual material that accompanies the report.

Anti-Tacking Material: This material shall be a fine graded granular material with 100% passing the $3/16$ " sieve and no more than 5% passing the #200 when tested in accordance with AASHTO T-27.

Backer Rod: All backer rods shall satisfy the requirements of ASTM D5249, Type 1.

Bridging Plate: The bridging plates shall be steel conforming to the requirements of ASTM A36 and be a minimum $1/4$ " thick and 8" wide. For joint openings in excess of 3" the minimum plate dimensions shall be $3/8$ " thick by 12" wide. Individual sections of plate shall

not exceed 4' in length. Steel locating pins for securing the plates shall be size 16d minimum, hot-dip galvanized, and spaced no more than 12" apart.

Concrete Leveling Material: Shall be a cementitious-based material that conforms to ASTM C928 Standard Specification for Packaged, Dry, Rapid-Hardening Cementitious Materials for Concrete Repair, for R3 performance requirements in Table 1 and achieve the following:

- a. Final set in 45 Minutes
- b. 2500 psi compressive strength in 24 hours
- c. 5000 psi compressive strength in 7 days

Parapet Sealant: The sealant used in parapet joint openings shall be a single component non-sag silicone sealant that conforms to the requirements of ASTM D5893.

Sidewalk Sealant: The sealant used in sidewalk joint openings shall be a rapid cure, self-leveling, cold applied, two-component silicone sealant. The silicone sealant shall conform to the requirements listed in Table B:

Table B

Properties - As Supplied	Test Method	Requirement
Extrusion Rate	ASTM C1183	200-600 grams/min
Leveling	ASTM C639	Self-Leveling
Specific Gravity	ASTM D792	1.20 to 1.40
Properties - Mixed	Test Method	Requirement
Tack Free Time	ASTM C679	60 min. max.
Joint Elongation – Adhesion to concrete	ASTM D5329 ^{1,2,3}	600% min
Joint Modulus @ 100% elongation	ASTM D5329 ^{1,2,3}	15 psi max
Cure Evaluation	ASTM D5893	Pass @ 5 hours

1. Specimens cured at $77 \pm 3^{\circ}\text{F}$ and $50 \pm 5\%$ relative humidity for 7 days
2. Specimens size: 1/2" wide by 1/2" thick by 2" long
3. Tensile Adhesion test only

The date of manufacture shall be provided with each lot. No sealant shall be used beyond its maximum shelf-life date.

The two-part silicone sealants shown in Table C are known to have met the specified requirements:

Table C

Product	Supplier
Dow Corning 902RCS	Dow Corning Corporation 2200 W Salzburg Road Auburn, Michigan 48611
Wabo SiliconeSeal	BASF/Watson Bowman Acme Corporation 95 Pineview Drive Amherst, New York 14228

Other two-component silicone joint sealants expressly manufactured for use with concrete that conform to the aforementioned ASTM requirements will be considered for use provided they are submitted in advance for approval to the Engineer. Other joint sealants will be considered for use only if a complete product description is submitted, as well as documentation describing at least five installations of the product. These documented installations must demonstrate that the product has performed successfully for at least three years on similar bridge expansion joint applications.

A Materials Certificate and Certified Test Report for the asphaltic binder shall be submitted by the Contractor in accordance with the requirements of Article 1.06.07 certifying that the asphaltic binder satisfies the requirements of the most current version of ASTM D6297.

A Materials Certificate for all other components of the APJ, leveling material, backer rod and sealant used in sealing parapet and sidewalk joint openings, shall be submitted by the Contractor in accordance with the requirements of Article 1.06.07

Construction Methods: The APJ shall be installed at the locations shown on the plans and in stages in accordance with the traffic requirements in the special provisions “Maintenance and Protection of Traffic” and “Prosecution and Progress”.

At least 30 days prior to start of the work, the Contractor shall submit to the Engineer for approval a detailed Quality Control Plan for the installation of the APJ. The submittal shall include:

- a) A list of all manufactured materials and their properties to be incorporated in the joint system, including, but not limited to the asphaltic binder, anti-tack material, backer rod, sealant, leveling material, as well as the aggregate’s source.
- b) A detailed step by step installation procedure and a list of the specific equipment to be used for the installation. The Quality Control Plan must fully comply with the specifications and address all anticipated field conditions, including periods of inclement weather.

The APJ shall not be installed when bituminous concrete overlay or joint cutout is wet. The APJ shall only be installed when the bridge superstructure surface temperature is within the limits specified in Table D and when the ambient air temperature is within the range of 45⁰F to 95⁰F.

The bridge superstructure surface temperature range is determined using the thermal movement range provided on the contract plans for the proposed APJ deck installation location and the selected APJ product.

Table D

Installation Restrictions	
Designed Deck Joint Thermal Movement Range²	Bridge Superstructure Surface Temperature¹
0" to 1"	45° F to 95° F
1-1/8"	45° F to 90° F
1-1/4"	45° F to 80° F
1-3/8"	45° F to 70° F
1-1/2"	45° F to 65° F

- 1. The superstructure surface temperature shall be determined from the average of three or more surface temperature readings taken at different locations on the interior girder surfaces by the Contractor as directed by the Engineer. Temperature measurements of the superstructure shall be taken by the contractor with a calibrated hand held digital infrared laser-sighted thermometer on the surfaces of an interior steel girder, or interior concrete girder protected from direct sunlight. The infrared thermometer to be supplied by the Contractor for this purpose shall meet certification requirements of EN61326-1, EN61010-1, and EN60825-1 maintained by the European Committee for Electrotechnical Standardization (CENELEC). The thermometer shall have a minimum distance-to-spot ratio of 50:1 and shall have adjustable emissivity control. The thermometer shall have a minimum accuracy value of $\pm 1\%$ of reading or $\pm 2^{\circ}\text{F}$, whichever is greater. The thermometer shall be used in strict accordance with the manufacturer's written directions. An additional infrared thermometer satisfying the same standards to be used in this application shall also be provided to the Engineer for quality assurance purposes.*
- 2. Linear interpolation may be used to determine an allowable surface temperature range for thermal movement ranges in between values shown in the table, as approved by the Engineer.*

Prior to installing the APJ, the Contractor shall determine the exact location of the deck joint beneath the bituminous concrete overly.

The APJ shall be installed symmetrically about the deck joint opening to the dimensions shown on the plans or as directed by the Engineer; not to exceed 24 inches measured perpendicular to the deck joint. The proposed saw cut lines shall be marked on the bituminous concrete overlay by the Contractor and approved by the Engineer, prior to saw-cutting. The saw-cuts delineating the edges of the APJ shall extend full depth of the bituminous concrete overlay.

The existing bituminous concrete overlay, waterproofing membrane and/or existing expansion joint material, within the saw cut limits shall be removed and disposed of by the Contractor to create the joint cutout.

Concrete surfaces that will support the bridging plates shall be smooth and form a plane along and across the deck joint. Rough or damaged concrete surfaces shall be repaired with a leveling compound meeting the requirements of this specification. Deteriorated concrete areas within the joint limits shall be repaired as directed by the Engineer: such repairs, when deemed necessary by the Engineer, shall be compensated for under the applicable concrete deck repair items in the Contract. The existing and repaired concrete surfaces shall provide continuous uniform support for the bridging plate and prevent the plate from rocking and deflecting.

Prior to the installation of the backer rod, all horizontal and vertical surfaces of the joint cutout shall be abrasive blast cleaned using an oil-free, compressed air supply. The entire cutout shall then be cleared of all loose blast media, dust, debris and moisture using an oil-free, hot air lance capable of producing an air stream at 3,000°F with a velocity of 3,000 feet per second.

A single backer rod, with a diameter at least 25% greater than the existing joint opening at the time of installation, shall be installed at an inch below the bridging plate in the existing deck joint opening between the concrete edges.

Asphaltic binder shall be heated to a temperature within the manufacturer's recommended application temperature range which shall be provided in the Quality Control Plan. During application, the temperature of the binder shall be maintained within this range. In no case shall the temperature of the binder go below 350° F nor exceed the manufacturer's recommended maximum heating temperature.

Asphaltic binder shall then be poured into the joint opening until it completely fills the gap above the backer rod. A thin layer of binder shall next be applied to the all horizontal and vertical surfaces of the joint cutout.

Bridging plates shall be abrasive blast-cleaned on-site prior to installation and then placed over the deck joint opening in the joint cutout. The plates shall be centered over the joint opening and secured with locating pins along its centerline. The plates shall be placed end to end, without overlap, such that the gap between plates does not exceed ¼". The plates shall extend to the gutter line and be cut to match the joint's skew angle, where concrete support exists on both sides of the joint. Within APJ installation limits, where concrete support does not exist at both sides of the joint opening (such as where a bridge deck end abuts a bituminous concrete roadway shoulder), bridging plates shall not be installed. Installed bridging plates shall not rock or deflect

in any way. After installation of bridging plates, a thin layer of asphaltic binder shall be applied to all exposed surfaces of the plates.

The remainder of the joint cutout shall then be filled with a mixture of hot asphaltic binder and aggregate prepared in accordance with the submitted Quality Control Plan and the following requirements:

- The aggregate shall be heated in a vented, rotating drum mixer by the use of a hot-compressed air lance to a temperature of between 370° F. to 380° F. This drum mixer shall be dedicated solely for the heating and, if necessary, supplemental cleaning of the aggregate. Venting of the gas and loose dust particles shall be accomplished through ¼” drilled holes spaced no more than 3” on center in any direction along the entire outside surface of the drum
- Once the aggregate has been heated, it shall then be transferred to a secondary drum mixer where it shall be fully coated with asphaltic binder. A minimum of two gallons of binder per 100lbs of stone is required.
- The temperature of the aggregate and binder shall be monitored by the contractor with a calibrated digital infrared thermometer.
- The coated aggregate shall be loosely placed in the joint cutout in lifts not to exceed 2 inches.
- Each lift shall be leveled, compacted and then flooded with hot asphaltic binder to the level of the aggregate to fill all voids in the coated aggregate layer. The surface of each lift shall be flooded until only the tips of the aggregate protrude out of the surface.
- The final lift shall be placed such that no stones shall project above the level of the adjacent overlay surface following compaction of the coated aggregate.
- Following installation of the final lift, sufficient time and material shall be provided to allow all voids in the mixture to fill. This step may be repeated as needed.
- The joint shall then be top-dressed by heating the entire area with a hot-compressed air lance and applying binder. The final joint surface must be smooth with no protruding stones and be absent of voids.
- Once top-dressed, the joint shall have an anti-tack material spread evenly over the entire surface to prevent tracking.

The Contractor shall be responsible for removing all binder material that leaks through the joint and is deposited on any bridge component, including underside of decks, headers, beams, diaphragms, bearings, abutments and piers.

Traffic shall not be permitted over the joint until it has cooled to 130° F when measured with a digital infrared thermometer. Use of water to cool the completed joint is permitted.

Sidewalk, parapet, and/or curb joint openings

Before placement of any sealing materials in parapets, curbs, or sidewalks, the joints shall be thoroughly cleaned of all scale, loose concrete, dirt, dust, or other foreign matter by abrasive blast cleaning. Residual dust and moisture shall then be removed by blasting with oil free

compressed air using a hot air lance. Projections of concrete into the joint space shall also be removed. The backer rod shall be installed in the joint as shown on the plans. The joint shall be clean and dry before the joint sealant is applied. Under no circumstances is the binder material to be used as a substitute for the joint sealant.

Whenever abrasive blast cleaning is performed under this specification, the Contractor shall take adequate measures to ensure that the abrasive blast cleaning will not cause damage to adjacent traffic or other facilities.

The joint sealant shall be prepared and placed in accordance with the manufacturer's instructions and with the equipment prescribed by the manufacturer. Extreme care shall be taken to ensure that the sealant is placed in accordance with the manufacturer's recommended thickness requirements.

The joint sealant shall be tooled, if required, in accordance with the manufacturer's instructions.

Primer, if required, shall be supplied by the sealant manufacturer and applied in accordance with the manufacturer's instructions.

When the sealing operations are completed, the joints shall be effectively sealed against infiltration of water. Any sealant which does not effectively seal against water shall be removed and replaced at the Contractor's expense.

Any installed joint that exhibits evidence of failure, as determined by the Engineer, such as debonding, cracking, rutting, or shoving of the APJ mixture shall be removed and replaced full-width and full-depth to a length determined by the Engineer at no additional cost to the State.

Method of Measurement: This work will be measured for payment by the number of cubic feet of "Asphaltic Plug Expansion Joint System" installed and accepted within approved horizontal limits. No additional measurement will be made for furnishing and installing backer rod and joint sealant in the parapets, concrete medians, curbs and/or sidewalks.

Basis of Payment: This work will be paid for at the contract unit price per cubic foot for "Asphaltic Plug Expansion Joint System," complete in place, which price shall include the saw-cutting, removal and disposal of bituminous concrete, membrane waterproofing, existing joint components and sealing elements, the furnishing and placement of the leveling compound, cleaning of the joint surfaces, furnishing and installing bridging plates, the furnishing and installing of the asphaltic plug joint mixture, the cost of furnishing and installing joint sealant in the parapets, concrete medians, curbs and sidewalks, and all other materials, equipment including, but not limited to, portable lighting, tools, and labor incidental thereto. No additional payment shall be made for the 12" wide bridging plates that are required for deck joint openings with widths in excess of 3".

If directed by the Engineer, additional deck repairs will be addressed and paid for under the applicable concrete deck repair items in the Contract.

ITEM # 0601091A – SIMULATED STONE MASONRY

Description:

This item shall consist of furnishing and installing textured and colored formed concrete surfaces using simulated stone molds (form liners) and a color straining system designed to duplicate closely the appearance of natural stone as described herein of the type and size called for on the plans, including accessories and hardware and in accordance with these specifications. The architectural form liner simulated stone masonry shall be monolithically formed with the concrete substructure.

This item also includes providing the concrete used for creating the architectural treatment.

Materials:

1. Quality Of Work: The process of form lining, texturing and color staining of the hardened concrete shall be performed in strict accordance with the manufacturer's written recommendations and as approved by the Engineer.
2. The design and pattern of form lined concrete surfaces shall follow the layout shown on the contract plans and the manufacturer's standard drawing. Final coloration of cast stone concrete surfaces shall accurately simulate the appearance of real stone. It shall also demonstrate the colors that may be apparent from aging, such as staining from oxidation, rusting and/or organic staining from soil and/or vegetation.
3. Quality Assurance:
 - a. Manufacturer of Simulated Stone Molds and Custom Coloring Systems shall have five years experience making custom simulated stone molds and color stains to create formed concrete surfaces to match natural stone shapes, surface textures and colors.
 - b. Contractor/Subcontractor (installer) shall have five years experience pouring vertically formed architectural concrete. The installer shall be trained in the manufacturer's special techniques in order to achieve realistic surfaces.
 - c. Color Stain System Application shall be performed by the manufacturer or manufacturer's authorized representative. The stain shall be applied by an applicator who has experience with similar projects.
 - d. A Pre-installation Meeting shall be scheduled with the manufacturer's representative, installer, and Department inspection personnel to assure understanding of simulated stone masonry use, color staining application, and to coordinate the work.

4. Protection: The contractor is solely responsible for construction methods, means, techniques, and for construction site safety precautions. The contractor shall conduct all construction operations in conformance with all applicable local, state and federal safety laws, rules, regulations and codes. All Material Safety Data Sheets (MSDS) shall be available for inspection.
5. Manufacturer: Subject to compliance with the design and specification requirements, the contractor shall provide simulated stone masonry and color staining system as manufactured by Custom Rock International, Inc., St. Paul, Minnesota, or approved equivalent.
6. Materials:
 - a. Simulated Stone Molds (form liners) shall be made of reusable elastomeric form liners, made of high-strength urethane and cutable form liners, made of lower grade urethane, easily attachable to forms. Form liners shall leave crisp, sharp definition of the architectural surface. Recurring textural configurations exhibited by repeating, recognizable shadow patterns shall be prevented by proper casting of form liner patterns. Form liners shall not compress more than ¼ inch when concrete is poured at a rate of 10 vertical feet per hour. Form lines shall be removable without causing deterioration of surface or underlying concrete. No substitutions will be permitted.
 - b. The form liner shall conform to the pattern and vertical wall joint spacing shown on the plans, including texture and color staining system and shall be as manufactured by Custom Rock International, St. Paul, Minnesota, Pattern CRS 12979 – Adirondack Dry Stack, or approved equivalent.
 - c. The form liner shall be designed to permit 180 degree rotation and interconnection with itself or another pattern liner of differing horizontal dimension. Maximum relief of pattern and the average relief shall be as shown on the contract plans. The simulated stone pattern shall vary in a random manner in the coursing parameters to prevent noticeable multiple duplicate pattern repetition and avoid stacked joints.
 - d. In addition to orthogonal surfaces, the form liner shall be capable of forming curved and/or battered surfaces, if shown on the plans, while maintaining the dimensioned coursing and plumb vertical joints without distortion.
7. Release Agent: The release agent shall be compatible with simulated stone masonry and with color staining system to be applied to surface, as recommended by the manufacturer.
8. Form Ties: Form ties shall be designed to separate at least one inch back from finished surface, leaving only a neat hole that can be plugged with compatible patching material.

9. Color Stain: The color stain shall be a penetrating stain mix as provided by the manufacturer, shall achieve color variations present in the natural stone being simulated for the project, as approved by the Engineer and in accordance Items 1 and 2 above. The stain shall create a surface finish that is breathable (allowing water vapor transmission), and that resists deterioration from water, acid, alkali, fungi, sunlight or weathering. The stain mix shall be a water borne, low V.O.C. material, less than 180 grams/liter, and shall meet requirements for weathering resistance of 2000 hours accelerated exposure measured by weather-o-meter in accordance with ASTM G23 with 3-bulb. Scrub test 1000 revolutions. Abrasive resistance (Tabor-CT-10) 500 cycles. Adhesion ASTM D3359 1.OOMM cross cuts on glass pass 3 or higher on a scale of 1 to 5. The contractor shall supply information pertaining to chemical resistance in accordance with ASTM D1308.

Construction Methods:

1. Shop Drawings and Submittals: Before fabricating any materials, the contractor shall submit shop drawings, product data sheets and samples to the Engineer for approval in accordance with Article 1.05.02 for the materials listed in Item 3 below. These drawings and submittals shall include, but not limited to, the following information: manufacturer's name, listing of product compliance with referenced specification standards, complete details of the assemblies, material designations, nominal hardness of appropriate materials, design loads, quantities and locations.
2. Field Measurements: Prior to ordering or fabricating any materials, the contractor shall take complete and accurate field measurements.
3. Submittals:
 - a. Catalog cuts, manufacturer's literature, and technical data for the materials specified herein, including but not limited to simulated stone mold pattern, form liner, release agent, concrete patching material and color charts for staining of hardened concrete.
 - b. Photographs: Color photographs of three (3) similar past projects of the manufacturer. Include project names, locations and a telephone number of the previous projects Owner's representatives.
 - c. Samples: Form ties, sample and description, showing method of separation when forms are removed.
 - d. Plan, elevation and details to show overall pattern, joint locations, form tie locations, and end, edge and other special conditions.
4. Scheduling: Schedule color stain application after adjacent earthwork is completed, to avoid contaminating or damaging the surface. Place topsoil and establish turf after staining application is completed. Coordinate the work to prevent interference with other trades.

5. Test Panels: At least 30 days prior to construction of the first textured and colored concrete surfaces, the Contractor shall prepare a test panel with a full scale field mock-up of the formed concrete surface (4' x 4') showing the proposed color, pattern, joint treatment and layout as shown on the plans or in the Manufacturer's catalog. If the resulting appearance is not acceptable to the Engineer, adjustments shall be made to the color, pattern, finished texture and/or joint treatment and another test panel shall be prepared for inspection. The accepted mock-up shall provide the standard for the work.
6. Installation:
 - a. Contractor's responsibilities:
 1. Install liners.
 2. Apply manufacturer release agent.
 3. Install concrete as specified elsewhere in the Specifications.
 4. Remove form liner.
 5. Patching, grinding and bush hammering of form liner seams as required.
 6. Provide scaffolding and heat as required and clean water for power washing of the hardened concrete prior to the staining process.
 7. Power washing and patching of form liners.
 8. Return of form liners to manufacturer.
 - b. Manufacturer's responsibilities:
 1. Ship and supply form liners and release agent.
 2. Technical information.
 3. Power wash wall.
 4. Apply the color staining process.
7. Liner to Form Attachment System: Securely attach form liners to forms with wood or sheet metal screws; threaded inserts added to the back of the form liner for bolts to fasten the form liner through the forms, or; bolted through the face of the form liner with flat head bolts inserted in a pattern joint and through the form liner and forming system. Construction adhesives may be used, but not on reusable forms. Place adjacent form liners with less than ¼ inch separation between form liners.
8. Release of Form Liners From Hardened Concrete: Only manufacturer recommended form release agents (Lark V or Orna Con) shall be utilized and shall be applied to the form liners before the concrete is poured. Release agents shall be applied in strict accordance with release agent manufacturer recommendations. Hand-charged sprayers will only be allowed if a thin uniform coating of release agent is obtained on the form liner.
9. Remove the form liner from the wall within 4 hours of pouring the concrete. The form liners may be detached from the forms and then removed from the forms and then removed from the concrete, or they may remain attached to the forms and the entire forming system removed from the concrete. Remove the form liners from the top, down. Curing of concrete

may be accomplished with form liners and forms placed back against the wall after initial detachment. Other means of curing can also be used including curing blankets and/or plastic. Curing compounds shall not be used.

10. Care and Cleaning of Form Liner: Form liners shall be cleaned the same day they are removed from the wall with a power wash and mild detergent. Synthetic brushes with stiff bristles may be used on stubborn areas. Mild acid washes may also be used. Solvents shall not be used. If necessary, patching of holes shall be performed with 100% clear silicone caulk. Form liners shall be stored inside or under a protective, non-transparent cover, in a vertical, upside-down position.
11. Wall Patching and Preparation: After form liners are removed from the hardened concrete, the textured uncolored surface shall be prepared for color staining. All holes larger than ¾” in greatest principal dimension shall be filled with concrete patching material such as Tamms Speed-crete or equal mixed with latex or acrylic bonder, as approved by the manufacturer and Engineer. All honeycombed areas shall be filled and textured to match surrounding areas. Seam lines and other unnatural protrusions shall be ground down to match adjacent areas with a hand-held power grinder using discs made for concrete. Grinding of seams shall be performed immediately after removal of the form liners. Perform final bush hammering to blend defects and ground areas into the final rock texture. In particular, the process of wall patching and preparation shall be subject to approval of the manufacturer and Engineer.
12. Color Staining (by manufacturer): The hardened concrete shall be a minimum of 30 days old before color staining is applied. Power wash the wall to free it from laitance, dirt, oil and other objectionable materials. After the wall has dried, the color staining process is applied using colors approved by the Engineer. Color staining shall be applied in such a way that the stones shall have individual colorations from one to the other. Water-based stains shall be used in air temperatures between 50 degrees F and 100 degrees F. Solvent-based stains shall be used in air temperatures of 50 degrees F and below, but in no case when the temperature of the hardened concrete is 40 degrees and falling. During color staining operations the Contractor shall protect property, pedestrians, vehicular and other traffic upon, underneath or in the vicinity of the walls against damage or disfigurement from errant stain materials. Comply with all environmental regulations regarding surface cleaning, stain application, ground and watercourse protection and disposal protection of waste materials. Refer to Section 1.10 of the Specifications.

Color: Color shall conform to that shown in the Concrete Rock Surfaces catalog dated January 2, 2007, page 30, in the photograph showing the pattern for Adirondack Dry Stack. Any areas lacking a uniform appearance (consistent with the approved sample) shall be recoated to the satisfaction of the Engineer at no additional cost to the State.

13. Simulated Stone Molds Preparation: Clean and make free of buildup prior to each pour. Inspect for blemishes and tears. Repair if needed following manufacturer's recommendations.

Method of Measurement:

This work shall be measured for payment by the actual number of square yards of the face area of accepted architectural form liner, poured in place simulated stone masonry, completed within the neat lines as shown on the plans, or as ordered by the Engineer.

Concrete used for creating the architectural treatment will not be measured for payment under this item or any other item.

Basis of Payment:

This work will be paid for at the contract unit price per square yard for “Simulated Stone Masonry”, complete in place, which price shall include all equipment, formwork molds, test panels, and all other tools and labor incidental thereto.

This work shall also include the cost of furnishing and application of the color stain system to the simulated stone masonry surface.

Concrete that is used for creating the architectural treatment will not be paid for directly under any pay items; the cost of said concrete shall be considered included within item “Simulated Stone Masonry”

ITEM # 0601318A - PARTIAL DEPTH PATCH

Description: Work under this item shall consist of the removal of spalled, delaminated or otherwise deteriorated concrete from existing bridge decks and/or approach slabs, and replacement with fast setting patching materials as shown on the plans, as directed by the Engineer, and hereinafter specified. Where ordered by the Engineer, work under this item shall also include repairing pop-outs on the underside of the deck caused by the removal of deteriorated concrete. Work under this item shall also include the furnishing and installation of deformed steel bars, reinforcing wire ties and vertical supports on inadequately supported and/or defective reinforcing steel within deck path areas and providing of a safe access to the structure for the delineation of the repair locations and review of the performed repair work.

Materials: The material shall conform to the following requirements:

1. High Early Strength Concrete – The high early strength concrete (HESC) shall conform to one of the following:

A. Unless otherwise approved by the Engineer, the HESC shall be one of the following materials:

Rapid Set DOT Cement
CTS Cement Manufacturing
1023 Dogwood Lane
West Chester, PA 19382
215-429-4956

HD-50
Dayton Superior Corporation
PO Box 355
Oregon, IL 61061
800-745-3707

Speed Crete Green Line
Tamms Industries
730 Casey Ave.
Wilkes-Barre, PA 18702
800-218-2667

B. In lieu of the above HESC mixes, the contractor may propose the use of another proprietary type mix. This mix shall meet the physical requirements as stated below. The high early strength concrete shall be of a high strength, have rapid strength gain characteristics in normal weather (above 10oC ambient temperature), bond to the existing concrete, and be durable. The concrete material shall be able to accept coarse aggregate to extend the yield and result in a workable mixture. The high early strength concrete, as delivered without additional coarse aggregate, and mixed in accordance with the manufacturer's instructions, shall have the following properties:

- A minimum one hour compressive strength of 2,500psi, a 24 hour strength of 3,500 psi and a 28 day strength of 5,000 psi (ASTM C109)
- A minimum bond strength of 220 psi after 24 hours. (ASTM C882)

- A minimum initial setting time of 5 minutes at $24^{\circ}\pm 1^{\circ}\text{C}$. (ASTM C266)
- The ability to withstand 50 cycles of freeze-thaw (10% NaCl solution) with a maximum loss of 6%. (ASTM C666)
- Expansion of no more than 0.40% and contraction of no more than 0.05%. (ASTM C157)
- A workable mixture when extended with a minimum 60% No. 8 aggregate by weight of dry concrete component.

A mix design for this material shall be submitted at least two weeks prior to use. The mix design shall state the percentage of each component to be utilized along with substantive data that demonstrates the ability of the material to meet the specified requirements.

2. Deformed Steel Bars: Section 6.02

Construction Methods:

1) Inspection of the Structural Slab: Before any existing concrete is removed from the structural slab, the contractor will provide the Engineer clear access to the bridge deck. During this time, the Engineer will perform an inspection of the structural slab and designate areas where concrete removal will be required. Due to the nature of the operations, the inspection can be performed only after some existing materials, notably overlays and waterproofing system, have first been removed from the structural slab. It shall be the responsibility of the contractor to arrange the construction schedule so that the required operations may be performed without causing delay to the work.

No operations will be performed by the Engineer until after the following construction work has been completed:

- a) The existing bituminous overlay or concrete wearing course, if present, has been removed.
- b) The existing waterproofing system, if present, has been removed.
Note: The removal of this material will be paid for under other applicable items.
- c) Installation of sedimentation controls for the prevention of materials entering the bridge drainage system.

The Contractor shall furnish and install sedimentation controls at bridge scuppers to prevent concrete debris from entering the bridge drainage system. The methods proposed by the Contractor will be approved by the Engineer.

It shall be the responsibility of the Contractor to inform the Engineer, in writing, of the date that a structure will be available for inspection operations. Notification shall be given to the engineer at least seven (7) days prior to the date that the area in question will be in a condition acceptable to the Engineer.

The Contractor is hereby informed that the following time period will be necessary to perform the required inspection operations:

One working day with suitable weather conditions per each six thousand square feet, or portion thereof, of structural slab area.

The contractor will not be allowed to do any further work to the structural slab, until all necessary inspection operations have been performed, unless given permission by the Engineer.

The Contractor will include any costs related to the allowance for this inspection in the general cost of the work.

2) Removal of Deteriorated Concrete: All deteriorated concrete designated for removal under this construction item shall be removed within the limits shown on the plans and where ordered by the Engineer. The lateral limits of each area to be repaired will be delineated by the Engineer and suitably marked. Where several areas to be repaired are very close together, the Engineer may combine these individual patches into a large area. The outlines of each such area shall first be cut to a depth of one half (1/2) inch with an approved power saw capable of making straight cuts. In the event that reinforcing steel is encountered within the upper 1/2 inch depth during sawing operations, the depth of the saw-cut shall immediately be adjusted to a shallower depth so as not to damage the steel bars. If so directed by the Engineer, saw cutting shall again be carried down to the 1/2 inch depth at other locations of repair provided reinforcing steel is not again encountered. Where over-breakage occurs resulting in a featheredge, the featheredge shall be squared up to a vertical edge in an approved manner. Where sawing is impractical, the area shall be outlined by chisel or other approved means.

All deteriorated concrete shall be removed by pneumatic hammers, hydro-demolition will not be permitted.

The weight of pneumatic hammers when used shall not exceed 30 pounds for concrete removal above the top reinforcing steel nor 15 pounds for concrete removal below the top reinforcing steel.

The depth of concrete removal shall be as shown on the plans but shall be such as to include all spalled, delaminated, or otherwise deteriorated concrete. The Engineer will be sole determiner of what constitutes deteriorated concrete, using sounding methods or other evaluation measures at his discretion.

For deterioration on the deck underside, the Contractor shall design, furnish and install protective shielding on the underside to prevent an unexpected fall of deteriorated concrete to areas below the bridge. The protective shielding shall be designed, furnished and installed by the contractor. Working drawings and design calculations for the temporary shielding shall be submitted in accordance with the requirements of Article 1.05.02(a). The working drawings and design calculations shall be prepared, sealed and signed by a Professional Engineer, licensed in the State of Connecticut. The furnishing of such plans shall not serve to relieve the contractor of any part of his responsibility for the safety of the work or for the successful completion of the project.

Where the existing reinforcing steel is damaged or corroded, it shall be cut out and replaced with new reinforcing steel of the same size. Any sound reinforcing steel damaged during the concrete removal operations, shall be repaired or replaced by the Contractor at his expense as directed by

the Engineer. New steel shall be attached beneath or beside the existing steel with a minimum splice length as indicated on the plans, or as directed by the Engineer. The concrete shall be removed to a minimum depth of 1 inch below the new steel.

3) Surface Preparation: Sound reinforcing steel which is in the proper position in the slab shall be left in place and cleaned of all concrete, the smaller fragments to be removed with hand tools in patch areas where pneumatic hammers were used.

Reinforcing bar wire ties and vertical supports shall be installed on inadequately supported and/or vibrating reinforcing steel, as directed by the Engineer. The concrete surface and reinforcing steel to receive patching material shall be sandblasted, followed by air blasting in order to remove all loose particles and dust. All blasting operations shall be performed using techniques approved by the Engineer, taking care to protect all pedestrians, traffic, and adjacent property. All compressed air sources shall have properly sized and designed oil separators, attached and functional, to allow delivered air at the nozzle to be oil-free. The patch area shall be cleaned of all additional loose or powder-like rust, oil, solvent, grease, dirt, dust, bitumen, loose particles, and foreign matter just prior to patching.

The entire concrete surface to be patched shall be dampened. All free water shall be removed from the patch area.

4) Mixing, Placing, and Finishing: Mixing and placing concrete should not be done unless the ambient temperature is above 35°F. All mixing shall be accomplished by means of a standard drum-type portable mixer. A continuous type mobile mixer may be used if permitted by the Engineer. The Contractor shall calibrate the mobile mixer under supervision of the Engineer. Calibration shall be in accordance with the applicable sections of ASTM method C685. The total mix shall be limited to the quantity that can be mixed and placed in 15 minutes. The concrete mix shall be spread evenly and compacted to a level slightly above the pavement surface. Vibration, spading or rodding shall be used to thoroughly compact concrete and fill the entire patch area. Where practical, internal vibration shall be used in cases where concrete has been removed below the reinforcing steel. Hand tamping shall be used to consolidate concrete in smaller patches, including popouts.

Vibrating plates or vibrating screeds shall be used on the surface of all patches for strike off and consolidation. After the concrete has been spread evenly and compacted to a level slightly above the pavement surface, the vibrating plate or screed shall be drawn over the surface at a uniform speed without stopping, in order to finish the surface smooth and even with adjacent concrete.

The surface shall be float finished.

Finishing operations shall be completed before initial set takes place.

Cured patches, having a hollow sound when chain dragged or tapped (indicating delamination), shall be replaced by the Contractor at his expense until a patch acceptable to the Engineer is in place.

5) Tolerances in Finished Patching Surfaces: The surface profile of the patched area shall not vary more than one-eighth inch in a distance of 10 feet, when a 10 foot long straightedge is placed on the surface at any angle relative to the centerline of the bridge. Humps in the patch that exceed the one-eighth inch tolerance shall be ground down by approved machinery. Sags or depressions in the surface of the patch area that exceed one-eighth inch tolerance shall be repaired by removal of the concrete in the depression over an area determined by the Engineer to a depth of one inch and repaired in the previously described manner.

6) Underside of Bridge Deck Treatment: The Engineer shall examine the underside of the bridge deck for pop-outs caused by the removal of deteriorated concrete. The surface area of pop-outs shall be coated with epoxy resin where ordered by the Engineer. The concrete surface and exposed reinforcing steel, if any, which is to receive the coating material shall be cleaned of all loose or powder-like rust, oil, dust, dirt, loose particles, and other bond inhibiting matter just prior to coating.

The epoxy resin shall be mixed in accordance with the manufacturer's instructions. Also in accordance with the manufacturer's instructions, two coats of the mixed material shall be applied in uniform coats of approximately 2 to 3 mil dry film thickness each.

If the pop-outs extend beyond the bottom layer of reinforcing steel, the pop-outs shall be repaired as ordered by the Engineer.

7) Test Cylinders: The Contractor shall make and perform compressive strength tests on representative cylinders under the supervision of the Engineer. The dimensions, type of cylinder mold and number of cylinders shall be specified by the Engineer. Traffic shall not be permitted on patched surfaces until the patch material attains a strength of 2,500 psi, as determined by breaks of the test cylinders.

A portable compression testing machine shall be provided by the Contractor and available on site for cylinder testing. All testing equipment shall conform to ASTM C39.

Note: This compression machine must be calibrated in accordance with the provisions of Section 5, ASTM C39.

8) Time Schedule: Work under this item begun on any specific bridge during a construction season shall be completed at least, to include this item and placing of first course wearing surface as soon as possible and specifically before the beginning of the construction season's winter shutdown.

All work shall proceed as required by the "Maintenance and Protection of Traffic" and "Prosecution and Progress" specifications contained elsewhere within the contract documents. Traffic will not be allowed on any areas where the Contractor has removed deteriorated concrete until a minimum of 1.5 hours after the placing and finishing operations on the areas are complete as required by this specification.

Method of Measurement: This work will be measured for payment by the actual volume in cubic feet of replacement concrete, complete and accepted. No deduction will be made for the volume of reinforcing steel. Removal of concrete, furnishing and installation of reinforcing steel and providing of a safe access for delineation and inspection of the performed repairs will not be measured for payment.

Basis of Payment: This work will be paid for at the contract unit price per cubic foot of deck concrete repaired for “Partial Depth Patch”, complete in place and accepted, which price shall include removal of deteriorated concrete, surface preparation of patch areas, epoxy resin coating of the underside of deck pop-out surfaces, concrete replacement, the furnishing and installation of deformed steel bars, reinforcing bar wire ties and vertical supports for inadequately supported and/or deteriorated existing reinforcing steel, furnishing and installing protective shielding, providing inspection access for delineation and inspection of performed repairs, all materials, equipment, including the portable compression testing machine required for the testing of the repair material, tools, labor, and work incidental thereto.

<u>Pay Item</u>	<u>Pay Unit</u>
Partial Depth Patch	c.f.

ITEM #0601445A - EMBANKMENT WALL (SITE NO. 1)

Description: This item will consist of designing, furnishing and constructing an embankment retaining wall in the location, grades, and to the dimensions and details shown on the contract drawings, and in accordance with these specifications.

Retaining Wall Selection: The Contractor shall select the proprietary embankment retaining wall from the Department's current approved list shown below. The Engineer will reject any proposed retaining wall that is not listed below.

The following is a list of the proprietary embankment retaining walls for this project:

1. VERSA-LOK Retaining Wall
VERSA-LOK of New England
P.O. Box 6002
Nashua, NH 03063
(603) 883-3042

3. KeySystem I Retaining Wall
Keystone Retaining Wall Systems
13453 County Road 1
Fairhope, AL 36532
(251) 990-5761

2. MESA Retaining Wall System
TENSAR Earth Technology, Inc.
227 Ritter Road
Sewickley, PA 15143
(412) 749-9190

4. Pyramid Modular Blockwall
The Reinforced Earth Company
133 Park Street
North Reading, MA 01864
(978) 664-2830

5. Redi-Rock Retaining Wall-
Cobblestone Face Mold
Redi-Rock Walls-CT Division
68A South Canal Street
Plainville, CT 06062
(860) 793-6805

No other proprietary retaining walls will be allowed for this project.

This listing does not warrant that the individual walls can be designed to meet either the dimensional, structural, or geotechnical constraints at each site.

Design:

1 - Design Computations: It is the Contractor's responsibility for the design, detailing and additional construction specifications required to construct the wall. The actual designer of the retaining wall shall be a qualified Professional Engineer licensed in the State of Connecticut.

2 - Designer's Liability Insurance: The Designer shall secure and maintain at no direct cost to the State, a Professional Liability Insurance Policy for errors and omissions in the minimum amount of Five Hundred Thousand Dollars (\$500,000). The designer may, at his election, obtain a policy containing a maximum One Hundred Twenty Five Thousand Dollars (\$125,000) deductible clause, but if he should obtain a policy containing such a clause, the designer shall be liable to the extent of the deductible amount. The Designer shall obtain the appropriate and proper endorsement to its Professional Liability Policy to cover the indemnification clause in this contract as the same relates to negligent acts, errors or omissions in the work performed by the Designer. The Designer shall continue this liability insurance coverage for a period of three years from the date of the acceptance of the work by the agency head as evidenced by a certificate of acceptance issued to the contractor or for three years after the termination of the contract, whichever is earlier, subject to the continued commercial availability of such insurance.

The designer shall supply the certificate of this insurance to the Engineer prior to the start of construction of the wall. The designer's insurance company shall be licensed in the State of Connecticut.

3 - Preliminary Submissions: Prior to the start of fabrication or construction, the Contractor shall submit to the Engineer a design package, which shall include, but not be limited to the following:

a. Detailed Plans:

- Plan sheets shall be approximately 24" x 36"
- Stamped by a licensed Professional Engineer (Connecticut).
- Full plan view of the wall drawn to scale. The plan view must reflect the horizontal alignment and offset from the horizontal control line to the face of the wall. Beginning and ending stations, all utilities, signs, lights, etc. that affect the construction along with all property lines and easement lines adjacent to the wall shall be shown.
- Full elevation view of the wall drawn to scale. Elevation views should indicate the elevation at the top and bottom of walls, horizontal and vertical break points, and the location of finished grade.
- Typical cross sections drawn to scale including all appurtenances. Detailed cross section should be provided at significant reinforcement transitions such as wall ends.

- Details of all wall components and their connections such as the length, size and type of soil reinforcement and where any changes occur; facing details; connections; etc.
 - Certified test reports indicating the connection strength versus normal load relationship for the block-soil reinforcement connection to be used.
 - Drainage details for embankment backfill including attachment to outlets shown on contract drawings.
 - Details of any roadway drainage pipe projecting through the wall, or any attachments to the wall. Details of the treatment of drainage swales or ditches shown on the contract drawings.
 - Design parameters used along with AASHTO references.
 - Material designations for all materials to be used.
 - Detailed construction methods including a quality control plan. Construction quality control plans should include monitoring and testing frequencies (e.g, for setting batter and maintaining horizontal and vertical control). Construction restraints should also be listed in the details. Specific requirements for construction around obstructions should be included.
 - Details of installation of protective fencing where required.
 - Details of Architectural Treatment where required.
 - Details of Temporary Earth Retaining System(s) where required.
 - Details of wall treatment where the wall abuts other structures.
 - Treatment at underground utilities where required.
- b. Design Computations:
- Stamped by a licensed Professional Engineer (Connecticut).
 - Computations shall clearly refer to the applicable AASHTO provisions as stated in the Notes on the Contract Drawings.
 - Documentation of computer programs including all design parameters.

c. Construction Specifications:

- Construction methods specific to the proprietary retaining wall chosen. These specifications should include construction limitations including vertical clearance, right-of-way limits, etc. Submittal requirements for materials such as certification, quality, and acceptance/rejection criteria should be included. Details on connection of modular units and connection of reinforcements such that assurance of uniform stress transfer should be included.
- Any requirements not stated herein.

The submissions for proprietary retaining walls shall be treated as working drawings according to Section 1.05 amended as follows:

a. Six sets of each submission shall be supplied to the State

b. The Contractor shall allow 21 days for the review of each submission. If subsequent submissions are required as a result of the review process, 21 days shall be allowed for review of these submissions. No extensions in contract time will be allowed for the review of these submissions.

4 - Final Submissions: Once a proprietary retaining wall design has been reviewed and accepted by the Department, the Contractor shall submit the final plans. The final submission shall include one set of full size (approximately 24" x 36") mylar sheets and five sets of full size blue line copies.

The final submission shall be made within 14 days of acceptance by the State. No work shall be performed on the retaining wall until the final submission has been received by the Department.

Acceptance of the final design shall not relieve the Contractor of his responsibility under the contract for the successful completion of the work.

The actual designer of the proprietary retaining wall is responsible for the review of any shop drawings prepared for the fabrication of the wall. One set of full size blue line copies of all approved shop drawings shall be submitted to the Department's permanent records.

5 - General Design Requirements:

a. All designs for proprietary walls and temporary earth retaining systems shall conform to the latest edition of the American Association of State Highway and Transportation Officials (AASHTO) Standard Specifications for Highway Bridges and later interims published except as noted otherwise herein:

b. The wall design shall follow the general dimensions of the wall envelope shown in the contract plans.

c. The top of the concrete leveling pad shall be located at or below the theoretical leveling pad elevation. The minimum wall embedment shall be two feet as measured to the top of the leveling pad or as shown on the plans.

d. If footing steps are required, they shall be kept below the minimum embedment depth. Footing steps in addition to those shown on the plans will be permitted at no additional cost to the State.

e. The wall shall be designed to be within all property lines and easement lines shown on the contract drawings. If additional work areas are necessary for the construction of the proprietary retaining wall, the Contractor shall be responsible for obtaining the rights from the affected property owners. Copies of these rights shall be forwarded to the Department.

f. The top of the wall shall be at or above the top of the wall elevations shown on the plans. The top of the wall may be level or sloped to meet the top of the wall line noted.

g. Cast-in-place concrete will not be an acceptable replacement for areas noted by the wall envelope, except for minor grouting of pipe penetrations.

h. The mechanical wall height for the purposes of design calculations shall be from the top of the leveling pad to the top of the potential failure surface where the failure surface intercepts the ground surface.

i. The minimum length of internal soil reinforcement shall be as specified in AASHTO 5.8.1, except for the minimum eight (8.0') foot length requirement.

i. If there are specific surcharges acting on the wall, they shall also be accounted for. The minimum equivalent fluid pressure used to design the wall shall be 33 lbs./ft² per linear foot of wall.

j. The maximum allowable bearing capacity of the soil shall be assumed to be 4 ksf unless otherwise shown on the plans. If additional soils information is required by the designer, it must be obtained by the Contractor and will not be reimbursed by the State.

k. For limit state allowable stress computations of extensible reinforcements, the combined factor of safety for construction damage and environmental/aging effects shall not be less than 1.75.

Materials: Materials shall conform to the following requirements and those not listed below shall be as prescribed within the Standard Specifications for Roads, Bridges and Incidental Construction, including supplemental specifications and applicable special provisions.

1 – Facing Block: The facing block can be precast or drycast concrete and shall be the color specified on the plans. The block shall meet the following requirements:

a. Drycast Concrete:

- i. The minimum compressive strength of the block shall be 4000 psi measured at 28 days.
- ii. The maximum water absorption shall be less than five percent.

The Contractor shall submit to the Engineer a certified test report confirming the compressive strength and water absorption conform to the requirements of ASTM C-140.

b. Precast Concrete: Shall conform to the requirements of Section M.03 and as follows:

- i. The minimum compressive strength of the block shall be 4000 psi measured at 28 days.
- ii. All precast concrete components shall be air-entrained composed of portland cement, fine and coarse aggregates, admixtures and water. The air-entraining feature may be obtained by the use of either air-entraining portland cement or an approved air-entraining admixture. The entrained-air content shall be not less than four percent or more than seven percent.

2 - Geosynthetic Soil Reinforcement: The minimum strength of the geosynthetic soil reinforcement shall be based on experimental data. The Contractor shall submit to the Engineer a certified test report confirming the strength of the material when tested according to the methods specified in ASTM D5262 and extrapolated according to ASTM D2837 as outlined in AASHTO Article 5.8.7.2.

3 – Metallic Soil Reinforcement: All soil reinforcement and structural connectors shall be hot dipped galvanized according to the requirements of ASTM A123 (AASHTO M-111). The minimum thickness of the galvanizing shall be based on the service life requirements in the AASHTO Specifications.

Steel strip reinforcement shall be hot rolled to the required shape and dimensions. The steel shall conform to AASHTO M223 (ASTM A572) Grade 65 unless otherwise specified.

Welded wire fabric reinforcement shall be shop fabricated from cold-drawn wire of the sizes and spacings shown on the plans. The wire shall conform to the requirements of ASTM A82, fabricated fabric shall conform to the requirements of ASTM A185.

4 - Metal Connectors: All metal hardware shall be hot dipped galvanized according to the requirements of ASTM A123 (AASHTO M-111). The minimum thickness of the galvanizing shall be based on the service life requirements in the AASHTO Specifications.

5 - Backfill Material: The material for backfill shall be Pervious Structure Backfill conforming to the requirements of Articles M.02.05 and M.02.06.

6 - Facing Sealer: The face of all exposed drycast block shall be coated with clear Penetrating Sealer Protective Compound conforming to the requirements of Article M.03.01-11.

Construction Methods: All construction methods for items not listed below shall be in accordance with the detailed requirements prescribed for the construction of the several contract items entering into the completed structure as specified in the Standard Specifications for Roads, Bridges, and Incidental Construction.

1 - Installation: The foundation for the structure shall be graded level for a width equal to or exceeding the length of the soil reinforcements, or as shown on the plans. If rock is encountered in the excavation, it shall be removed to provide a level area equal to or exceeding the length of the soil reinforcements, but not greater than the pay limits shown on the plans.

Prior to wall construction, the foundation, if not in rock, shall be compacted as directed by the Engineer. Any foundation soils found to be unsuitable shall be removed and replaced.

At each foundation level, an unreinforced concrete leveling pad shall be provided as shown on the plans. The leveling pad shall have nominal dimensions of 6 inch thickness and 24 inch width, and shall be cast using minimum 2,000 psi 28-day compressive strength concrete. The leveling pad shall be cast to the design elevations as shown on the plans. Allowable elevation tolerances are +0.01 foot (1/8 inch), and -0.02 foot (1/4 inch), from the design elevation.

The materials for the wall shall be handled carefully and installed in accordance with manufacturer's recommendations and specifications. Special care shall be taken in setting the bottom course of blocks to true line and grade.

All blocks above the first course shall interlock with the lower courses by means of connecting pins. Vertical joints shall be staggered with each successive course as shown on the working drawings. Vertical tolerances and horizontal alignment tolerances measured from the face line shown on the plans shall not exceed 1/2 inch when measured along a 8-foot straightedge. The overall tolerance of the wall from top to bottom shall not exceed 1/2 inch per eight feet of wall height or one inch total, whichever is the lesser, measured from the face line shown on the plans. A bond breaker shall be placed between the blocks and any adjacent cast-in-place concrete.

2 - Backfilling: Backfill placement shall closely follow erection of each course of panels. Backfill shall be placed in such a manner as to avoid any damage or disturbance to the wall

materials or misalignment of the facing panels. Any wall materials which become damaged or disturbed during backfill placement shall be either removed and replaced at the Contractor's expense or corrected, as directed by the Engineer. Any backfill material placed within the reinforced soil mass which does not meet the requirements of this specification shall be corrected or removed and replaced at the Contractor's expense.

Backfill shall be compacted to 95 percent of the maximum density as determined by AASHTO T-99, Method C or D (with oversize correction, as outlined in Note 7).

The moisture content of the backfill material prior to and during compaction shall be uniform throughout each layer. Backfill material shall have a placement moisture content less than or equal to the optimum moisture content. Backfill material with a placement moisture content in excess of the optimum moisture content shall be removed and reworked until the moisture content is uniform and acceptable throughout the entire lift. The optimum moisture content shall be determined in accordance with AASHTO T-99, Method C or D (with oversize correction, as outlined in Note 7).

If 30 percent or more of the backfill material is greater than 19 mm in size, AASHTO T-99 is not applicable. For such a material, the acceptance criterion for control of compaction shall be either a minimum of 70 percent of the relative density of the material as determined by a method specification provided by the wall supplier, based on a test compaction section, which defines the type of equipment, lift thickness, number of passes of the specified equipment, and placement moisture content.

The maximum lift thickness after compaction shall not exceed 10 inches, regardless of the vertical spacing between layers of soil reinforcements. The Contractor shall decrease this lift thickness, if necessary, to obtain the specified density. Prior to placement of the soil reinforcements, the backfill elevation at the face shall be level with the connection after compaction. From a point approximately three feet behind the back face of the panels to the free end of the soil reinforcements the backfill shall be two inches above the attachment device elevation unless otherwise shown on the plans.

Compaction within three feet of the back face of the panels shall be achieved by at least three passes of a lightweight mechanical tamper, roller or vibratory system. The specified lift thickness shall be adjusted as warranted by the type of compaction equipment actually used. Care shall be exercised in the compaction process to avoid misalignment of the panels or damage to the attachment devices. Heavy compaction equipment shall not be used to compact backfill within three feet of the wall face.

At the end of each day's operation, the Contractor shall slope the last level of backfill away from the wall facing to direct runoff of rainwater away from the wall face. The Contractor shall control and divert runoff at the ends of the wall such that erosion or washout of the wall section does not occur. In addition, the Contractor shall not allow surface runoff from adjacent areas to enter the wall construction site.

3 - Face Sealer: After the wall has been erected, the entire exposed face of the wall shall be coated with Penetrating Sealer Protective Compound. The application of the sealer shall conform to the requirements Article 8.18.03.

Several samples of the dry cast block shall be sealed prior to sealing the actual wall to ensure that the sealer will not discolor the block. If the sealer does discolor the block, the Contractor shall change to another approved supplier of sealer.

Method of Measurement: This work will be paid for on a lump sum basis and will not be measured for payment.

Basis of Payment: This work will be paid for at the contract lump sum for "EMBANKMENT WALL (SITE NO. 1)", complete in place, which price shall include all work shown within the pay limits shown on the plans for the retaining wall including but not limited to the following:

1. Design, detailing, and specifications for the wall.
2. Excavation for the wall
3. Design and Construction of temporary earth retaining systems for the support of the slope during construction.
4. Construction of the Embankment Wall, including the unreinforced concrete leveling pad.
5. The furnishing, placing and compacting of pervious structure backfill within the maximum payment lines.
6. The furnishing and placing of backfill drainage systems for the wall.
7. Any other work and materials shown on the plans for the construction of the wall.

The price shall also include all materials, equipment, tools and labor incidental thereto.

If bedrock or large boulders (greater than one cubic yard) are encountered in the excavation, the payment for it's removal will be made under the item "Structure Excavation - Rock".

ITEM #602910A - DRILLING HOLES AND GROUTING DOWELS

Description: Work under this item shall consist of drilling holes in concrete and grouting dowels at the locations shown on the plans, in accordance with the plans, the manufacturer's recommendations, and as directed by the Engineer.

For the purposes of this specification, a dowel may be a reinforcing bar, anchor bolt or threaded rod.

Materials: The chemical anchoring material shall conform to Subarticle M.03.01-15.

Construction Methods: Before fabricating any materials, the Contractor shall submit manufacturer's specifications and installation for the chemical anchoring material to the Engineer for review in accordance with Article 1.05.02.

Holes for the dowels shall be located as shown on the plans. The holes shall clear the existing reinforcement and provide the minimum cover as shown on the plans. A pachometer shall be used to locate existing reinforcing steel. If existing reinforcing is encountered during the drilling operation, the holes shall be relocated and the uncompleted holes shall be filled with the chemical anchoring material and finished smooth and flush with the adjacent surface.

The depth and diameter of each hole shall be as shown on the plans. If the diameter of a hole is not shown, the diameter of the hole shall conform to the manufacturer's recommendations for the diameter of the dowel being anchored. If the depth and diameter of a hole are not shown, the hole shall conform to the manufacturer's recommendations for the diameter of the dowel being anchored such that the grouted dowels will be able to develop in tension 100 percent of its specified yield strength.

Hole drilling methods shall not cause spalling, cracking, or other damage to the existing concrete. The weight of the drill shall not exceed 20 pounds. Those areas damaged by the Contractor shall be repaired by him in a manner suitable to the Engineer and at no expense to the State.

Prior to placing the chemical anchoring material in the holes, the holes shall be cleaned of all dirt, moisture, concrete dust and other foreign material. The dowel and the chemical anchoring material shall be installed in the holes in accordance with the chemical anchoring material manufacturer's recommendations.

The Contractor, as directed by the Engineer, shall take adequate precautions to prevent any materials from dropping to the area below, which may result in damage to any existing construction or to adjoining property. Should any damage occur to the structure as a result of the Contractor's operations, the Contractor shall make repairs at his own expense. The repair work shall be approved in advance and shall be of a quality acceptable to the Engineer.

Method of Measurement: This work will be measured for payment by the actual number of drilled holes in which dowels are embedded and accepted.

Basis of Payment: This work will be paid for at the contract unit price each for "Drilling Holes and Grouting Dowels," which price shall include drilling and preparing holes, furnishing and installing the chemical anchoring material in the holes and all material, equipment, tools and labor incidental thereto.

ITEM # 0603061A – STRUCTURAL STEEL (SITE NO. 1)

ITEM # 0603062A – STRUCTURAL STEEL (SITE NO. 2)

Article 6.03.01 - Description: is supplemented as follows:

This special provision provides additional requirements for the surface preparation, shop painting, and field touch-up painting of new structural steel.

Work under this item shall conform to the requirement of Section 6.03, supplemented and amended as follows:

Article 6.03.02 – Materials: Following the second paragraph, add the following:

Painting materials for this work shall conform to the following:

- The Contractor shall select a three-coat system from the qualified products Lists A and B issued by the Northeast Protective Coating Committee (NEPCOAT), except System No. SSC(03)-02, comprised of Carbozinc 859 organic zinc rich primer, Carboguard 888 epoxy polyamide, and Carbothatne 133HB aliphatic Polyurethane that shall not be permitted. The approved NEPCOAT listings may be found at the NEPCOAT website at <http://www.maine.gov/mdot/nepcoat/index>. The system chosen shall have a prime coat that has achieved a Class ‘B’ slip coefficient Top coat paint color shall be as noted on the plans.
- Both the shop painted and field touchup applied coating systems shall be of the same three-coat system. The same coating material manufacturer shall furnish all materials for the complete coating system. Intermixing of materials within and between coating systems will not be permitted. Thinning of paint shall conform to the manufacturer’s written instructions.

Article 6.03.03 – Construction Methods: In Subarticle 4 “Field Erection” - part (f) “High Strength Bolted Connections” , the following revisions are made:

- Replace the first sentence of the fourth paragraph “Surface Conditions: At the time of...other foreign material ” with the following:

At the time of assembly, all connection faying surfaces shall be free of burrs, dirt or other foreign material. Faying surfaces within portions of structural steel designated to be uncoated shall be free of scale, except tightly adhered mill scale. Connection faying surfaces within portions of structural steel designated to be painted shall receive a single coat of primer in accordance with requirements stipulated elsewhere in this special provision.

- Delete the entire fifth paragraph: “Paint is permitted on...wire brushing is not permitted.”

Following the last paragraph of the article, add the following:

The painting application shall be done in compliance with the following requirements:

Qualification of Shop Painting Firm: All shop painting of structural steel must be performed by and in an enclosed shop that is certified by the SSPC Painting Contractor Certification Program QP-3, entitled “Standard Procedure for Evaluating Qualifications of Shop Painting Contractors” in the enclosed shop category or that holds an AISC Quality Certificate with a “Sophisticated Paint Endorsement” in the enclosed shop category. They shall be fully certified, including endorsements, for the duration of the time they are performing the surface preparation and coating application. A copy of the subject certification shall be provided to the Engineer prior to commencing any surface preparation or coating application.

The complete coating system shall be applied in an enclosed shop except for field touch-up painting which shall be applied after all bolts are fully tensioned and deck formwork removed. The enclosed shop shall be a permanent facility with outside walls to grade and a roof where surface preparation and coating activities are normally conducted in an environment not subject to outdoor weather conditions and/or blowing dust.

Quality Control Inspection of Shop Painting: The firm performing shop painting of the structural steel shall have a written quality control (QC) program. A copy of the QC program and record keeping procedures shall be provided to the Engineer prior to commencing any surface preparation or coating application. The program shall contain, but not be limited to, the following:

1. Qualifications of QC staff.
2. Authority of QC staff. QC staff must have the authority to stop non-conforming work.
3. Procedure for QC staff to advise operation supervisor, in writing, of non-conforming work.
4. Sample copy of QC inspection reports that will document compliance with specification.
5. Procedure for calibrating inspection equipment and recording calibration.
6. Procedure for repairing defective coating applications.

The Contractor or Shop shall provide at least one Quality Control Inspector for the duration of the shop application to provide Quality Control. The QC Inspector must be a National Association of Corrosion Engineers (NACE) Coating Inspector Certificated with Peer Review. The QC Inspector shall verbally inform the Engineer on a daily basis, of the progress and any corrective actions performed on the coating work. The QC Inspector shall be present during all cleaning and coating operations.

The Contractor or Shop shall be responsible for purchasing and providing the latest version of the NACE Coating Inspector Log Book(s) and all necessary inspection tools. The Contractor’s QC Inspector shall stamp the front page of each inspector's log book used during painting operations.

The stamped book(s) shall indicate the inspector's NACE certification number, certification expiration date and shall also be signed. All daily coating activity shall be recorded in the Log Book. Copies of the log entries shall be provided on a daily basis to the Department's Quality Assurance (QA) shop representative. Upon completion of the coating, the log book(s) shall then be furnished to the Department's QA shop representative.

Technical Advisor: The Contractor or Shop shall obtain the services of a technical advisor who is employed by the coating manufacturer to assist the Engineer and shop painting firm during this work. The technical advisor shall be a qualified representative and shall be made available at the Shop upon request by the QC Inspector or the Engineer.

Surface Preparation: The following shall be performed prior to abrasive blast cleaning of steel members:

- All corners and edges shall be rounded to a 1/16-inch radius or chamfered to a 1/16-inch chamfer.
- All fins, slivers and tears shall be removed and ground smooth.
- All rough surfaces shall be ground smooth.
- Flame cut edges shall be ground over their entire surface such that any hardened surface layer is removed, and subsequent abrasive blast cleaning produces the specified surface profile depth.

Immediately before abrasive blast cleaning all steel members shall be solvent cleaned in accordance with SSPC-SP1 - "Solvent Cleaning."

Abrasive blast cleaning shall be performed in accordance with SSPC-SP 10 - "Near White Blast Cleaning" using a production line shot and grit blast machine or by air blast. The abrasive working mix shall be maintained such that the final surface profile is within the range specified elsewhere in this specification.

The QC Inspector shall test the abrasive for oil, grease or dirt contamination in accordance with the requirements of ASTM D7393 and document the test results. Contaminated abrasive shall not be used to blast clean steel surfaces. The blast machine shall be cleared of all contaminated abrasive and then solvent cleaned thoroughly in accordance with SSPC-SP 1 "Solvent Cleaning". New uncontaminated abrasive shall be added. Abrasive shall be tested for contaminants in accordance with the requirements of ASTM D7393 prior to the start of blast cleaning operations and at least every four hours during the blast cleaning operations.

All compressed air sources shall have properly sized and designed oil and moisture separators, attached and functional, to allow air at the nozzle, either for blast cleaning, blow-off, painting or breathing, to be oil-free, and moisture-free. They shall have sufficient pressure to accomplish the associated work efficiently and effectively.

The QC Inspector shall perform the blotter test and document the results at the start of each blasting shift and at least every four hours during the blasting operation to ensure that the compressed air is

free of oil and moisture. The blotter test shall be performed in accordance with the procedure outlined in ASTM D4285. For contaminated air sources, the oil and moisture separators shall be drained and the air retested.

No surface preparation or coating shall be done when the relative humidity is at or above 80 percent or when the surface temperature of the steel is less than five (5) degrees Fahrenheit above the dewpoint temperature as determined by a surface thermometer and an electric or sling psychrometer.

Surface Profile: The steel surface profile shall be 1 to 3 mils. Each girder or beam shall have the surface profile measured at a minimum of three locations in accordance with the test requirements of ASTM D4417, Method C. Smaller pieces such as diaphragms shall have the surface profile measured at a minimum of three locations on one piece at the beginning of abrasive blast operations and at least every four hours and at the end of abrasive blast cleaning operations. This measurement shall be performed with both coarse (0.8-2.0 mils) and extra coarse (1.5-4.5 mils) replica tape. During this measurement, special attention shall be given to areas that may have been shielded from the blast wheels, such as the corners of stiffeners and connection plates. The impressed tapes shall be filed in the NACE Coating Inspector's Log Book. Note: When measuring the profile on the tape, 2 mils shall be subtracted (non-compressible mylar thickness) from the micrometer reading as indicated on each piece of tape.

A surface profile correction factor shall be measured in accordance with SSPC-PA 2 section 2.2.4 with a "Type 2" magnetic film thickness gage.

Application Methods: The coating system shall be applied by spray equipment of a type and size capable of applying each coat within the required thickness range. The applicator shall strictly adhere to the manufacturer's written recommendations about application methods, cure times, temperature and humidity restrictions and recoat times for each individual coat of the specified system. However, in no case shall coatings be applied in ambient conditions that exceed the relative humidity and dewpoint temperature control limits specified elsewhere within this special provision. Brushes shall be used in areas where spray application will not achieve acceptable results. Brushing technique shall be performed in a manner that will provide a uniform, blended finish.

Conventional spray equipment with mechanical agitators shall be used for prime coat application.

All storage, mixing, thinning, application and curing techniques and methods shall be accomplished in strict accordance with the printed material data sheets and application instructions published by the respective coating material manufacturer.

Surfaces shall be painted with the specified prime coat material before the end of the same work shift that they were blast cleaned and before any visible rust back occurs. Applied coatings shall not have runs, sags, holidays, pinholes or discontinuities.

The dry film thickness shall be within the range specified in the manufacturer's printed literature for the specified coating system. Dry film thickness shall be measured in accordance with SSPC-PA 2.

The prime, intermediate and top coats shall be of contrasting colors as determined by the Engineer. There shall be no color variation in the topcoat as determined by comparison with Federal Standard 595.

Areas Requiring Special Treatment: All steel surfaces shall receive the three-coat shop applied system as specified except the following particular area types which shall be treated as follows:

- 1) Faying surfaces of connections shall receive only a single application of primer. The dry film thickness shall be no greater than the thickness tested on the coating manufacturer's Certified Test Report for slip coefficient.
- 2) All steel surfaces within four (4) inches of field welds shall receive only a single mist coating of primer at 0.5 - 1.5 mils dry film thickness.
- 3) Top surfaces of top flanges that will be in contact with concrete shall receive only a single mist coating of primer at 0.5 - 1.5 mils dry film thickness.
- 4) Edges and shop welds shall be locally hand-stripped with a brush in the longitudinal direction with an additional coat of an appropriate zinc-rich primer prior to application of the full intermediate coat. The application of the striping materials shall be in accordance with the coatings manufacturer's written instructions. The striping material shall be a contrasting color to distinguish it from the primer and intermediate coats.
- 5) The interior surfaces of box girders, including bracing, shall be prepared in accordance with these specifications then coated with the first two coats of the three-coat system. The intermediate coat in these areas shall be white and match Federal Standard 595 Color Number 27925.

Adhesion: Adhesion strength of the fully coated assemblies shall be the more restrictive of the manufacturer's specified adhesion strength or at least 600 psi for systems with organic zinc primers and at least 250 psi for systems with inorganic zinc rich primers measured as per ASTM D4541 using apparatus under Annex A4. All adhesion test locations shall be recoated in accordance with this specification at no additional cost. The QC Inspector shall perform adhesion strength tests every 500 sq. ft. and document the adhesion strength test results.

If adhesion test results are less than the specified value, but equal to or greater than 80% of the specified value, four (4) additional adhesion tests shall be taken within the 500 sq. ft. area of the failed test. If any of the additional adhesion tests are less than the specified value the coating shall be removed from the entire piece and re-applied at the Contractor's expense. The entire coating system shall be removed from a piece if any adhesion tests are less than 80% of the specified value and re-applied at the Contractor's expense.

Smaller pieces such as diaphragms shall be analyzed in lots that have an overall coated surface area of approximately 500 sq. ft.

Protection of Coated Structural Steel: All fully coated and cured assemblies shall be protected from handling and shipping damage with the prudent use of padded slings, dunnage, separators and tie downs. Loading procedures and sequences shall be designed to protect all coated surfaces. Erection marks for field identification of members and weight marks shall be affixed in such a manner as to facilitate removal upon final assembly without damage to the coating system.

Qualification of Field Touchup Painting Contractors: All painting contractors and painting subcontractors used for all field touchup painting must be certified by the SSPC Painting Contractor Certification Program (PCCP), QP-1, entitled "Standard Procedure for Evaluating Qualifications of Painting Contractors: Field Application to Complex Structures" at the time of field touchup coating application. This certification must be full and not interim. The painting contractors or subcontractors must remain so certified for the duration of the field coating application. If a contractor's or subcontractor's certification expires, the painting firm will not be allowed to perform any work until the certification is reissued. Requests for extension of time for any delay to the completion of the project due to an inactive certification will not be considered and liquidated damages will apply.

Quality Control Inspection of Field Touchup Painting: The contractor performing field touchup painting of the structural steel shall have a written quality control (QC) program. A copy of the QC program and record keeping procedures shall be provided to the Engineer prior to commencing any surface preparation or coating application. The program shall contain, but not be limited to, the following:

1. Qualifications of QC staff.
2. Authority of QC staff. QC staff must have the authority to stop non-conforming work.
3. Procedure for QC staff to advise operation supervisor, in writing, of non-conforming work.
4. Sample copy of QC inspection reports that will document compliance with specification.
5. Procedure for calibrating inspection equipment and recording calibration.
6. Procedure for repairing defective coating applications.

The Contractor shall provide at least one Coating Inspector who is Certificated and peer reviewed with the National Association of Corrosion Engineers (NACE) for the duration of the field application to provide Quality Control. The QC Inspector shall verbally inform the Engineer on a daily basis, of the progress and any corrective actions performed on the coating work. The QC Inspector shall be present during all cleaning and coating operations.

The Contractor shall be responsible for purchasing and providing the latest version of the NACE Coating Inspector Log Book(s) and all necessary inspection tools. The Contractor's QC Inspector shall stamp the front page of each inspector's log book used during painting operations. The stamped book(s) shall indicate the inspector's NACE certification number, certification expiration date and shall also be signed. All daily coating activity shall be recorded in the Log Book. Copies of the log entries shall be provided on a daily basis to the Department's Quality Assurance (QA) field representative. Upon completion of the coating, the log book(s) shall then be furnished to the Department's QA field representative.

Field Touch-Up Painting of Shop applied coating: The field applied coating for touchup painting shall be the same system used in the shop applied application. Field application of coatings shall be in accordance with the manufacturer's written application guidelines and these specifications. All areas cleaned to bare metal must be coated with zinc-rich primer before any visible rusting occurs. The intermediate and topcoat material for field touch-up painting shall be from the same lot and batch used in the shop provided its shelf life has not expired. If the shelf life has expired, the same material of the same color from a different lot and batch shall be used.

After all concrete is placed and the forms are removed, all rust, scale, dirt, grease, concrete splatter and other foreign material shall be completely removed from all painted surfaces. All surfaces to be field painted shall also be cleaned by solvent cleaning in accordance with SSPC-SP 1, hand tool cleaning SSPC-SP 2, and power tool cleaning SSPC-SP 3 and SSPC-SP 11. Areas cleaned to SSPC-SP 11 must have a 1-3 mil profile and must be primed prior to rusting. All debris generated from cleaning operations must be contained and properly disposed of by the Contractor.

Bolts, nuts, washers and surrounding areas shall receive brush applications of intermediate and topcoat after final tensioning. Careful attention shall be given to bolted connections to insure that all bolts, nuts and washers are fully coated and that no gaps are left unfilled and uncoated.

Field welds and surrounding areas shall be treated in the same manner as shop welded areas, including special treatment requirements.

Damage to the coating system that extends to the steel surface (such as scratches, gouges or nicks), shall have the entire three-coat system locally reapplied after power tool cleaning to bare metal in accordance with SSPC-SP 11. The coating system adjacent to the damage shall be feathered back to increase the surface area for touch up painting. The area cleaned to SSPC-SP 11 shall be primed with a zinc-rich primer before rusting occurs.

Damage to the coating system that extends back only to the prime or intermediate coat, shall only have the topcoat applied. Application of the touch-up materials in these damaged areas shall be performed by brush only.

General: The word "PAINTED", followed by the month and year the painting of the structure is completed along with the ConnDOT Project Number and the manufacturer's abbreviations for each of the three coats, shall be stenciled on the inside of a fascia girder at mid-depth of the girder in three (3) inch high block letters located near the abutment, so as to be clearly visible from the ground below. Paint for stenciling information shall be of a contrasting color and be compatible with the topcoat.

Article 6.03.05 – Basis of Payment: Add the following at the end of the second paragraph: Payment for either method for structural steel, complete in place, shall also include painting, equipment, tools and labor incidental thereto.

ITEM #0603729A - LOCALIZED PAINT REMOVAL AND FIELD PAINTING OF EXISTING STEEL

Description: Work under this item shall consist of paint removal and field painting of the existing steel at designated areas. The work shall include containments, paint removal, collection of paint and associated debris, surface preparation and field painting. Designated areas include: areas specifically designated on the plans and those areas where construction activities required the removal of the existing coatings to accomplish other contract work (i.e., arc gouging, welding, etc.). The paint removal is required because of the possible presence of hazardous paint (e.g., containing lead or other hazardous metals). The paint removal is required to comply with OSHA and DEEP (Department of Energy and Environmental Protection) regulations.

Privately-owned utilities, bridge rails, stay-in-place forms, fences, elastomeric bearing pads and bronze components shall be protected from damage by surface preparation and painting operations and are not to be painted.

Contractor - Subcontractor Qualifications: Contractors and subcontractors doing this work are required to be certified by the SSPC Painting Contractor Certification Program (PCCP) to QP-1 entitled “Standard Procedure for Evaluating Qualifications of Painting Contractors: Field Application to Complex Structures”. When the work involves the disturbance of lead-containing paint, the contractor and subcontractor are also required to be certified to SSPC QP-2 “Standard Procedure for Evaluating the Qualifications of Painting Contractors to Remove Hazardous Paint”. The certification(s) must be kept current for the duration of the work. If a contractor’s or subcontractor’s certification expires, the firm will not be allowed to do any work related to this item until the certification is reissued. Requests for extension of time for delay to the completion of the project due to an inactive certification will not be considered and liquidated damages will apply. In addition, if any recoat times are exceeded, the effected areas shall be cleaned to SSPC-SP 15 and coatings reapplied in accordance with these specifications at no additional cost to the State.

Submittals: A minimum of 20 calendar days before starting any paint removal, surface preparation and coating application work, the contractor shall submit the following to the Engineer for acceptance:

- A copy of the firm’s written Quality Control Program used to control the quality of surface preparation and coating application including ambient conditions, surface cleanliness and profile, coating mixing, dry film thickness, final film continuity, etc.
- A copy of the firm’s written surface preparation and application procedures. This written program must contain a description of the equipment that will be used for surface preparation, including the remediation of soluble salts, and for paint mixing and application. Coating repair procedures shall be included.
- A detailed description of the contractor’s enforcement procedures and the authority of personnel.
- Containment plans (paint removal/collection of debris, surface preparation, coating applications, coating applications with heat, etc.).

- If the application of heat is proposed for coating application purposes, provide information on the heat containment and procedures that will be used, with data sheets for the equipment. **Note:** If heat is used for coating operations, the heat and containment must be maintained to provide the required temperatures for the duration of the **cure** period.
- Proof of SSPC-QP1 qualifications and QP2 qualifications, as applicable.
- Proof that the finish coat complies with the color and gloss retention performance criteria of SSPC Paint 36, Level 3, for accelerated weathering.
- Coating product information, including coating manufacturer, product name, application instructions, technical data, MSDS and color chips.

The Contractor shall not begin paint removal Work until the Engineer has accepted the submittals. The Contractor shall not construe Engineer acceptance of the submittals to imply approval of any particular method or sequence for conducting the Work, or for addressing health and safety concerns. Acceptance of the programs does not relieve the Contractor from the responsibility to conduct the Work in strict accordance with the requirements of Federal, State, or local regulations, this specification, or to adequately protect the health and safety of all workers involved in the project and any members of the public who may be affected by the project. The Contractor remains solely responsible for the adequacy and completeness of the programs and work practices, and adherence to them.

Materials: The paint shall be one of the following two coat systems:

Carbomastic 15	
Carbothane 134 HS, manufactured by:	Carboline 2150 Schuetz Road St. Louis, MO 63146 (800) 848-4645

Epoxy Mastic Aluminum II	
Acrolon 218 HS, manufactured by:	Sherwin Williams 425 Benton Street Stratford, CT 06615 (203) 377-1711 (800) 474-3794

Carbomastic 90	
Carbothane 134 HS, manufactured by:	Carboline 2150 Schuetz Road St. Louis, MO 63146 (800) 848-4645

All materials for the complete coating system shall be furnished by the same coating material manufacturer with no subcontracted manufacturing allowed. Intermixing of materials within and between coating systems will not be permitted. Thinning of paint shall conform to the manufacturer's written recommendations. The coating thickness shall be in accordance with the

Manufacturer's printed instructions. All components of the coating system and the mixed paint shall comply with the Emission Standards for Volatile Organic Compounds (VOC) stated in the Connecticut Department of Energy and Environmental Protection's Administration Regulation for the Abatement of Air Pollution, Section 22a-174-20(s).

Control of Materials: A Materials Certificate will be required for the selected paint system in accordance with Article 1.06.07, confirming the conformance of the paint to the requirements set forth in these specifications. The coating thickness shall be in accordance with the Manufacturer's printed instructions. The selected Topcoat shall conform (as close as possible) in color to the existing topcoat.

Note: If any of the above and/or following stipulated contract specifications differ from those of the manufacturer's recommended procedures or ranges, the more restrictive of the requirements shall be adhered to unless directed by the Engineer in writing.

Construction Methods: All Contractor activities associated with the work described and specified herein shall be conducted in accordance with all applicable Federal, State of Connecticut and local safety regulations and guidelines.

Quality Control Inspections: The Contractor shall perform first line, in process Quality Control (QC) inspections. The Contractor shall implement a Quality Control Program accepted by the Engineer, including written daily reports, that ensures that the work accomplished complies with these specifications. All Quality Control Reports must be reviewed and signed by either a NACE Coating Inspector Level 2 - Certified (must have completed sessions I, II and III) or SSPC – BCI Level I Inspector (Minimum qualifications). Copies of these reports shall be provided daily to the Engineer. Contractor QC inspections shall include, but not be limited to the following:

- Suitability of protective coverings and containments
- Ambient conditions
- Surface preparation (solvent cleaning or hand/power tool cleaning)
- Coating application (mixing, thinning, and wet/dry film thickness)
- Recoat times and cleanliness between coats
- Coating continuity (freedom from runs, sags, pinholes, shadow-through, skips, misses, etc.)
- Final film acceptance

Limits of Paint Removal and Field Painting: Prior to applying the heat of welding equipment to localized areas of existing steel superstructures, the existing paint shall be removed to a width of 6 inches from wherever the heat will be applied, or as directed by the Engineer. The locations of the paint removal and field painting shall be reviewed and accepted by the Engineer prior to commencement of the work. Such acceptance by the Engineer does not relieve the Contractor of his responsibility for complying with applicable OSHA and DEEP regulations.

Containment for Paint Removal and Collection of Debris: The containment(s) shall be designed and erected to contain, as well as facilitate the collection of debris from the paint removal operations. Drawings and details of the containment(s) shall be submitted to the Engineer for

review and comments prior to any paint removal. Review of the containment by the Engineer shall in no way relieve the Contractor of his responsibility for the containment. The containment shall conform to the requirements found within the SSPC Guide 6. The class of the containment shall be a minimum of Class 3P, modified to include paragraphs A through C:

- A. The containment materials shall be air and water impenetrable and fire resistant.
- B. With the exception of the entryways, all seams in the containment enclosure shall be lapped a minimum of 24 inches and shall be tied off at intervals not to exceed 18 inches.
- C. All attachments to bridge parapets and/or the underside of the bridge deck shall be sealed to prevent the escape of dust and debris

The above specified containment must be utilized for **all** paint removal and collection of debris operations. The containment must remain in place until all associated debris has been collected.

Storage and Disposal of Collected Debris: All of the debris resulting from the paint removal operations shall be contained and collected. Debris within containment enclosures shall be removed by HEPA vacuum collection prior to disassembly of the enclosures. All the debris, rust and paint chips shall be stored in leak proof storage containers at the project site. Debris storage shall be in accordance with Connecticut Hazardous Waste Management Regulations. The storage containers and storage locations shall be reviewed by the Engineer and shall be located in areas not subject to ponding. Storage containers shall be placed on pallets and closed and covered with tarps at all time except during placement, sampling, and disposal of the debris.

Prior to generation of any hazardous waste, the Contractor shall notify the Engineer of its selected hazardous waste transporter and disposal facility. The Contractor must submit to the Engineer: (1) the transporter's current U.S DOT Certificate of Registration and (2) the transporter's current Hazardous Waste Transporter Permits for the State of Connecticut, the hazardous waste destination state and any other applicable states. The Engineer will then obtain an EPA ID number that will be forwarded to the contractor. Any changes in transporter or facility shall be immediately forwarded to the Engineer for review.

The Contractor shall conform to the latest requirements of the Hazardous Waste Management Regulations prepared by the DEEP's Hazardous Waste Management Section, subject to regulations of Section 22a-449(c) of the Connecticut General Statutes.

Disposal of the debris shall be in strict conformance with all Federal E.P.A. and DEEP regulations for hazardous materials.

All necessary forms, including the "Uniform Hazardous Waste Manifest" obtained from the Hazardous Waste Management Section of DEEP, must be filled out, approved and signed by the Department's Project Engineer (Construction), and appropriate copies returned to the Department's Division of Environmental Compliance.

A licensed hazardous waste transporter and a licensed hazardous waste treatment/disposal facility must be secured from lists available from the DEEP and approved by the Department's Division of Environmental Compliance.

The Contractor is liable for any fines, costs, or remediation costs incurred as a result of their failure to be in compliance with this special provision and all Federal, State and Local laws.

Paint Removal/Surface Preparation: The existing structural steel shall be power tool cleaned according to SSPC-SP 15 “Commercial Grade Power Tool Cleaning.” The power tools (needle guns, grinders, etc.) shall be equipped with HEPA vacuum attachments. Before the power tool cleaning, all dissolvable foreign matter, such as oil, grease, and dust shall be removed by wiping or scrubbing the surface with rags or brushes wetted with solvent in accordance with the provisions of SSPC-SP 1 “Solvent Cleaning.” Clean solvent and clean rags or brushes shall be used for the final wiping. The cleaned surface shall be accepted by the Engineer. If the surface is determined to meet the requirements of SSPC-SP 15, painting operations can commence.

Note: Chemical stripping and abrasive blast cleaning will not be permitted.

Existing Steel Surfaces to be Painted: After the designated areas have been inspected and accepted according to the surface preparation specification, SSPC SP 15, the steel surfaces which are to receive the field touch up paint shall be cleaned immediately prior to coating operations by wiping or scrubbing the surface with rags or brushes wetted with solvent. Use clean solvent and clean rags for the final wiping.

- Solvent must be compatible with the specified coatings. Solvent cleaned surfaces shall be primed before any detrimental recontamination or corrosion occurs. Follow manufacturer’s safety recommendations when using any solvent.
- All foreign materials such as dirt, dust, loose rust scale, sand, bird droppings, and all materials loosened or deposited on the steel surface by cleaning operations shall also be completely removed by vacuuming before any painting operations commence.
- Failure by the Contractor to properly prepare and clean surfaces to be painted in accordance with the specifications shall be cause for rejection by the Engineer. All surfaces that are rejected shall be cleaned and painted to the satisfaction of the Engineer in accordance with the specifications, at no additional cost to the State.

Application of Field Paint: The method for coating application shall be by brush and roll equipment. The containment for paint application shall consist of drop clothes and a solid platform bottom.

Storage, opening, mixing, thinning and application of the paint shall be accomplished in strict accordance with the specified contract requirements and procedures published by the paint manufacturer and supplier. The Contractor shall have at the project site, at all times, the current copies of all technical data, recommendations and procedures published by the paint manufacturer. All coatings shall be supplied in sealed containers bearing the manufacturers name, product designation, batch number and mixing/thinning instructions. Leaking containers shall not be used. Paint shall be furnished in the manufacturer's original sealed and undamaged containers. For multiple component paints, only complete kits shall be mixed and used. Partial mixing is not

allowed. The paint shall be applied to produce a uniform smooth coat without runs, streaks sags, wrinkles, or other defects.

The Contractor shall provide a suitable facility for the storage of paint, which is in accordance with the latest Federal and State regulations. This facility must provide protection from the elements and insure that the paint is not subjected to temperatures outside the manufacturer's recommended extremes. Storage for paint must be located in reasonable proximity to the painting locations. The Engineer shall be provided access to the stored paint at any time, for inspection and to witness removal of the materials. The Contractor's facility for the storage of paint is subject to the approval of the Engineer.

Ambient Conditions: No solvent cleaning just prior to coating application or coating application work shall be performed when the conditions are as follow:

- When the relative humidity is at or above 80 percent or when there is falling rain or dew present, or anticipated, before a prepared surface can be coated.
- When the substrate is damp or covered by frost or ice.
- When the surface temperature or air temperature are less than 50 degrees Fahrenheit or greater than 100 degrees Fahrenheit.
- When the surface temperatures of the steel or air are less than five (5) degrees Fahrenheit above the dewpoint temperature, as determined by a surface temperature thermometer and electric or sling psychrometer.

The Contractor is liable for any fines, costs, or remediation costs incurred as a result of his failure to be in compliance with this special provision and all federal, state, and local laws.

Method of Measurement: This work will be measured by the actual square foot of existing steel at designated areas where paint was removed, surfaces cleaned, re-painted and accepted. **Note:** In some instances when **new steel** is being added to the designated areas where the paint was removed, the removal area may not equal the area to be re-painted. Measurement in these cases will be by the actual s.f. of existing steel where the paint was removed and accepted.

Basis of Payment: This work will be paid for at the unit price per square foot for "Localized Paint Removal and Field Painting of Existing Steel," complete in place, which price shall include all materials, containments, collection and disposal of non-hazardous debris, containers, equipment, tools, labor, heating devices, services of the technical advisor and for any incidental work. No direct payment will be made for the cost of storage or hauling the paint and other materials, including paint chips and associated debris, to and/or from the bridge site, but the cost thereof shall be included in the contract unit price.

Pay Item
Localized Paint Removal and Field Painting Of Existing Steel

Pay Unit
S.F.

ITEM #0707200A GEOGRID

Description: This work shall consist of furnishing material and placement of geogrids, in accordance with these specifications and in reasonable close conformity to the lines, grades, and dimensions shown on the plans or as directed by the Engineer.

Materials: Materials shall conform to the following requirements.

The geogrid shall be a regular biaxial network of integrally connected polymer tensile elements with aperture geometry sufficient to permit significant mechanical interlock with the surrounding soil. The polymer shall be either a polypropylene (PP), a polyethylene (HDPE), or a polyester (PET). The geogrid structure shall be dimensionally stable and able to retain its geometry under manufacture, transport, and installation.

The geogrid shall have certified properties as shown on Table 1. The Contractor shall submit a manufacturer's certification that the geogrid supplied meets the requirements as shown on Table 1, measured in full accordance with all test methods and standards specified, as set forth in these specifications, and in conformance with Article 1.06.07.

Geogrid Type	Property	Test Method	Criteria
All Polymers	Long Term Allowable Tensile Strength (T_{all})	GRI:GG4, where $T_{all} = T_{ult} / (RF_{CR} * RF_{ID} * RF_D)$	Min. 375 lbs/ft (Biaxial)
Polyester	Geogrid Rib Tensile Strength (T_{ult})	GRI:GG1	Min. 908 lbs/ft
Polypropylene	Geogrid Rib Tensile Strength (T_{ult})	GRI:GG1	Min. 1816 lbs/ft
Polyethylene	Geogrid Rib Tensile Strength (T_{ult})	GRI:GG1	Min. 1133 lbs/ft
Polyester	Creep Reduction Factor (RF_{CR})	ASTM D 5262	Min. 2.0
Polypropylene	Creep Reduction Factor (RF_{CR})	ASTM D 5262	Min. 4.0
Polyethylene	Creep Reduction Factor (RF_{CR})	ASTM D 5262	Min. 2.5
All Polymers	Installation Damage Reduction Factor (RF_{ID})	ASTM D 5818	Min. 1.1

Table 1 (cont.)

Geogrid Type	Property	Test Method	Criteria
Polyester	Durability Reduction Factor (RF _D)	Hydrolysis Degradation Testing (extrapolated to 100yrs)	Min. 1.1
Polypropylene and Polyethylene	Durability Reduction Factor (RF _D)	Oxidation Degradation Testing (extrapolated to 100yrs)	Min. 1.1

The geogrid reinforcement shall be manufactured with a high degree of quality control. The Manufacturer is responsible for establishing and maintaining a quality control (QC) program to ensure compliance with the requirements of the specification. The purpose of the QC testing program is to verify that the reinforcement geogrids being supplied to the project is representative of the material used for performance testing and approval by the department.

Conformance testing shall be performed as part of the manufacturing process and may vary for each type of product. As a minimum the following index test shall be considered as applicable for an acceptable QA/QC program: Specific Gravity (HDPE only, ASTM D-1505); Wide Width Tensile (GRI:GG1); Melt Flow (HDPE and PP only, ASTM D-1238); Intrinsic Viscosity (PET only, ASTM D-4603); Carboxyl End Group (PET only, ASTM D-2455).

Sampling and conformance testing shall be in accordance with ASTM D-4354. Conformance testing procedures shall be established as noted in the specification. Geogrid product acceptance shall be based on ASTM D-4759.

The quality control certificate shall include roll number and identification, sampling procedures, and results of control test (including a description of test methods used).

Construction Methods: The Contractor shall insure that during all periods of shipment and storage, the geogrid material is protected from mud, dirt, all deleterious materials that might become affixed to the geogrids or geocomposite, and temperatures greater than 140°F. Follow manufacturer's recommendations with regards to protection from direct sunlight. At the time of installation, the geogrid shall be free of any defects, including, but not limited to tears, punctures, flaws, deterioration, or any damage due to manufacture, transportation, and storage.

All areas beneath the installation area for the geogrid reinforcement shall be properly prepared as detailed on the plans, specified within this specification, or as directed by the Engineer. All excavation required for construction of the slope shall conform to Article 2.02. Subgrade surfaces shall be level. The subgrade surface shall also be free from frozen soil. Benching the backcut into competent soil shall be performed as shown on the plans or as directed by the Engineer and in conformance with Subarticle 2.02-5, paragraph 3, so as to ensure stability.

The geogrid shall be installed in accordance with the plans, specifications, and manufacturer's recommendation, or as directed by the Engineer.

The geogrid reinforcement shall be placed in continuous 4 foot wide strips. If the Contractor is unable to complete a required length with a single continuous length of geogrid, joints may be made with the Engineer's approval. The joints shall be made for the full 4 foot width of the strip by using a similar material with similar strength. Joints may not be used for the purpose of utilizing geogrid that are less than 4 foot in width. Joints in geogrid reinforcement shall be pulled and held taut during placement of fill. The minimum length of geogrid placed shall be 6 feet. Adjacent, overlying, and underlying rolls of geogrid shall not have a joint within 6 feet of each other.

Place only that amount of geogrid reinforcement required for immediately pending work to prevent undue damage.

Geogrid reinforcement shall be placed to lay flat and pulled tight prior to backfilling. After a layer of geogrid reinforcement has been placed, suitable means, such as pins or small piles of soil, shall be used to hold the geogrid reinforcement in position until the subsequent soil layer can be placed.

During construction, the surface of the fill should be kept approximately horizontal. Geogrid reinforcements are to be placed within 3 inches of the design elevation view unless otherwise directed by the Engineer. The Contractor shall verify correct orientation of the geogrid reinforcement.

Tracked construction equipment shall not be operated directly upon the geogrid reinforcement. A minimum fill thickness of 6 inches is required prior to operation of tracked vehicles over the geogrid reinforcement. Turning of tracked vehicles should be kept to a minimum to prevent tracks from displacing the fill and the geogrid reinforcement.

The Engineer may allow rubber tired equipment to pass over the geogrid reinforcement at speeds less than 10 mph. Sudden braking and sharp turning shall be avoided.

Method of Measurement: This work will be measured for payment by the actual number of square yards of the type indicated on the plans or authorized by the Engineer. Geogrid specifically included in the payment of another item will not be measured for payment under this item. No additional measurement will be made for necessary lap material.

Basis of Payment: This work will be paid for at the contract unit price of "Geogrid", complete in place, which price shall include all materials, labor, tools and equipment incidental and necessary for installation and removal if necessary.

Pay Item
Geogrid

Pay Unit
S.Y.

ITEM #0714050A - TEMPORARY EARTH RETAINING SYSTEM

Description: Temporary earth retaining system shall be any type of adequately braced temporary retaining wall such as temporary sheet piling which the Contractor elects to build to satisfy, and which does satisfy, the condition that existing facilities be properly retained during excavation or fill for the placement of substructure or other facilities. Temporary earth retaining system shall be designed by the Contractor and constructed where shown on the plans. This system shall be removed upon completion of the permanent work, except that some sections may be left in place when so ordered by the Engineer.

Materials: Materials of steel sheet piling shall conform to the requirement of ASTM A 328. Timber sheet piling shall conform to the requirements of Subarticle M.09.01-1. Materials other than steel or timber, or a combination of these may be used provided they are properly designed for the purpose intended. Systems utilizing other material(s) shall conform to the manufacturer's specifications and project specifications. The parts list shall be furnished for the proprietary system and the Contractor shall provide the material certificates for the parts.

Construction Methods: Temporary earth retaining system shall be safely designed and shall be carried to adequate depths and braced as necessary for proper performance of the work. Construction shall be such as to permit excavation or fill as required. Interior dimensions shall be such as to give sufficient clearance for construction of forms and their inspection and for battered pile clearance when necessary. Movements of the system or bracing which prevent the proper completion of the substructure shall be corrected at the sole expense of the Contractor. No part of the temporary earth retaining system or bracing shall be allowed to extend into the substructure without written permission of the Engineer.

Working drawings and design calculations for temporary earth retaining system shall be submitted in accordance with the requirements of Article 1.05.02(2). The working drawings and design calculations shall be prepared, sealed, and signed by a Professional Engineer, licensed in the State of Connecticut. The furnishing of such plans shall not serve to relieve the Contractor of any part of his responsibility for the safety of the work or for the successful completion of the project.

Unless otherwise ordered by the Engineer, all parts of the temporary earth retaining system shall be removed upon completion of the work for which it was provided. The excavation shall be backfilled and properly compacted, prior to removal of the system unless otherwise permitted by the Engineer. Temporary earth retaining system may be left in place at the option of the Contractor if so permitted by the Engineer, provided that it is cut off at an elevation as directed by the Engineer and the cutoffs removed from the site.

Method of Measurement: Temporary earth retaining system will be measured for payment by the number of square feet of temporary retaining wall completed and accepted, as computed from the horizontal and vertical payment lines shown on the plans or as ordered. If no payment limits are shown on the plans, the limits used for payment will be the actual horizontal limit of temporary earth retaining system installed and accepted, and the vertical limit as measured from

the bottom of the exposed face of the wall system to the top of the retained earth behind the system. The measurement for temporary earth retaining system which is used as a common wall for staged construction will be the horizontal payment limit shown on the plans and the greater vertical dimension of the common wall face.

No measurement will be made of end extensions or returns necessary for the safety of the retained facility. Earth retaining system ordered left in place by the Engineer shall be measured in accordance with "Earth Retaining System Left in Place."

Earth retaining systems left in place solely at the Contractor's option, and with the Engineer's permission, will not have an additional payment at the contract unit price per square foot for "Earth Retaining System Left in Place."

Basis of Payment: Payment for this work will be made at the contract unit price per square foot for "Temporary Earth Retaining System" measured as described above, which price shall include all design, materials, equipment and labor incidental to the construction and removal of the temporary earth retaining system required at the locations specified on the plans; including removal of obstructions, repair and correction, adjustments or reconstruction required by the plans. Any common earth retaining system required for staged construction will be measured for payment only once.

<u>Pay Item</u>
Temporary Earth Retaining System

<u>Pay Unit</u>
S.F.

ITEM #0714999A MONITORING STRUCTURES

General:

Work under this item shall consist of furnishing all necessary labor, equipment, tools and materials to perform all operations related to settlement monitoring of bridges, recording all pertinent information, reducing the data and transmitting this data to the Engineer.

Materials:

The settlement monitoring points shall consist of targets that have been installed on each existing abutment of Bridge No. 1190. If a target is damaged, additional targets shall be established using the same datum as the original targets but at a new location so that the resulting target elevations cannot be confused with the original target elevations. Two targets shall be set on each structure to be monitored.

Construction Methods:

The Contractor shall use an established benchmark(s). Such benchmark(s) shall not be subject to movement and shall be a minimum of one hundred (100) feet beyond any portion of the structure to be monitored and any activity that may cause movement of the benchmark(s). The placement of survey equipment shall be such that it will not be affected by vibrations due to pile installation. When readings are taken, pile driving shall be halted and restarted after the readings are finished.

All monitoring shall be performed by qualified engineering or surveying personnel who are trained, experienced and skilled in construction survey. The personnel shall perform the work under the direct supervision of a professional surveyor currently licensed in Connecticut. All survey measurements shall be accurate to a minimum precision of one hundredth of a foot (0.01 foot).

Engineering Data Reports shall be prepared by the Contractor and shall include at a minimum the following data:

1. Date and time of readings
2. Temperature at time of readings
3. Pile installation activities (pile number and driving depth)
4. Elevation
5. Cumulative change in horizontal location and elevation from first reading
6. Change in horizontal location and elevation from the previous reading.

A new line for measurements shall be added to the report for each set of new measurements so that trends will be evident and measurements can be compared without paging through numerous sheets. Immediately after measurements are taken and elevations are computed, the elevations shall be transmitted to the Engineer. The Engineering Data Reports shall be transmitted to the Engineer for review immediately on the morning after readings are taken.

When total or differential readings of settlement exceed one-hundredth (0.01) foot for any structure, the Contractor shall immediately notify the Engineer.

The Department and the Engineer of Record shall determine whether any remedial action is required. Remedial action may consist of immediate stoppage of pile installation operations, using a lower energy hammer, and/or repair of the settling structure.

Monitoring shall be performed according to the following schedule:

Construction Activity	Frequency of Monitoring
Pile Driving	All monitoring point locations: Once at beginning, middle and end of each work day. See Note 1.

Note 1: Time intervals may be adjusted at the discretion of the Engineer dependent on settlement. Time between readings may be increased if no settlement is occurring. Time between readings may be decreased if settlement is occurring. Only the Engineer may adjust the time interval of readings.

Method of Measurement:

This work will be measured for payment by the number of days that Monitoring Structures occurs.

Basis of Payment:

Payment for this work will be at the contract lump sum for "MONITORING STRUCTURES" which price shall include all materials, tools, equipment labor and work incidental thereto including resetting of settlement monitoring points and benchmarks as necessary.

PAY ITEM

MONITORING STRUCTURES

PAY UNIT

L.S.

ITEM #0901003A - STEEL BOLLARD

Description: This item shall consist of furnishing and installing a bollard in a concrete footing, of the type specified, at the location, to the dimensions and details as shown on the plans in accordance with these specifications, or as directed by the Engineer. The purpose of the bollard is to protect a traffic control device against incidental damage from a motor vehicle.

Material: Material for this work shall conform to the following requirements:

Concrete	Article M.03.01 Class "A" Concrete.
100mm(4") Steel Post	ASTM Schedule 80.
	Galvanized in accordance with ASTM A 123.

If the steel post is not galvanized it shall be painted. Painting shall consist of one primer coat conforming to Federal Specification TT-P-615d, Type II. There shall be two finished coats of paint. The final finish coat shall conform to Federal Specification TT-E-527 Air Drying, and the color shall be traffic signal green conforming to Article M.07.01

Construction Methods: The steel post shall have an exposed length of 1.2m (4'). The post shall be installed to a depth of 0.9m(3'), set in a concrete footing of at least 455mm(18") in diameter and 455mm(18") deep. In lieu of a footing, the entire hole shall be filled with concrete. If installed in a grass area, the top 150mm (6") of the hole shall be backfilled with a comparable material.

The post shall be filled with concrete. The top shall be rounded to a convex surface. No sharp edges, burrs, threads or other defects shall be exposed.

Method of Measurement: This work shall be measured for payment by the number of steel bollards installed and accepted in place.

Basis of Payment: This work will be paid for at the contract unit price each for "Steel Bollard", which price shall include the steel post, concrete footing, painting, all necessary tools, equipment and labor required for installation. Concrete sidewalk shall be paid for at the contract "Square Foot" price.

ITEM #913952A – PROTECTIVE FENCE (5' HIGH)

Description: Work under this item shall consist of furnishing and installing chain link protective fencing in accordance with the details shown on the plans or as ordered and in conformance with these specifications.

Materials: The Contractor shall provide Materials Certificates and Certificates of Compliance in accordance with article 1.06.07 for all materials conforming to ASTM A53 (E or S, Grade B) and AASHTO M181.

Materials for this work shall conform to the following:

1. Fabric: The fabric shall be aluminum coated steel woven wire of the chain link type. It shall be No. 9 gage wire woven to form a two inch mesh. The chain link fabric shall conform to the requirements of AASHTO M181 for Type II Aluminum Coated Steel Fabric except that the fabric selvage shall be knuckled at the top and bottom.
2. Posts and Rails: Metal posts and rails shall be standard steel pipe conforming to the requirements of ASTM A53 (E or S, Grade B) or with AASHTO M181, Grade 2, all to be galvanized in conformance with Subarticle M.10.05-2.
3. Base Plates: Base plates shall conform to ASTM A36 and be galvanized in conformance with Subarticle M.10.05-2.
4. Fittings: Fittings shall conform to AASHTO M181 Sections 29-36 and shall be of the fabricator's standard design. All except the stretcher bars shall be galvanized in accordance with ASTM A153. The stretcher bars shall be galvanized in conformance with ASTM A123.
5. Wire Clamps and Wire Ties: All clamps and wire ties shall conform to the requirements of Subarticle M.10.05-4.
6. Galvanizing Compound: Galvanizing compound shall be in conformance with the requirements of Federal Specification TT-P-641b or Military Specification MIL-P-21035.
7. Preset anchorages and hardware shall conform to the requirements as shown on the plans.

Construction Methods: The protective fence shall be accurately fabricated in accordance with the plans.

The protective fence shall be installed in accordance with the details shown on the plans. The posts shall be placed plumb with the rails set parallel to the top of the parapets. The fabric shall be stretched tightly between end posts and securely fastened with stretcher bar bands. The fabric shall be attached to the rails and line posts as shown on the plans.

Dome caps shall be installed on the ends of all posts.

Galvanized areas damaged during shipment, storage and installation shall be given two coats of galvanizing compound.

Shop Drawings: Prior to fabricating any materials, the Contractor shall submit shop drawings to the Engineer for approval in accordance with Article 1.05.02(b). These drawings shall include but not be limited to the following information: the layout plan showing all rail posts locations, fence details, preset anchorage details, cut angle for post bottoms to ensure plumbness, material lists and material designations.

Method of Measurement: This work will be measured by payment by the number of linear feet of completed and accepted Protective Fence (5' High) measured horizontally as shown on the plans.

Basis of Payment: This work will be paid for at the contract unit price per linear foot for Protective Fence (5' High) complete in place, which price shall include all materials, equipment, tools and labor incidental thereto.

ITEM #0921001A CONCRETE SIDEWALK

Concrete sidewalks shall be constructed in accordance with Article 9.21, supplemented as follows:

Article 9.21.01 - Description: Add the following:

This item shall include furnishing and installing Detectable Warning Strips in the locations and to the dimensions and details shown on the plans or as directed by the Engineer.

Article 9.21.02 – Materials: Add the following:

The Detectable Warning Strip, for new construction, shall be chosen from the Department's Qualified Products Lists. The tile shall conform to the dimensions shown on the plans Manufacturer's specifications and have a brick red homogeneous color throughout in compliance with Federal Standard 595A Color #22144 or approved equal.

Article 9.21.03 – Construction Methods: Add the following:

The Detectable Warning Strip, for new construction, shall be set directly in poured concrete according to the plans and the Manufacturer's specifications and details. The flanges shall be embedded in wet concrete so that after the concrete is cured the surface of the detectable warning strip does not project above the adjacent concrete surface. The Contractor shall place two 25-pound concrete blocks or sandbags on each tile to prevent the tile from floating after installation.

The detectable warning strip shall be installed 6" from the edge of road along the full width of the ramp. The rows of truncated domes in a detectable warning surface shall then be aligned to be perpendicular or radial to the grade break between the ramp, landing, or blended transition and the street.

Article 9.21.04 - Method of Measurement: Add the following:

The Detectable Warning strip will not be measured for payment. All materials, equipment, tools and labor incidental thereto shall be included in the Bid price for Concrete Sidewalk.

ITEM #0950019A – TURF ESTABLISHMENT - LAWN

Description: The work included in this item shall consist of providing an accepted stand of grass by furnishing and placing seed as shown on the plans or as directed by the Engineer.

Materials: The materials for this work shall conform to the requirements of Section 9.50 of Standard Specification Form 816. The following mix shall be used for this item:

Turf Seed Mix:

In order to preserve and enhance the diversity, the source for seed mixtures shall be locally obtained within the Northeast USA including New England, New York, Pennsylvania, New Jersey, Delaware, or Maryland. One approved seed mixture is detailed below. Other proposed mixtures must be approved by the Conn DOT Landscape Design office.

<u>Proportion (Percent)</u>	<u>Species Common name</u>	<u>Scientific name</u>
25	Abbey Kentucky Bluegrass	Poa pratensis
15	Envicta Kentucky Bluegrass	Poa pratensis
25	Pennlawn Red Fescue	Festuca rubra
15	Ambrose Chewing Fescue	Festuca rubra
20	Manhattan Ryegrass	Lolium perenne

Construction Methods: Construction Methods shall be those established as agronomically acceptable and feasible and that are approved by the Engineer. Rate of application shall be field determined in Pure Live Seed (PLS) based on the minimum purity and minimum germination of the seed obtained. Calculate the PLS for each seed species in the mix. Adjust the seeding rate for the above composite mix, based on 250 lbs. (274 kg.) per acre (hectare). The seed shall be mulched in accordance with Article 9.50.03.

Method of Measurement: This work will be measured for payment by the number of square yards (square meters) of surface area of accepted established grasses as specified or by the number of square yards (square meters) of surface area of seeding actually covered and as specified.

Basis of Payment: This work will be paid for at the contract unit price per square yard (square meters) for “Turf Establishment - Lawn” which price shall include all materials maintenance, equipment, tools, labor, and work incidental thereto. Partial payment of up to 60% may be made for work completed, but not accepted.

<u>Pay Item</u>	<u>Pay Unit</u>
Turf Establishment – Lawn	S.Y. (S.M.)

ITEM #0952001A – SELECTIVE CLEARING AND THINNING

Section 9.52 is amended as follows:

Article 9.52.03 – Construction Methods is supplemented as follows:

Where directed by the Engineer, materials to be cut, trimmed or removed shall be those items that restrict visibility to an extruded aluminum sign to less than 800 ft. The entire sign will be visible for 800 ft measured from the center of the right-travel lane approaching the sign, as viewed from a 3.5 ft height above the roadway.

All trees scheduled to be removed shall be visibly marked or flagged by the Contractor at least seven days prior to the cutting of such trees.

The Engineer will inspect the identified trees and verify the limits of clearing and thinning prior to the Contractor proceeding with his cutting operation.

ITEM # 0969062A - CONSTRUCTION FIELD OFFICE, MEDIUM

Description: Under the item included in the bid document, adequate weatherproof office quarters will be provided by the Contractor for the duration of the work, and if required, for a maximum of ninety days thereafter for the exclusive use of ConnDOT forces and others who may be engaged to augment ConnDOT forces with relation to the contract. The office quarters shall be located convenient to the work site and installed in accordance with Article 1.08.02, this office shall be separated from any office occupied by the Contractor. Ownership and liability of the office quarters shall remain with the Contractor.

Materials: Materials shall be in like new condition for the purpose intended and shall be approved by the Engineer.

Office Requirements: The Contractor shall furnish the office quarters and equipment as described below.

	Description:
400 SF	Sq. Ft. of floor space with a minimum ceiling height of 7 ft. and shall be partitioned as shown on building floor plan as provided by the Engineer.
2 EA	Minimum number of exterior entrances.
7 EA	Minimum number of parking spaces.

Office layout: The office shall have a minimum square footage as indicated in the table above, and shall be partitioned as shown on building floor plan as provided by the Engineer. The underside of the office shall be fully skirted to the ground.

Lavatory Facilities: The Contractor shall furnish lavatory and toilet facilities at a location convenient to the office quarters for the use of Department personnel and such assistants as they may engage. He shall also supply lavatory and sanitary supplies as required.

Windows and Entrances: The windows shall be of a type that will open and close conveniently, shall be sufficient in number and size to provide adequate light and ventilation, and shall be fitted with locking devices, blinds and screens. The entrances shall be secure, screened, and fitted with a lock for which four keys shall be furnished. All keys to the construction field office shall be furnished to the Department and will be kept in their possession while State personnel are using the office. Any access to the entrance ways shall meet applicable building codes and be slip resistant, with appropriate handrails.

Lighting: The Contractor shall equip the office interior with electric lighting that provides a minimum illumination level of 100 foot-candles at desk level height, and electric outlets for each desk and drafting table. The Contractor shall also provide exterior lighting that provides a minimum illumination level of 2 foot-candles throughout the parking area and for a minimum distance of 10 ft. on each side of the field office.

The Contractor shall provide the following additional equipment, facilities, and/or services at the Field Office on this project to include at least the following to the satisfaction of the Engineer:

Parking Facility: Adequate parking spaces with adequate illumination on a paved surface, with surface drainage if needed. If paved parking does not exist adjacent to the field office, the Contractor shall provide a parking area of sufficient size to accommodate the number of vehicles indicated in the table above. Construction of the parking area and driveway, if necessary, will consist of a minimum of 6 inches of processed aggregate base graded to drain. The base material will be extended to the office entrance.

Field Office Security: Physical Barrier Devices - This shall consist of physical means to prevent entry, such as: 1) All windows shall be barred or security screens installed; 2) All field office doors shall be equipped with dead bolt locks and regular day operated door locks; and 3) Other devices as directed by the Engineer to suit existing conditions.

Electric Service: The field office shall be equipped with an electric service panel to serve the electrical requirements of the field office, including: lighting, general outlets, computer outlets, calculators etc., and meet the following minimum specifications:

- A. 120/240 volt, 1 phase, 3 wire.
- B. Ampacity necessary to serve all equipment. Service shall be a minimum 100 amp dedicated to the construction field office.
- C. The electrical panel shall include a main circuit breaker and branch circuit breakers of the size and quantity required.
- D. Additional 120 volt, single phase, 20 amp, isolated ground dedicated power circuit with dual NEMA 5-20 receptacles will be installed at each computer workstation location.
- E. Additional 120 volt, single phase, 20 amp, isolated ground dedicated power circuit with dual NEMA 5-20 receptacles will be installed, for use by the Telephone Company.
- F. Additional 120-volt circuits and duplex outlets as required meeting National Electric Code requirements.
- G. One exterior (outside) wall mounted GFI receptacle, duplex, isolated ground, 120 volt, straight blade.
- H. After work is complete and prior to energizing, the State's ConnDOT electrical inspector, must be contacted at 860-594-2240. (Do Not Call Local Town Officials)
- I. Prior to field office removal the ConnDOT Data Communications office must be notified to deactivate the communications equipment.

Heating, Ventilation and Air Conditioning (HVAC): The field office shall be equipped with sufficient heating, air conditioning and ventilation equipment to maintain a temperature range of 68°-80° Fahrenheit within the field office.

The Following Furnishings and Equipment Shall Be Provided In The Applicable Field Office Type:

Qty	Description:
3 EA	Office desks (2.5 ft x 5 ft) with drawers, locks, and matching desk chairs that have

Qty	Description:
	pneumatic seat height adjustment and dual wheel casters on the base.
2 EA	Office Chairs.
1 EA	Fire resistant cabinets (legal size/4 drawer), locking.
1 EA	Drafting type tables (3 ft x 6 ft) and supported by wall brackets and legs; and matching drafters stool that have pneumatic seat height adjustment, seat back and dual wheel casters on the base.
2 EA	Personal computer tables (4 ft x 2.5 ft).
1 EA	Hot and cold water dispensing unit and supply of cups and bottled water shall be supplied by the Contractor for the duration of the project.
2 EA	Electronic office type printing calculators capable of addition, subtraction, multiplication and division with memory and a supply of printing paper.
2 EA	Telephone.
1 EA	Telephone answering machine.
1 EA	Plain paper facsimile (FAX) machine capable of transmitting via telephone credit card. All supplies, paper and maintenance shall be provided by the Contractor.
1 EA	Copier/Scanner - dry, plain paper with automatic feeder and reducing capability. All supplies, paper and maintenance shall be provided by the Contractor.
2 EA	Computer systems as specified below under <u>Computer Hardware and Software</u> . All supplies and maintenance shall be provided by the Contractor.
1 EA	Laser printer as specified below under <u>Computer Hardware and Software</u> . All supplies, paper and maintenance shall be provided by the Contractor.
2 EA	Digital Camera as specified below under <u>Computer Hardware and Software</u> . All supplies and maintenance shall be provided by the Contractor.
1 EA	Wastebaskets - 30 gal., including plastic waste bags.
3 EA	Wastebaskets - 5 gal., including plastic waste bags.
2 EA	Electric pencil sharpeners.
* EA	Fire extinguishers - provide and install type and number to meet applicable State and local codes for size of office indicated, including a fire extinguisher suitable for use on a computer terminal fire.
1 EA	Vertical plan racks for 2 sets of 2 ft x 3 ft plans for each rack.
1 EA	Infrared Thermometer, including certified calibration, case, cleaning wipes.
1 EA	Concrete Curing Box as specified below under <u>Concrete Testing Equipment</u> .
1 EA	Concrete Air Meter as specified below under <u>Concrete Testing Equipment</u> .
1 EA	Concrete Slump Cone as specified below under <u>Concrete Testing Equipment</u> .

The furnishings and equipment required herein shall remain the property of the Contractor. Any supplies required to maintain or operate the above listed equipment or furnishings shall be provided by the Contractor for the duration of the project.

Telephone Service: This shall consist of the installation of two (2) telephone lines: one (1) line for phone/voice service and one (1) line dedicated for the facsimile machine. The Contractor shall pay all charges except for out-of-state toll calls made by State personnel.

Data Communications Facility Wiring: Contractor shall install a Category 5e 468B patch panel in a central wiring location and Cat 5e cable from the patch panel to each PC station, terminating in a (category 5e 468B) wall or surface mount data jack. The central wiring location shall also house either the data circuit with appropriate power requirements or a category 5 cable run to the location of the installed data circuit. The central wiring location will be determined by the ConnDOT Data Center staff in coordination with the designated field office personnel as soon as the facility is in place. The ConnDOT Project Engineer will provide the Contractor with a copy of the current PC specifications, approved printer list and data wiring schematic as soon as possible after the contract is awarded.

Contractor to run a CAT 5e LAN cable a minimum length of 25 feet for each computer to LAN switch area leaving an additional 10 feet of cable length on each side with terminated RJ45 connectors. Each run / jack shall be clearly labeled with an identifying Jack Number.

The installation of a data communication circuit between the field office and the ConnDOT Data Communication Center in Newington will be coordinated between the ConnDOT District staff, ConnDOT Office of Information Systems and the local phone company. The ConnDOT District staff will coordinate the installation of the data communication service with ConnDOT PC Support once the field office phone number is issued. The Contractor shall provide the field office telephone number(s) to the ConnDOT Project Engineer as soon as possible to facilitate data line and computer installations.

Computer Hardware and Software:

The ConnDOT Project Engineer will provide the Contractor with a copy of the current PC specifications, approved printer list and data wiring schematic as soon as possible after the contract is awarded.

Before ordering the computer hardware and software, the Contractor must submit a copy of their proposed PC specifications and the type of printer to the ConnDOT Project Engineer for review by the ConnDOT Data Center. If the specification meets or exceeds the minimum specifications listed below, then the Contractor will be notified that the order may be placed.

Before any equipment is delivered to the Data Center, arrangements must be made a minimum of 24 hours in advance by contacting 860-594-3500. All software, hardware and licenses listed below shall be clearly labeled, specifying the (1) Project No., (2) Contractor Name, (3) Project Engineer's Name and (4) Project Engineer's Phone No., and shall be delivered to the ConnDOT Data Center, 2710 Berlin Turnpike, Newington, CT, where it will be configured and prepared for field installation. Installation will then be coordinated with ConnDOT field personnel and the computer system specified will be stationed in the Department's project field office.

The computer system furnished shall have all software and hardware necessary for the complete installation of the latest versions of the software listed, and therefore supplements the minimum specifications below. The Engineer reserves the right to expand or relax the specification to adapt to the software and hardware limitations and availability, the compatibility with current

agency systems, and to provide the Department with a computer system that can handle the needs of the project. This requirement is to ensure that the rapid changing environment that computer systems have experienced does not leave the needs of the project orphan to what has been specified. There will not be any price adjustment due to the change in the minimum system requirements.

The Contractor shall provide the Engineer with a licensed copy registered in the Department's name of the latest versions of the software listed and maintain customer support services offered by each software producer for the duration of the Contract. The Contractor shall deliver to the Engineer all supporting documentation for the software and hardware including any instructions or manuals. The Contractor shall provide original backup media for the software.

The Contractor shall provide the computer system with all required supplies, maintenance and repairs (including labor and parts) throughout the Contract life.

Once the Contract has been completed, the computer will remain the property of the Contractor. Prior to the return of any computer(s) to the Contractor, field personnel will coordinate with the Data Center personnel for the removal of Department owned equipment, software, data, and associated equipment.

A) Computer – Minimum Specification:

Processor – Intel® Core 2 Duo Processor (2.00 GHz, 800 MHz FSB 2MB L2 Cache)

Memory – 2 GB DIMM DDR2 667MHz.

Monitor – 19.0 inch LCD color monitor.

Graphics – Intel Graphics Media Accelerator 3100. or equivalent.

Hard Drive – 160 GB Ultra ATA hard drive (Western Digital, IBM or Seagate).

Floppy Drive – 3.5 inch 1.44MB diskette drive.

Optical Drive – CD-RW/DVD-RW Combo.

Multimedia Package – Integrated Sound Blaster Compatible AC97 Sound and speakers.

Case – Small Form or Mid Tower, capable of vertical or horizontal orientation.

Integrated Network Adapter – comparable to 3COM PCI 10/100 twisted pair Ethernet.

Keyboard – 104+ Keyboard.

Mouse – Optical 2-button mouse with scroll wheel.

Operating System – Windows XP Professional Service Pack 2; Windows Vista Capable.

Application Software – MS Office 2007 Professional Edition.

Additional Software (Latest Releases, including subscription services for the life of the Contract.–

- Norton Anti-Virus and CD/DVD burning software (ROXIO or NERO),
- Adobe Acrobat Standard

Resource or Driver CD/DVD – CD/DVD with all drivers and resource information so that computer can be restored to original prior to shipment back to the contractor.

Uninterrupted power supply – APC Back-UPS 500VA.

Note A1: All hardware components must be installed before delivery. All software documentation and CD-ROMs/DVD for Microsoft Windows XP Professional, Microsoft

Office 2007 Professional Edition, and other software required software must be provided. Computer Brands are limited to Dell, Gateway and HP brands only. No other brands will be accepted. The ConnDOT Project Engineer will provide the Contractor with a copy of the current PC specifications and approved printer list as soon as possible after the contract is awarded.

Note A2: As of June 30, 2008, Microsoft will no longer distribute Windows XP for retail sale, although the date for specific computer manufacturers may be different. Please consult your manufacturer for details. The Department still requires Windows XP on all PCs. Microsoft has stated that any PCs that are purchased with either Windows Vista Business, or Vista Ultimate are automatically entitled to “downgrade rights”, which allow the PC to be rolled back to Windows XP. Please consult the specific manufacturer for details on downgrading new PCs to Microsoft Windows XP after June 30, 2008.

B) Laser Printer – Minimum Specification:

Print speed – 20 ppm.
Resolution – 1,200 x 1,200 dpi.
Paper size – Up to 216 mm x 355 mm (8.5 in x 14 in).
RAM – 16 MB.
Print Drivers – Must support HP PCL6 and HP PCL5e.
Printer cable – 1.8 m (6 ft).

Note B1: Laser printer brands are limited to Hewlett-Packard and Savin brands only. The ConnDOT Project Engineer will provide the Contractor with a copy of the current PC specifications and approved printer list as soon as possible after the contract is awarded.

Note B2: It is acceptable to substitute a multi-function all-in-one printer/copier/scanner/fax machine listed on the approved printer list in place of the required laser printer and fax machine.

C) Digital Camera – Minimum Specification:

Optical – 5 mega pixel, with 3x optical zoom.
Memory – 2 GB.
Features – Date/time stamp feature.
Connectivity – USB cable or memory card reader.
Software – Must be compatible with Windows XP and Vista.
Power – Rechargeable battery and charger.

The Contractor is responsible for service and repairs to all computer hardware. All repairs must be performed with-in 48 hours. If the repairs require more than a 48 hours then a replacement must be provided. All supplies, paper and maintenance for the computers, laptops, printers, copiers, and fax machines shall be provided by the Contractor.

Concrete Testing Equipment: If the Contract includes items that require compressive strength cylinders for concrete, in accordance with the Schedule of Minimum Testing Requirements for

Sampling Materials for Test, the Contractor shall provide the following. All testing equipment will remain the property of the Contractor at the completion of the project.

- A) Concrete Cylinder Curing Box – meeting the requirements of Section 6.12 of the Standard Specifications.
- B) Air Meter – The air meter provided shall be in good working order and will meet the requirements of AASHTO T 152.
- C) Slump Cone Mold – Slump cone, base plate, and tamping rod shall be provided in like-new condition and meet the requirements of AASHTO T119, Standard Test Method for Slump of Hydraulic-Cement Concrete.

Insurance Policy: The Contractor shall provide a separate insurance policy, with no deductible, in the minimum amount of twenty thousand dollars (\$20,000.00) in order to insure all State-owned data equipment and supplies used in the office against all losses. The Contractor shall be named insured on that policy, and the Department shall be an additional named insured on the policy. These losses shall include, but not be limited to: theft, fire, and physical damage. The Department will be responsible for all maintenance costs of Department owned computer hardware. In the event of loss, the Contractor shall provide replacement equipment in accordance with current Department equipment specifications, within seven days of notice of the loss. If the Contractor is unable to provide the required replacement equipment within seven days, the Department may provide replacement equipment and deduct the cost of the equipment from monies due or which may become due the Contractor under the contract or under any other contract. The Contractor's financial liability under this paragraph shall be limited to the amount of the insurance coverage required by this paragraph. If the cost of equipment replacement required by this paragraph should exceed the required amount of the insurance coverage, the Department will reimburse the Contractor for replacement costs exceeding the amount of the required coverage.

Maintenance: During the occupancy by the Department, the Contractor shall maintain all facilities and furnishings provided under the above requirements, and shall maintain and keep the office quarters clean through the use of weekly professional cleaning to include, but not limited to, washing & waxing floors, cleaning restrooms, removal of trash, etc. Exterior areas shall be mowed and clean of debris. A trash receptacle (dumpster) with weekly pickup (trash removal) shall be provided. Snow removal, sanding and salting of all parking, walkway, and entrance ways areas shall be accomplished during a storm if on a workday during work hours, immediately after a storm and prior to the start of a workday. If snow removal, salting and sanding are not completed by the specified time, the State will provide the service and all costs incurred will be deducted from the next payment estimate.

Method of Measurement: The furnishing and maintenance of the construction field office will be measured for payment by the number of calendar months that the office is in place and in operation, measured to the nearest month.

There will not be any price adjustment due to any change in the minimum computer system requirements.

Basis of Payment: The furnishing and maintenance of the construction field office will be paid at the listed unit price per month for the item “Construction Field Office, Medium”, which price shall include all material, equipment, labor, utility services and work incidental thereto.

The cost of providing the parking area, external illumination, trash removal and snow and ice removal shall be included in the monthly unit price bid for the respective item “Construction Field Office, Medium”.

The State will be responsible for payment of data communication user fees and for toll calls by State personnel.

<u>Pay Item</u>	<u>Pay Unit</u>
Construction Field Office, Medium	Month

ITEM #0970006A – TRAFFICPERSON (MUNICIPAL POLICE OFFICER)
ITEM #0970007A – TRAFFICPERSON (UNIFORMED FLAGGER)

9.70.01—Description: Under this item the Contractor shall provide the services of Trafficpersons of the type and number, and for such periods, as the Engineer approves for the control and direction of vehicular traffic and pedestrians. Traffic persons requested solely for the contractor's operational needs will not be approved for payment.

9.70.03—Construction Method: Prior to the start of operations on the project requiring the use of Trafficpersons, a meeting will be held with the Contractor, Trafficperson agency or firm, Engineer, and State Police, if applicable, to review the Trafficperson operations, lines of responsibility, and operating guidelines which will be used on the project. A copy of the municipality's billing rates for Municipal Police Officers and vehicles, if applicable, will be provided to the Engineer prior to start of work.

On a weekly basis, the Contractor shall inform the Engineer of their scheduled operations for the following week and the number of Trafficpersons requested. The Engineer shall review this schedule and approve the type and number of Trafficpersons required. In the event of an unplanned, emergency, or short term operation, the Engineer may approve the temporary use of properly clothed persons for traffic control until such time as an authorized Trafficperson may be obtained. In no case shall this temporary use exceed 8 hours for any particular operation.

If the Contractor changes or cancels any scheduled operations without prior notice of same as required by the agency providing the Trafficpersons, and such that Trafficperson services are no longer required, the Contractor will be responsible for payment at no cost to the Department of any show-up cost for any Trafficperson not used because of the change. Exceptions, as approved by the Engineer, may be granted for adverse weather conditions and unforeseeable causes beyond the control and without the fault or negligence of the Contractor.

Trafficpersons assigned to a work site are to only take direction from the Engineer.

Trafficpersons shall wear a high visibility safety garment that complies with OSHA, MUTCD, ASTM Standards and the safety garment shall have the words "Traffic Control" clearly visible on the front and rear panels (minimum letter size 2 inches (50 millimeters)). Worn/faded safety garments that are no longer highly visible shall not be used. The Engineer shall direct the replacement of any worn/faded garment at no cost to the State.

A Trafficperson shall assist in implementing the traffic control specified in the Maintenance and Protection of Traffic contained elsewhere in these specifications or as directed by the Engineer. Any situation requiring a Trafficperson to operate in a manner contrary to the Maintenance and Protection of Traffic specification shall be authorized in writing by the Engineer.

Trafficpersons shall consist of the following types:

1. Uniformed Law Enforcement Personnel: Law enforcement personnel shall wear the high visibility safety garment provided by their law enforcement agency. If no high visibility safety garment is provided, the Contractor shall provide the law enforcement personnel with a garment meeting the requirements stated below for the Uniformed Flaggers' garment.

Law Enforcement Personnel may be also be used to conduct motor vehicle enforcement operations in and around work areas as directed and approved by the Engineer.

Municipal Police Officers: Uniformed Municipal Police Officers shall be sworn Municipal Police Officers or Uniformed Constables who perform criminal law enforcement duties from the Municipality in which the project is located. Their services will also include an official Municipal Police vehicle when requested by the Engineer. Uniformed Municipal Police Officers will be used on non-limited access highways. If Uniformed Municipal Police Officers are unavailable, other Trafficpersons may be used when authorized in writing by the Engineer. Uniformed Municipal Police Officers and requested Municipal Police vehicles will be used at such locations and for such periods as the Engineer deems necessary to control traffic operations and promote increased safety to motorists through the construction sites.

2. Uniformed Flagger: Uniformed Flaggers shall be persons who have successfully completed flagger training by the American Traffic Safety Services Association (ATSSA), National Safety Council (NSC) or other programs approved by the Engineer. A copy of the Flagger's training certificate shall be provided to the Engineer before the Flagger performs any work on the project. Uniformed Flaggers shall conform to Chapter 6E, Flagger Control, in the Manual of Uniformed Traffic Control Devices (MUTCD) and shall wear high-visibility safety apparel, use a STOP/SLOW paddle that is at least 18 inches (450 millimeters) in width with letters at least 6 inches (150 millimeters) high. The paddle shall be mounted on a pole of sufficient length to be 6 feet (1.8 meters) above the ground as measured from the bottom of the sign.

Uniformed Flaggers will only be used on non-limited access highways to control traffic operations when authorized in writing by the Engineer.

9.70.04—Method of Measurement: Services of Trafficpersons will be measured for payment by the actual number of hours for each person rendering services approved by the Engineer. These services shall include, however, only such trafficpersons as are employed within the limits of construction, project right of way of the project or along detours authorized by the Engineer to assist the motoring public through the construction work zone. Services for continued use of a detour or bypass beyond the limitations approved by the Engineer, for movement of construction vehicles and equipment, or at locations where traffic is unnecessarily restricted by the Contractor's method of operation, will not be measured for payment.

Trafficpersons shall not work more than twelve hours in any one 24 hour period. In case such services are required for more than twelve hours, additional Trafficpersons shall be furnished and measured for payment. In cases where the Trafficperson is an employee on the Contractor's payroll, payment under the item "Trafficperson (Uniformed Flagger)" will be made only for those hours when the Contractor's employee is performing Trafficperson services.

Travel time will not be measured for payment for services provided by Uniformed Municipal Police Officers or Uniformed Flaggers.

Mileage fees associated with Trafficperson services will not be measured for payment.

Safety garments and STOP/SLOW paddles will not be measured for payment.

9.70.05—Basis of Payment: Trafficpersons will be paid in accordance with the schedule described herein.

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

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

The Department will pay the Contractor its actual costs for "Trafficperson (Municipal Police Officer)" plus an additional 5% as reimbursement for the Contractor's administrative expense in connection with the services provided.

The invoice must include a breakdown of each officer's actual hours of work and actual rate applied. Mileage fees associated with Trafficperson services are not reimbursable expenses and are not to be included in the billing invoice. The use of a municipal police vehicle authorized by the Engineer will be paid at the actual rate charged by the municipality. Upon receipt of the invoice from the municipality, the Contractor shall forward a copy to the Engineer. The invoice will be reviewed and approved by the Engineer prior to any payments. *Eighty (80%) of the invoice will be paid upon completion of review and approval. The balance (20%) will be paid upon receipt of cancelled check or receipted invoice, as proof of payment.* The rate charged by the municipality for use of a uniformed municipal police officer and/or a municipal police vehicle shall not be greater than the rate it normally charges others for similar services.

2. Uniformed Flagger: Uniformed flaggers will be paid for at the contract unit price per hour for "Trafficperson (Uniformed Flagger)", which price shall include all compensation, insurance benefits and any other cost or liability incidental to the furnishing of the trafficpersons ordered.

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

ITEM NO. #0971001A – MAINTENANCE AND PROTECTION OF TRAFFIC

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":

Route I-84

The Contractor shall maintain and protect the minimum number of through lanes and shoulders as dictated in the Special Provision for Section 1.08 - Prosecution and Progress "Limitations of Operations - Minimum Number of Lanes to Remain Open" Chart, on a paved travel path not less than 11 feet in width per lane.

Excepted therefrom will be those periods, during the allowable periods, when the Contractor shall be allowed to halt traffic for a period of time not to exceed 10 minutes to perform necessary work as approved by the Engineer. If more than one 10-minute period is required, the Contractor shall allow all stored vehicles to proceed through the work area prior to the next stoppage.

Route I-84 EB Exit 5 Off-Ramp

The Contractor shall maintain and protect existing traffic operations. During stage construction, existing traffic operations will be considered to be as shown on the Maintenance and Protection of Traffic plans contained in the contract plans.

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 paved travel path not less than 12 feet in width.

Excepted therefrom, will be a one weekend work period when the Contractor shall be allowed to reduce the number of lanes on the I-84 EB Exit 5 off-ramp from 2 lanes to 1 lane as shown on the Interchange 5 Eastbound Off-Ramp M&PT plan sheet for Stage 1 Sequence 1. The Contractor shall maintain and protect one lane of traffic as shown on the Interchange 5 Eastbound Off-Ramp M&PT plan sheet for Stage 1 Sequence 1.

Route I-84 WB Exit 6 Off-Ramp

The Contractor shall maintain and protect existing traffic operations. During stage construction, existing traffic operations will be considered to be as shown on the Maintenance and Protection of Traffic plans contained in the contract plans.

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 paved travel path not less than 12 feet in width.

All Other Route I-84 Ramps

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 paved travel path not less than 12 feet in width.

Route 37 (Between Golden Hill Road and Second Avenue)

The Contractor shall maintain and protect the existing number of lanes of traffic in each direction, including turning lanes, each lane on a paved travel path not less than 11 feet in width. During stage construction, the existing number of lanes of traffic will be considered to be the number of lanes shown on the Maintenance and Protection of Traffic plans contained in the contract plans.

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 one lane of through traffic in each direction, each lane on a paved 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 paved 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.

Excepted therefrom will be those periods, during the allowable periods, when the Contractor shall be allowed to halt traffic for a period of time not to exceed 10 minutes to perform drainage work as approved by the Engineer. If more than one 10-minute period is required, the Contractor shall allow all stored vehicles to proceed through the work area prior to the next stoppage.

Route 37 (Between Second Avenue and Barnum Court)

The Contractor shall maintain and protect the existing number of lanes of traffic in each direction, including turning lanes, each lane on a paved travel path not less than 11 feet in width. During stage construction, the existing number of lanes of traffic will be considered to be the number of lanes shown on the Maintenance and Protection of Traffic plans contained in the contract plans.

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 one lane of through traffic in each direction, each lane on a paved 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 paved 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.

Route 39 (Main Street)

The Contractor shall maintain and protect the existing number of lanes of traffic in each direction, including turning lanes, each lane on a paved 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 two lanes of through traffic in the southbound direction and one lane of traffic in the northbound direction, each lane on a paved 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 one lane of through traffic in each direction, each lane on a paved 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 paved 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.

SR 841 (Downs Street)

Hayestown Avenue

The Contractor shall maintain and protect the existing number of lanes of traffic in each direction, including turning lanes, each lane on a paved 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 one lane of through traffic in each direction, each lane on a paved 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 paved 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.

Tamarack Avenue

All Other Roadways

The Contractor shall maintain and protect the existing number of lanes of traffic in each direction, including turning lanes, each lane on a paved 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 paved 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.

Second Avenue

The Contractor shall maintain and protect the existing number of lanes of traffic in each direction, including turning lanes, each lane on a paved 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 paved 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.

Excepted therefrom will be those periods, during the allowable periods, when the Contractor shall be allowed to halt traffic for a period of time not to exceed 10 minutes to perform drainage work as approved by the Engineer. If more than one 10-minute period is required, the Contractor shall allow all stored vehicles to proceed through the work area prior to the next stoppage.

During the allowable period, the Contractor will be allowed to close Second Avenue for drainage work between Route 37 and Oakland Avenue to through traffic and detour traffic as shown on the Detour Plan contained in the Contract plans. The closure and detour shall occur during the months of July or August so that school bus routes will not be affected.

Stage Construction of Bridge No. 01185 (I-84 over Kohanza Street)

Stage Construction of Bridge No. 01190 (I-84 over Tamarack Avenue)

The Contractor shall maintain and protect traffic on all project roadways as shown on the Maintenance and Protection of Traffic plans contained in the contract plans.

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 only be permitted for areas requiring full depth and full width reconstruction, in which case, the Contractor will be allowed to maintain traffic on processed aggregate for a duration not to exceed 10 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 construction work on overhead signs and structures, shall close the lanes directly below the work area for the entire length of time overhead work is being undertaken. At no time shall an overhead sign be left partially removed or installed.

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 overhead and side-mounted 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 Department including the offices of Maintenance and Traffic, and the Town/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 - Limited Access Highways, Turning Roadways and Ramps

During construction, the Contractor shall maintain all pavement markings throughout the limits of the project.

Interim Pavement Markings

The Contractor shall install painted pavement markings, which shall include lane lines (broken lines), shoulder edge lines, stop bars, lane-use arrows and gore markings, on each intermediate course of bituminous concrete pavement and on any milled surface by the end of the work day/night. All painted pavement markings will be paid under the appropriate items.

If the Contractor does not install permanent Epoxy Resin Pavement Markings by the end of the work day/night on exit ramps where the final course of bituminous concrete pavement has been installed, the Contractor shall install temporary 12 inch wide white stop bars. The temporary

stop bars shall consist of Temporary Plastic Pavement Marking Tape and shall be installed by the end of the work day/night. Stop bars may consist of two 6 inch wide white markings or three 4 inch wide white markings placed side by side. The Contractor shall remove and dispose of these markings when the permanent Epoxy Resin Pavement Markings are installed. The cost of furnishing, installing and removing the Temporary Plastic Pavement Marking Tape shall be at the Contractor's expense.

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 day/night. If the painted pavement markings are not installed by the end of the work day/night, then Temporary Plastic Pavement Marking Tape shall be installed as described above and the painted pavement markings shall be installed by the end of the work day/night on Friday of that week.

If Temporary Plastic Pavement Marking Tape is installed, the Contractor shall remove and dispose of these markings when the painted pavement markings are installed. The cost of furnishing, installing and removing the Temporary Plastic Pavement Marking Tape shall be at the Contractor's expense.

The Contractor shall install permanent Epoxy Resin Pavement Markings in accordance with Section 12.10 entitled "Epoxy Resin Pavement Markings, Symbols, and Legends" after such time as determined by the Engineer.

Pavement Markings -Non-Limited Access Multilane Roadways Secondary and Local Roadways

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 centerlines, shoulder edge lines, lane lines (broken lines), lane-use arrows, and stop bars, on each intermediate course of bituminous concrete pavement and on any milled surface by the end of the work day/night. If the next course of bituminous concrete pavement will be placed within seven days, shoulder edge lines are not required. 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, the Contractor may install Temporary Plastic Pavement Marking Tape in place of the painted pavement markings by the end of the work day/night. These temporary pavement markings shall include centerlines, lane lines (broken lines) and stop bars; shoulder edge lines are not required.

Centerlines shall consist of two 4 inch wide yellow markings, 2 feet in length, side by side, 4 to 6 inches apart, at 40-foot intervals. No passing zones should be posted with signs in those areas where the final centerlines have not been established on two-way roadways. Stop bars may consist of two 6 inch wide white markings or three 4 inch wide white markings placed side by side. The Contractor shall remove and dispose of the Temporary Plastic Pavement Marking Tape when another course of bituminous concrete pavement is installed. The cost of furnishing, installing and removing the Temporary Plastic Pavement Marking Tape shall be at the Contractor's expense.

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 day/night. If the painted pavement markings are not installed by the end of the work day/night, then Temporary Plastic Pavement Marking Tape shall be installed as described above and the painted pavement markings shall be installed by the end of the work day/night on Friday of that week.

If Temporary Plastic Pavement Marking Tape is installed, the Contractor shall remove and dispose of these markings when the painted pavement markings are installed. The cost of furnishing, installing and removing the Temporary Plastic Pavement Marking Tape shall be at the Contractor's expense.

The Contractor shall install permanent Epoxy Resin Pavement Markings in accordance with Section 12.10 entitled "Epoxy Resin Pavement Markings, Symbols, and Legends" after such time as determined by the Engineer.

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.

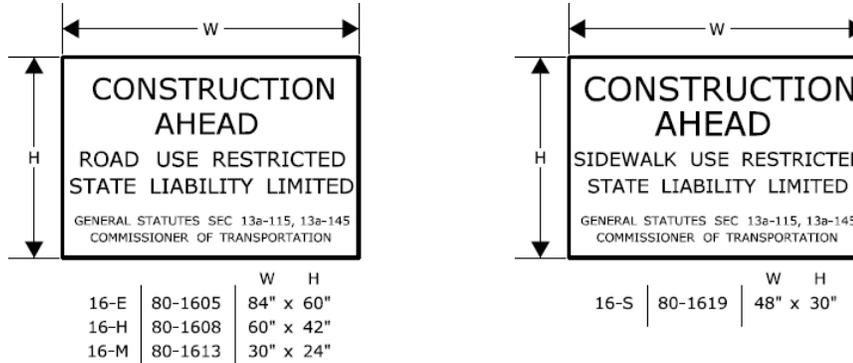
SECTION 7. USE OF (REMOTE CONTROLLED) CHANGEABLE MESSAGE SIGNS (CMS)

- 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.

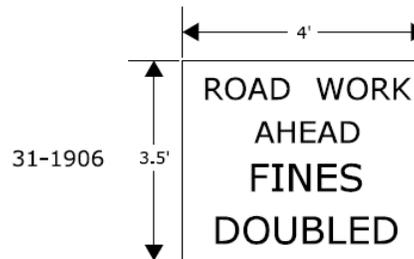
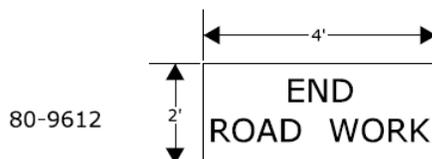
REGULATORY SIGN "ROAD WORK AHEAD, FINES DOUBLED"

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

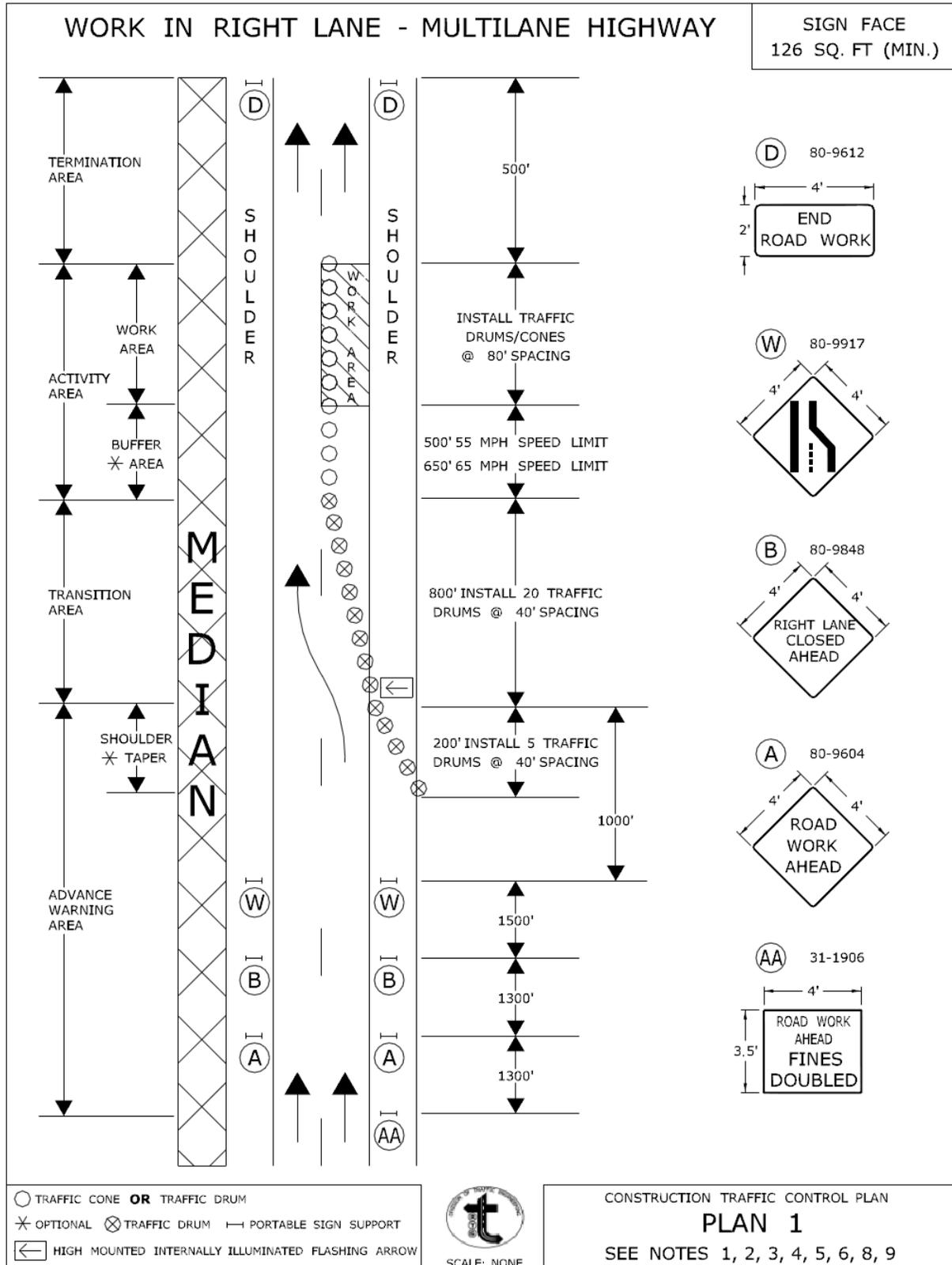
CONSTRUCTION TRAFFIC CONTROL PLAN NOTES

CONNECTICUT DEPARTMENT OF TRANSPORTATION
BUREAU OF ENGINEERING & CONSTRUCTION

APPROVED

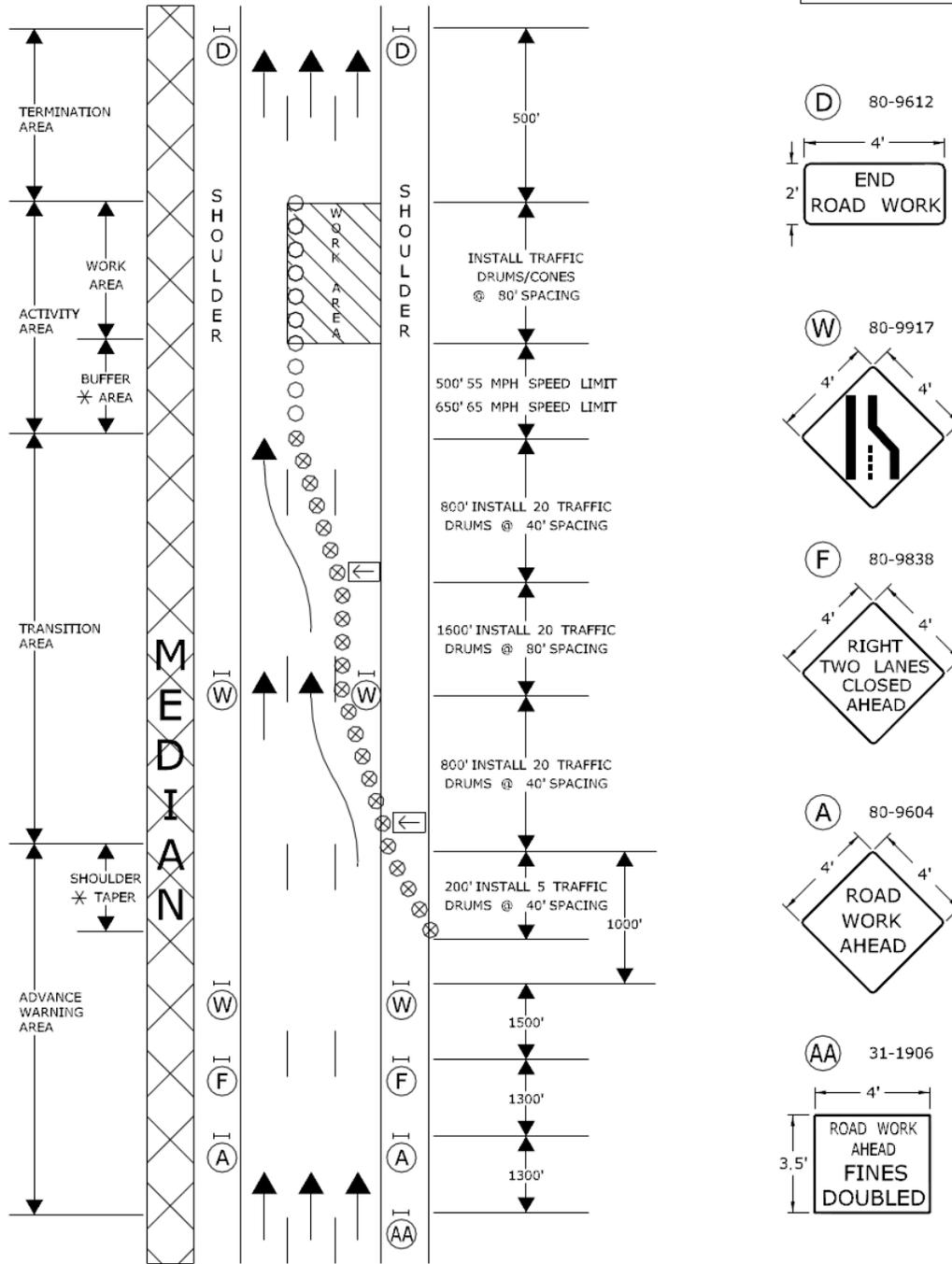
Charles S. Harlow
PRINCIPAL ENGINEER

Charles S. Harlow
2012.06.05 15:50:35-0400



WORK IN RIGHT TWO LANES - MULTILANE HIGHWAY

SIGN FACE
158 SQ. FT (MIN.)



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

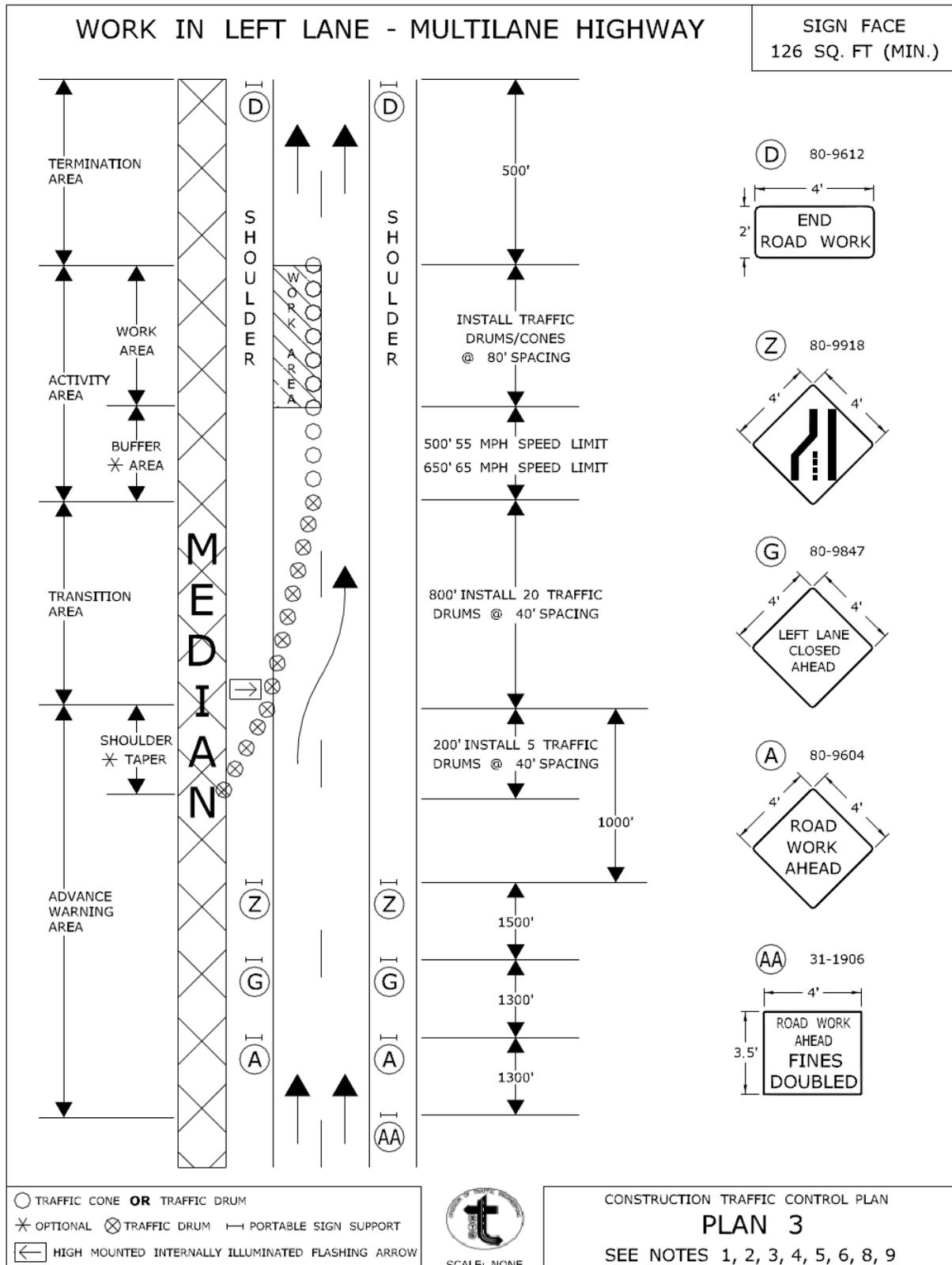


SCALE: NONE

CONSTRUCTION TRAFFIC CONTROL PLAN
PLAN 2
SEE NOTES 1, 2, 3, 4, 5, 6, 8, 9

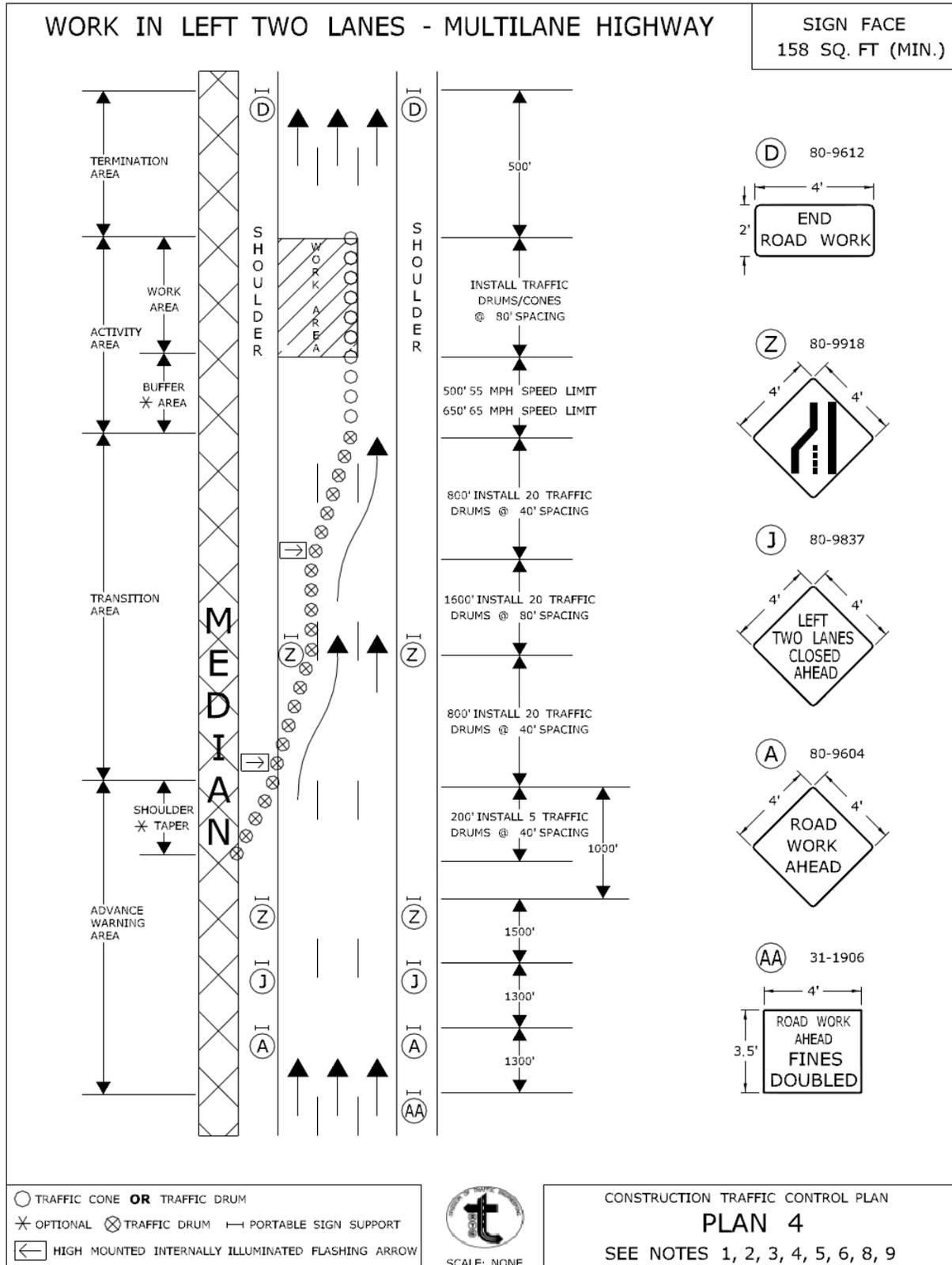
CONNECTICUT DEPARTMENT OF TRANSPORTATION
BUREAU OF ENGINEERING & CONSTRUCTION

APPROVED *Charles S. Harlow*
PRINCIPAL ENGINEER
Charles S. Harlow
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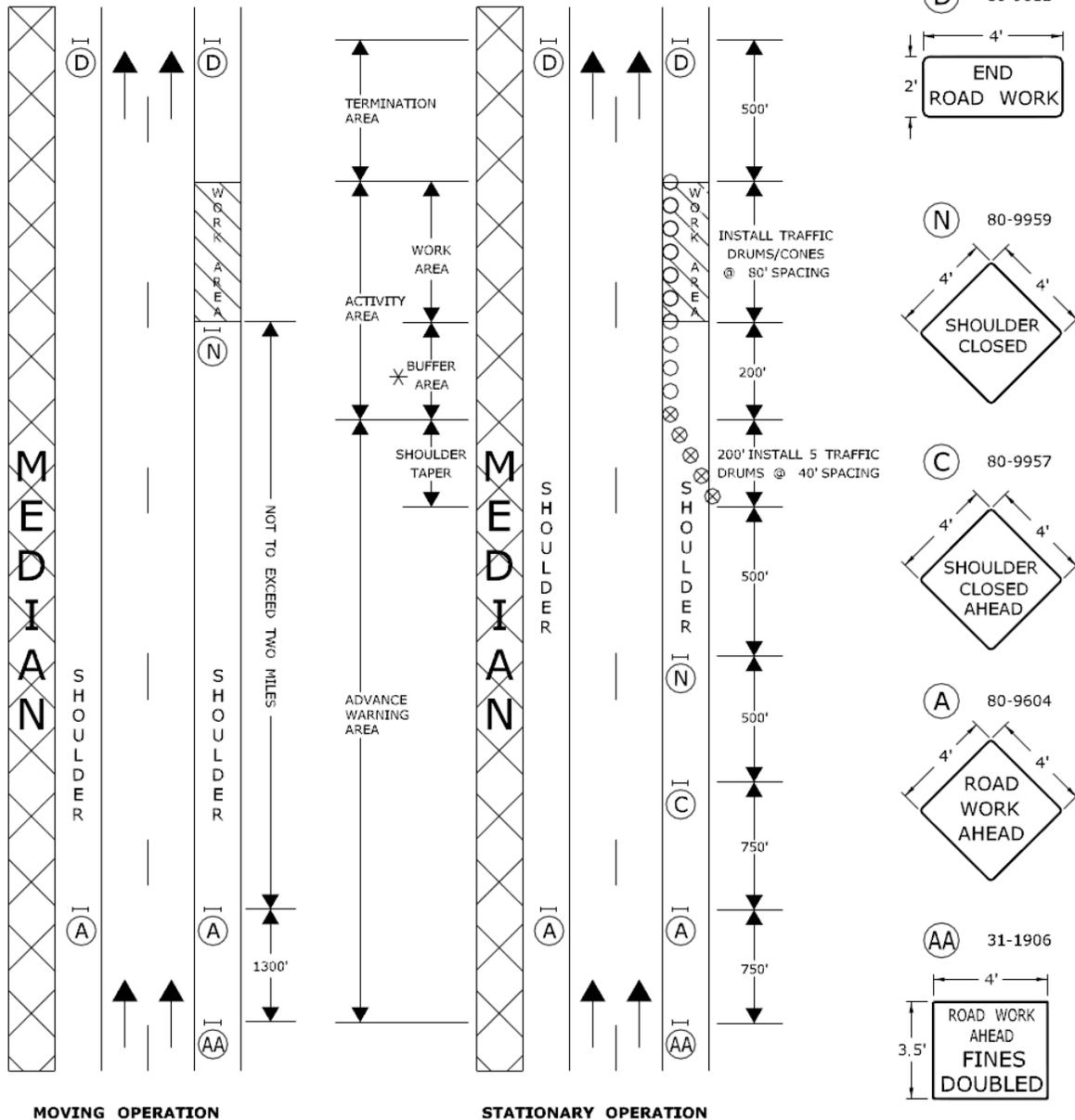
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BUREAU OF ENGINEERING & CONSTRUCTION

APPROVED *Charles S. Harlow*
 Charles S. Harlow
 2012.06.05 15:51:46-0400
 PRINCIPAL ENGINEER



WORK IN SHOULDER AREA - MULTILANE HIGHWAY

SIGN FACE
94 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 6

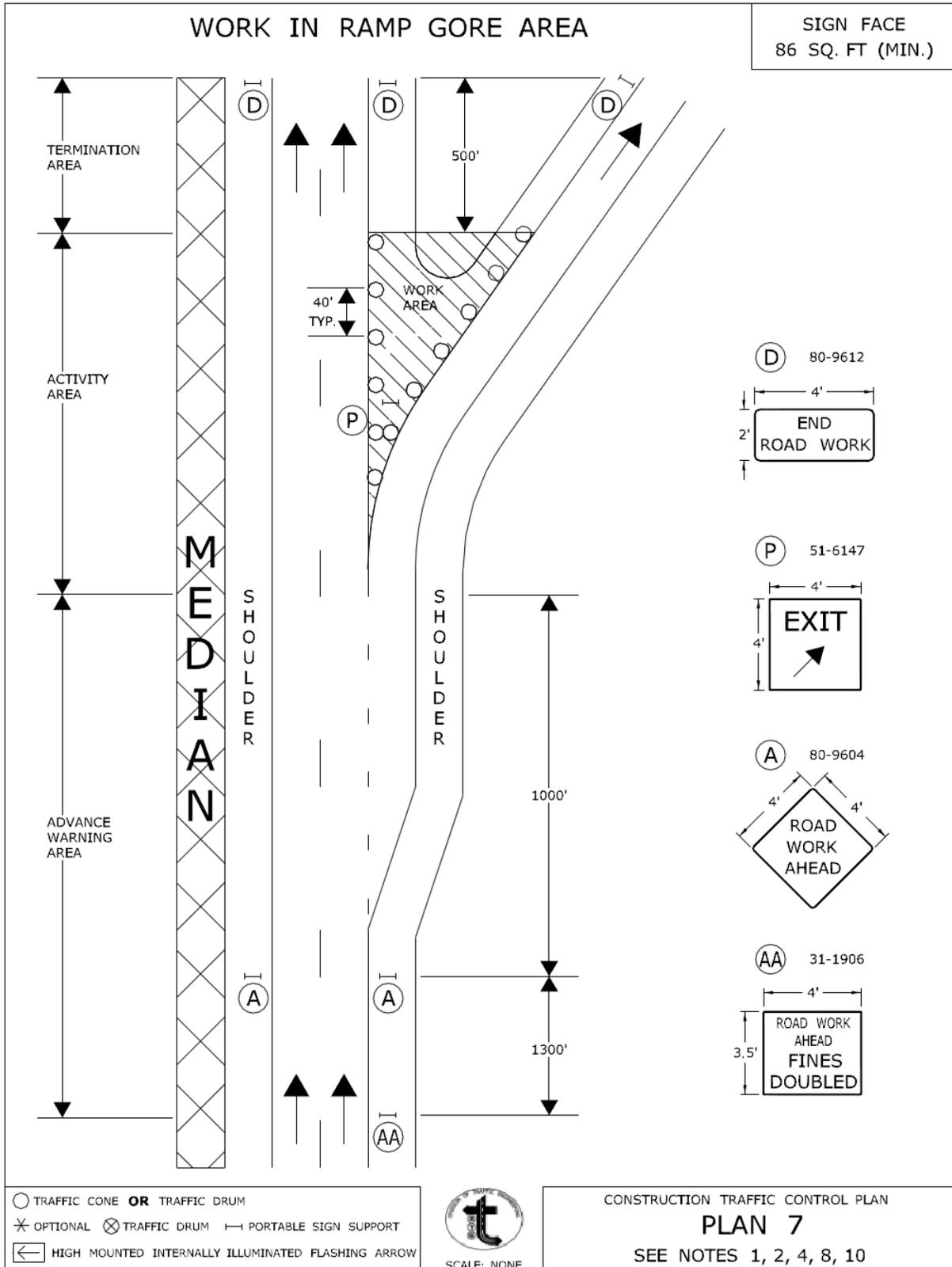
SEE NOTES 1, 2, 4, 8

CONNECTICUT DEPARTMENT OF TRANSPORTATION
BUREAU OF ENGINEERING & CONSTRUCTION

APPROVED

Charles S. Harlow
PRINCIPAL ENGINEER

Charles S. Harlow
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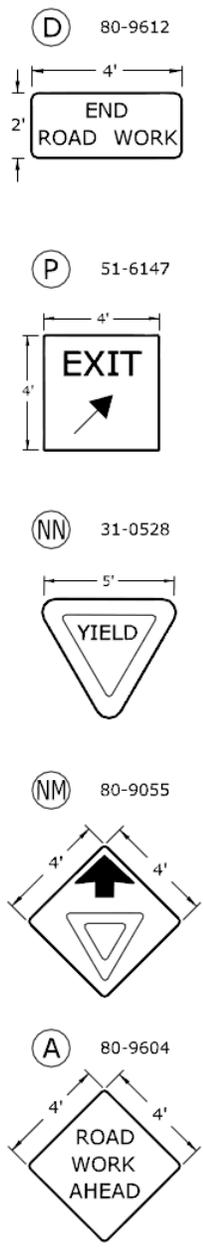
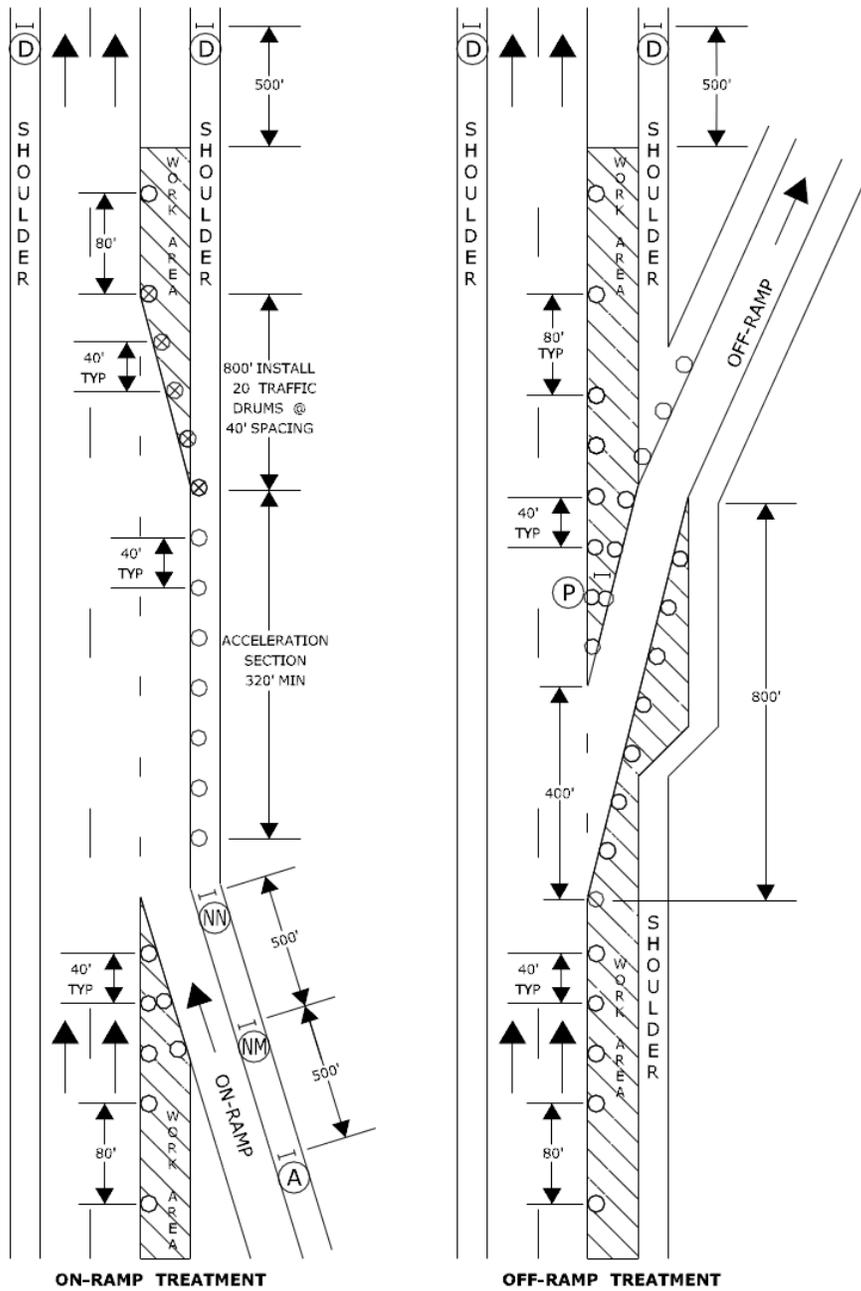


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APPROVED *Charles S. Harlow*
PRINCIPAL ENGINEER
Charles S. Harlow
2012.06.05 15:53:03-0400

TYPICAL RAMP TREATMENTS FOR MAINLINE LANE CLOSURE - MULTILANE HIGHWAY

SIGN FACE
SQ. FT. VARIES



ON-RAMP TREATMENT

OFF-RAMP TREATMENT

USE TRAFFIC CONTROL PLAN 1 TO CLOSE THE RIGHT LANE

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



SCALE: NONE

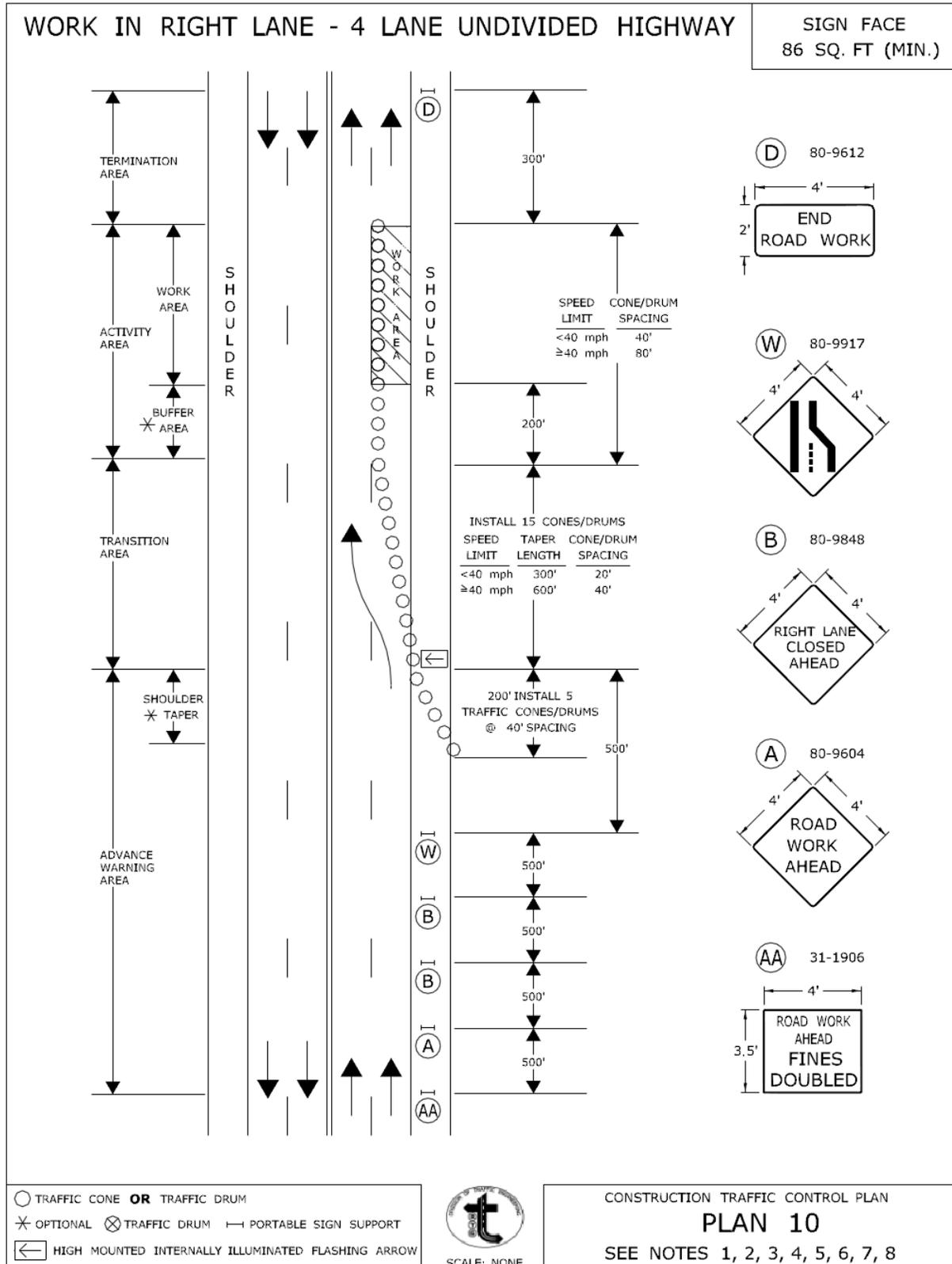
CONSTRUCTION TRAFFIC CONTROL PLAN

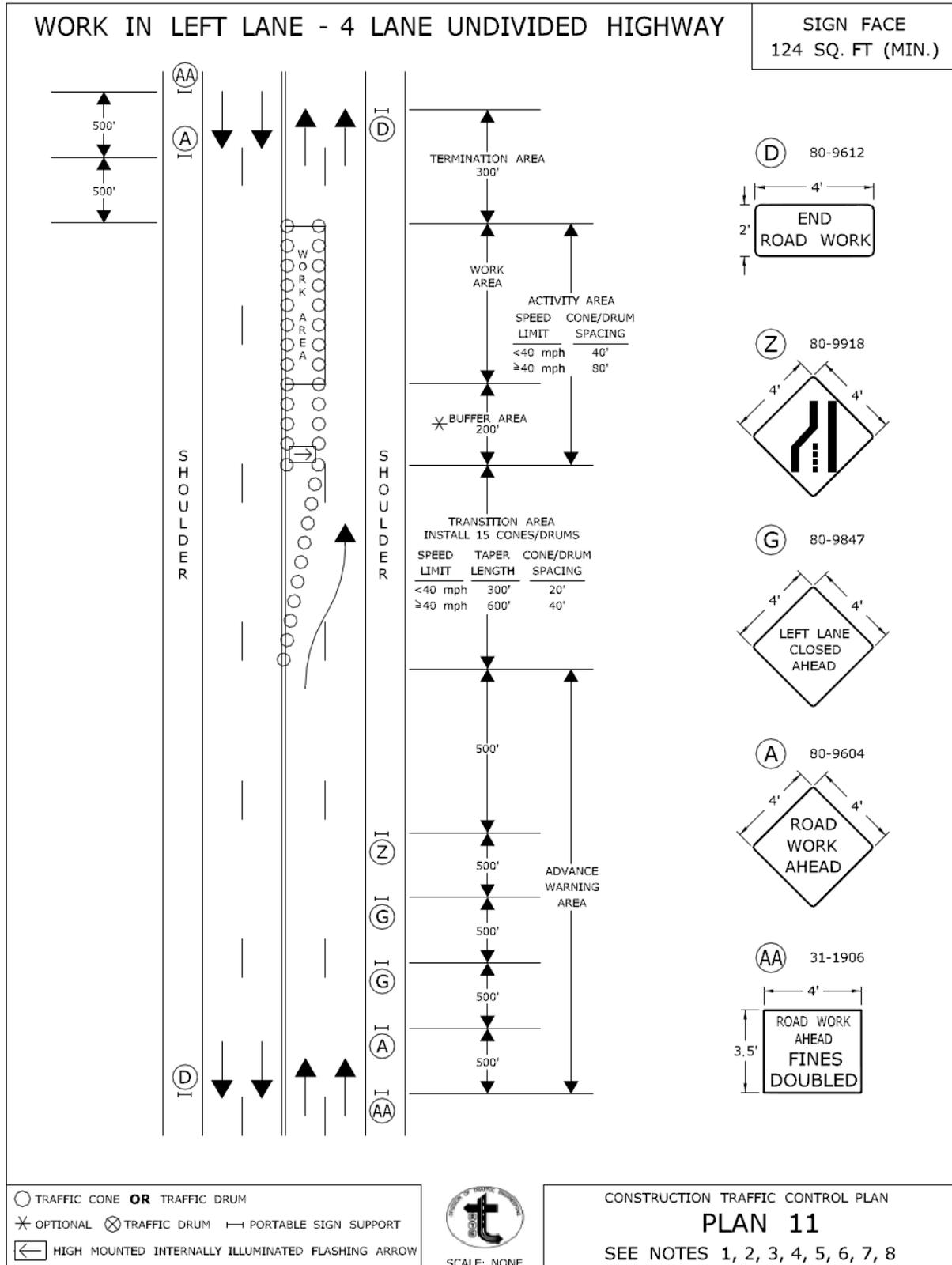
PLAN 8

SEE NOTES 1, 2, 3, 4, 5, 6, 8, 9, 10

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APPROVED *Charles S. Harlow*
PRINCIPAL ENGINEER
Charles S. Harlow
2012.06.05 15:53:31-0400





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

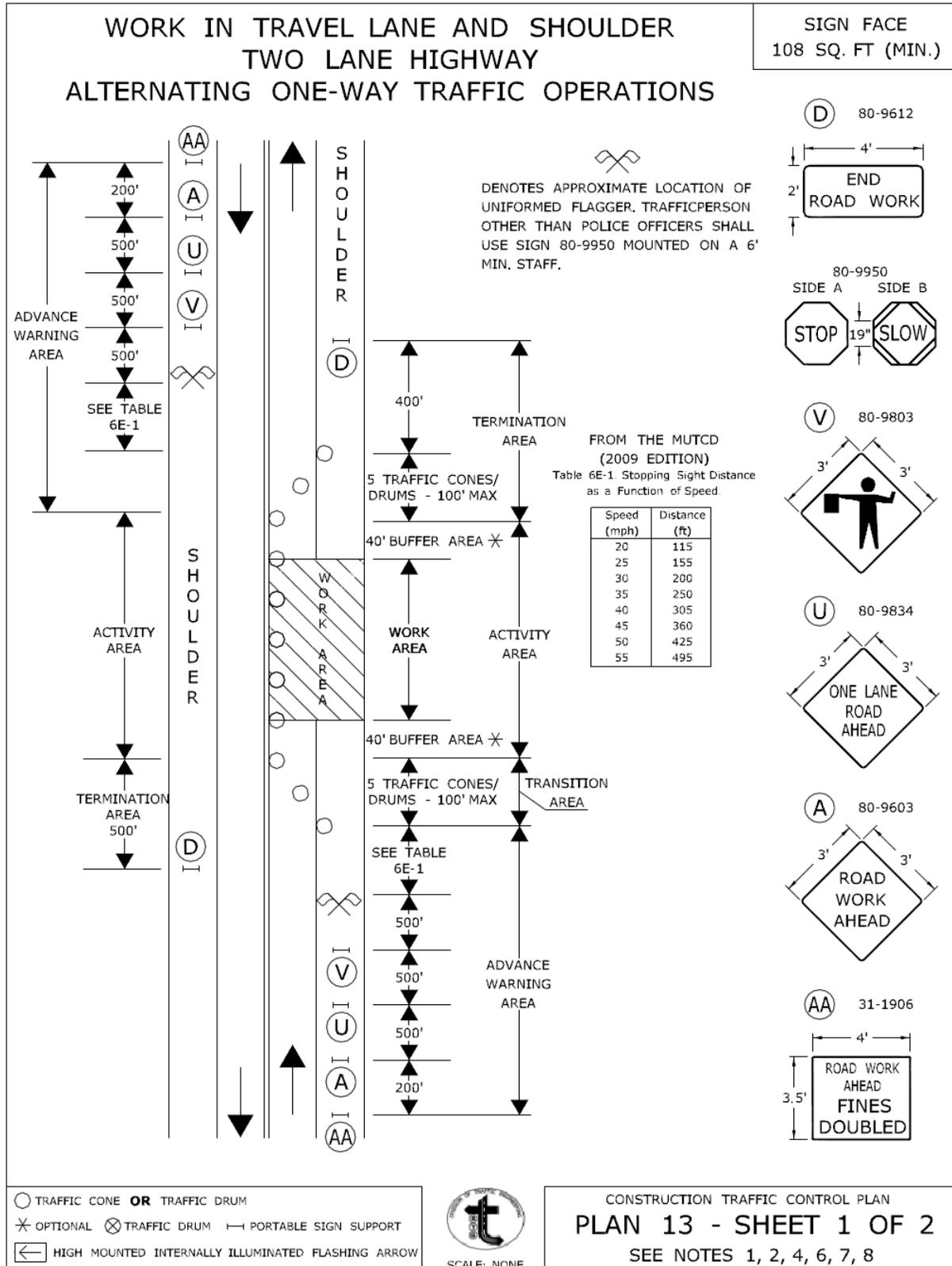


SCALE: NONE

CONSTRUCTION TRAFFIC CONTROL PLAN
PLAN 11
SEE NOTES 1, 2, 3, 4, 5, 6, 7, 8

CONNECTICUT DEPARTMENT OF TRANSPORTATION
BUREAU OF ENGINEERING & CONSTRUCTION

APPROVED *Charles S. Harlow*
PRINCIPAL ENGINEER
Charles S. Harlow
2012.08.05 15:54:36-0400'



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

CONNECTICUT DEPARTMENT OF TRANSPORTATION
 BUREAU OF ENGINEERING & CONSTRUCTION

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

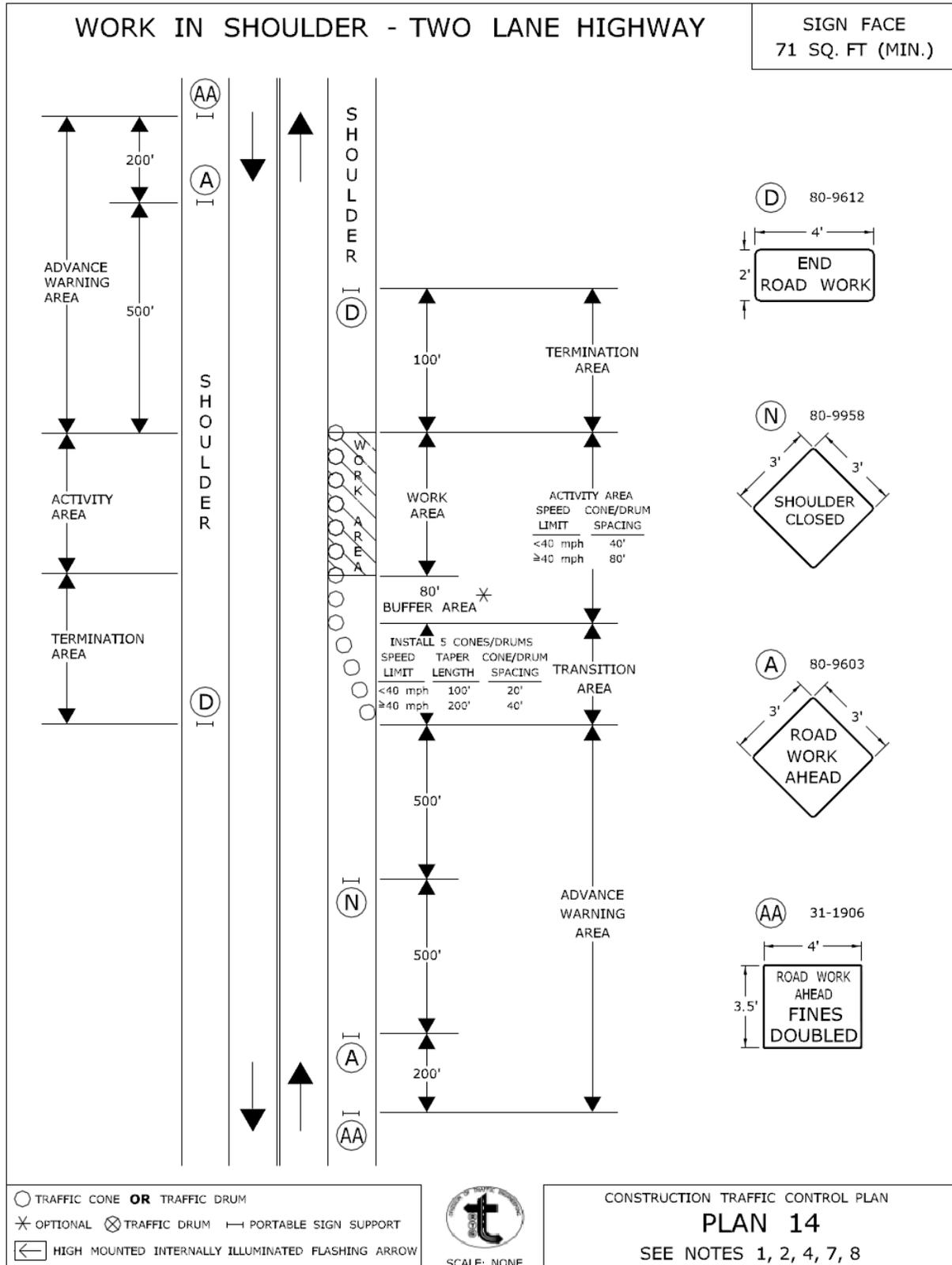


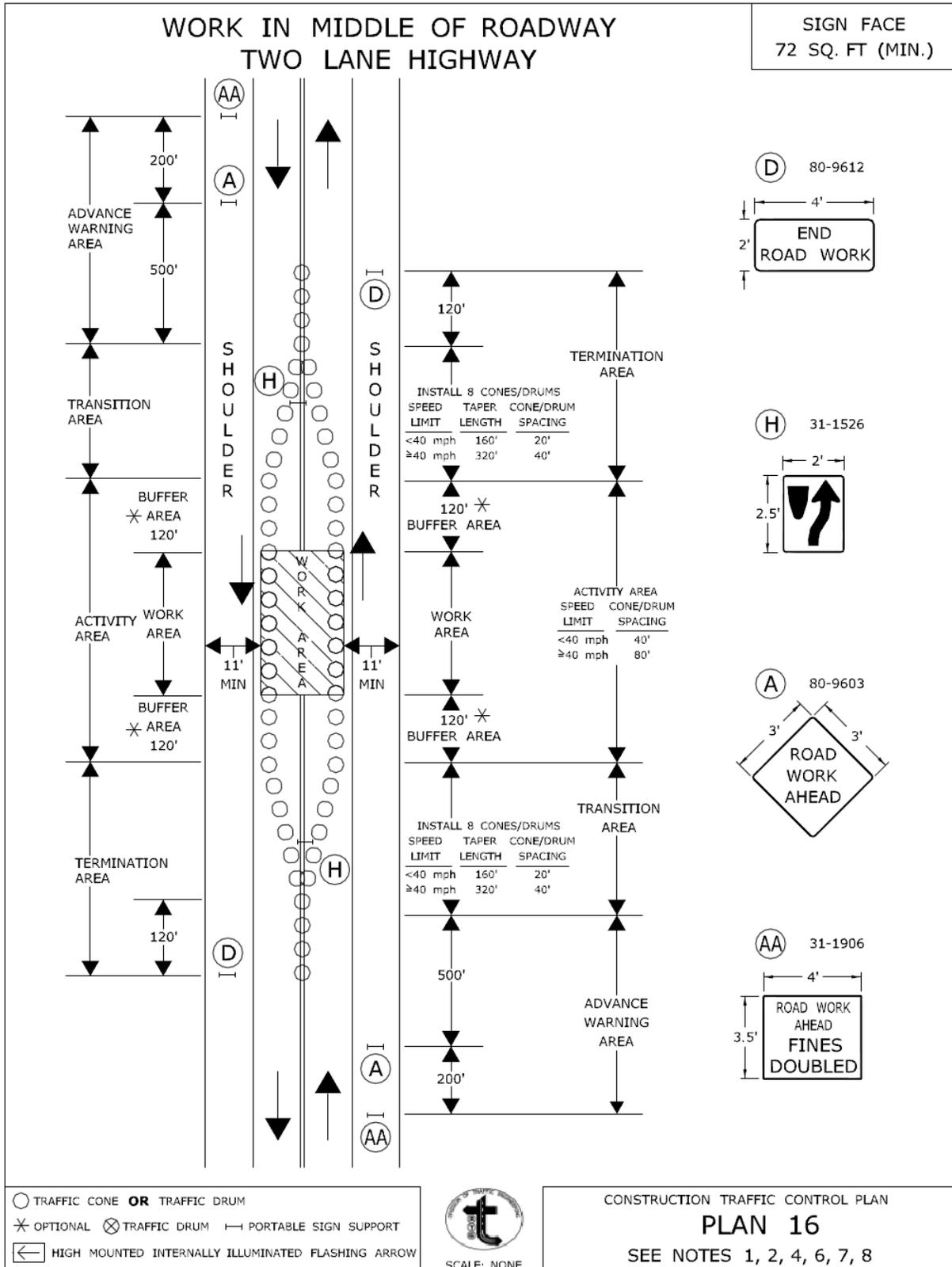
SCALE: NONE

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

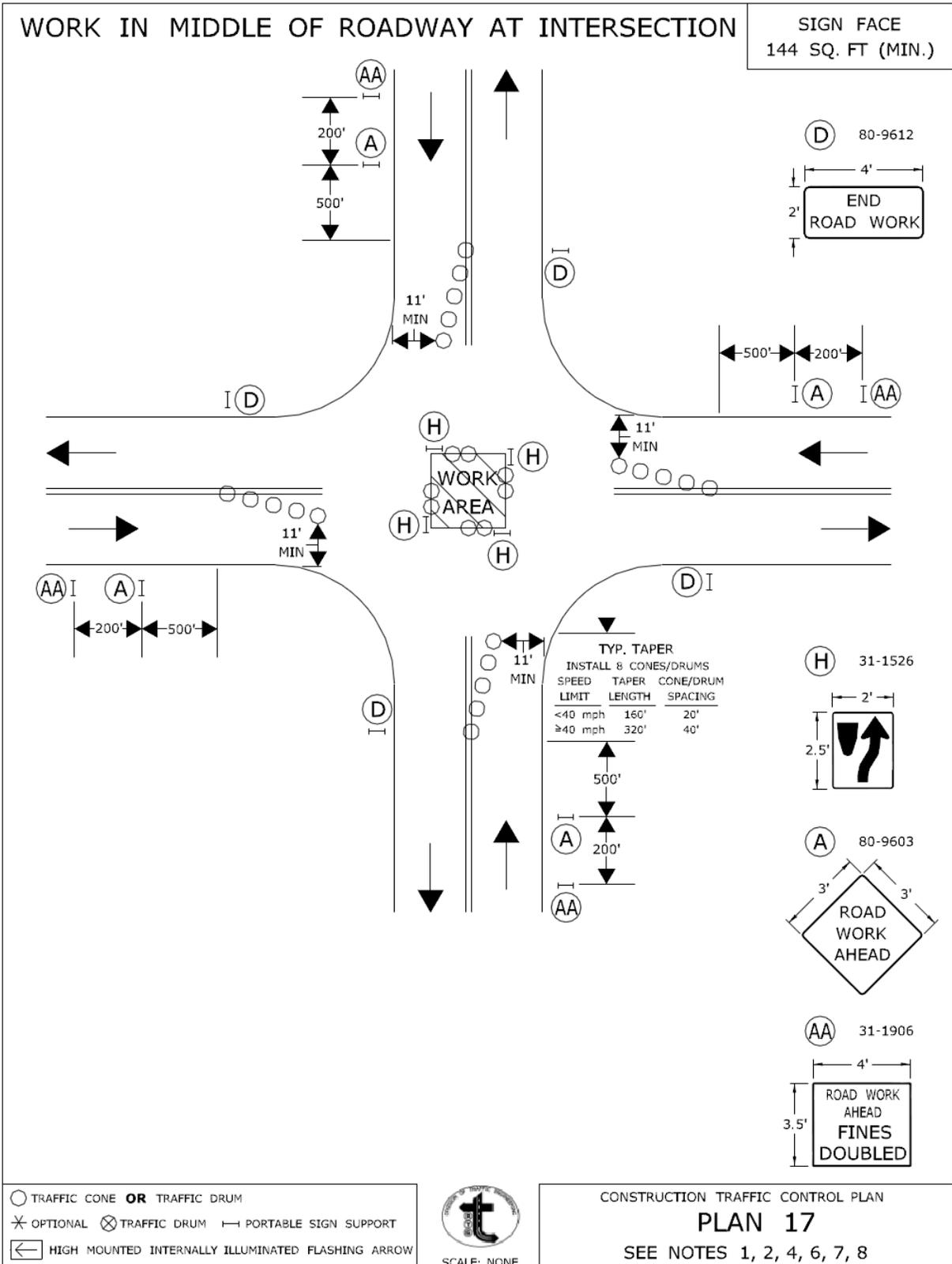
CONNECTICUT DEPARTMENT OF TRANSPORTATION
BUREAU OF ENGINEERING & CONSTRUCTION

APPROVED *Charles S. Harlow*
PRINCIPAL ENGINEER Charles S. Harlow
2012.06.05 15:55:45-04'00"





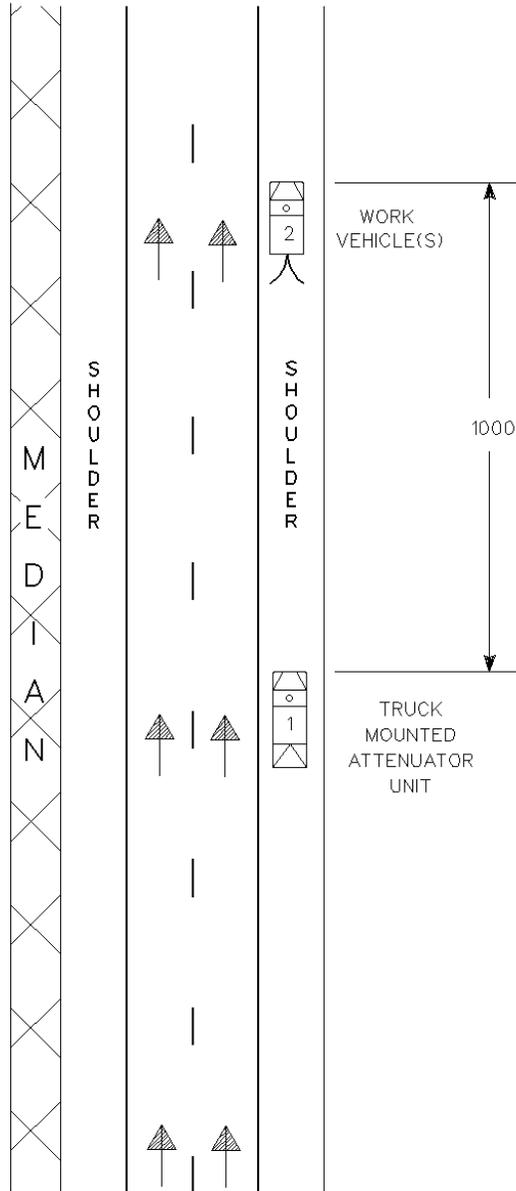
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 Charles S. Harlow
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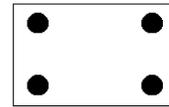
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BUREAU OF ENGINEERING & CONSTRUCTION

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

MOVING OPERATION ON RIGHT SHOULDER MULTILANE HIGHWAY & SECONDARY ROADWAYS



SIGN MOUNTED ON TRUCK 1



DEPARTMENT APPROVED
ARROW BOARD
(FLASHING YELLOW MODE)

REV'D 1-02



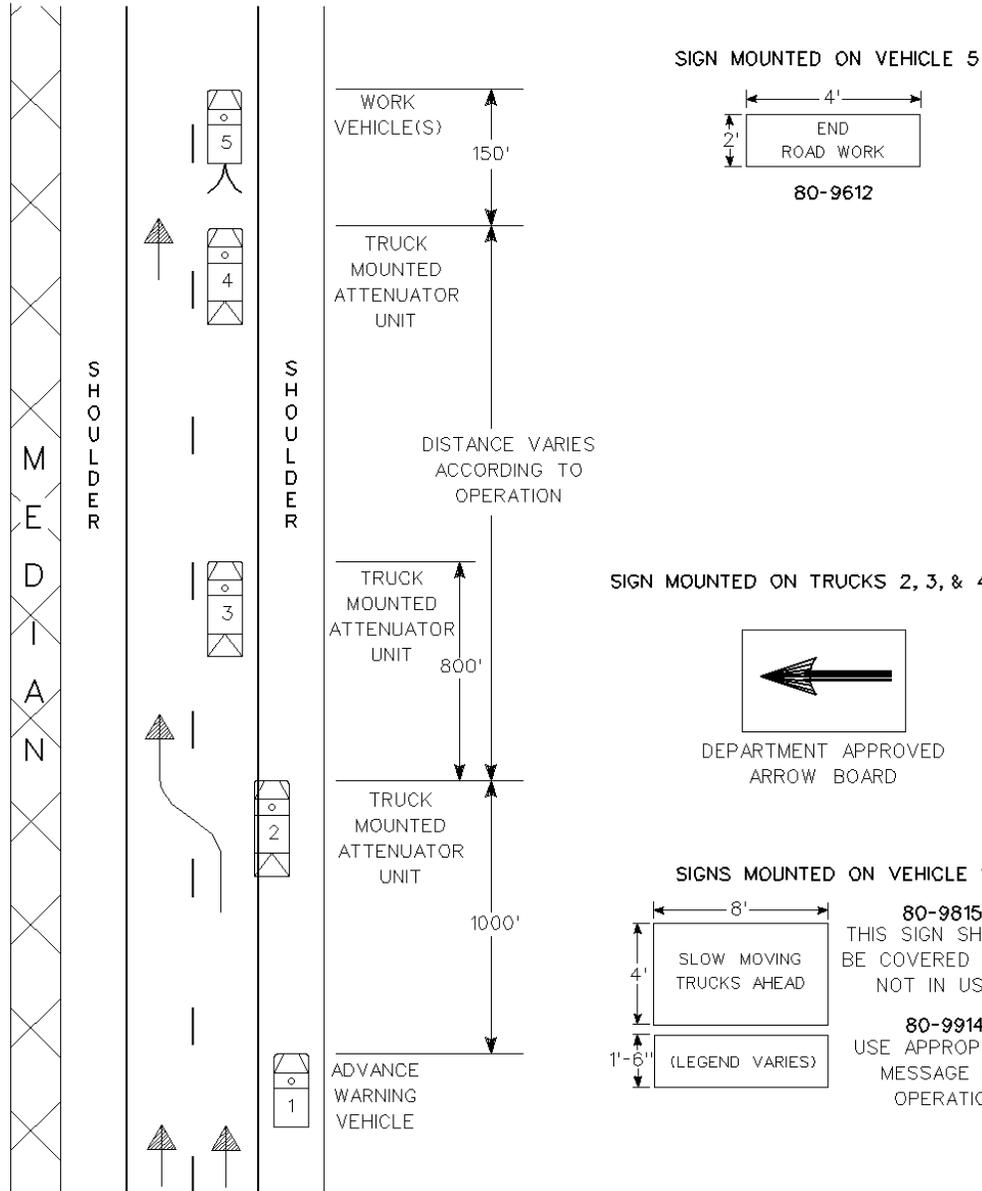
CONNECTICUT
DEPARTMENT OF TRANSPORTATION
BUREAU OF ENGINEERING &
HIGHWAY OPERATIONS
DIVISION OF TRAFFIC ENGINEERING

CONSTRUCTION
TRAFFIC CONTROL PLAN
PLAN 19

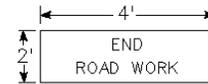
SCALE NONE

APPROVED J. McCall DATE 1-30-02
PRINCIPAL ENGINEER

MOVING OPERATION IN RIGHT LANE
AND OUTSIDE SHOULDER AT THE SAME TIME
MULTILANE HIGHWAY

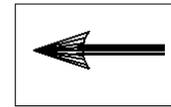


SIGN MOUNTED ON VEHICLE 5



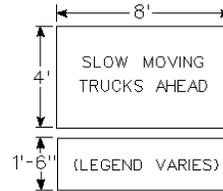
80-9612

SIGN MOUNTED ON TRUCKS 2, 3, & 4



DEPARTMENT APPROVED
ARROW BOARD

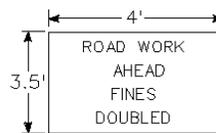
SIGNS MOUNTED ON VEHICLE 1



80-9815
THIS SIGN SHOULD
BE COVERED WHEN
NOT IN USE.

80-9914
USE APPROPRIATE
MESSAGE FOR
OPERATION.

SIGN MOUNTED ON VEHICLE 2



31-1906

REV'D 1-02



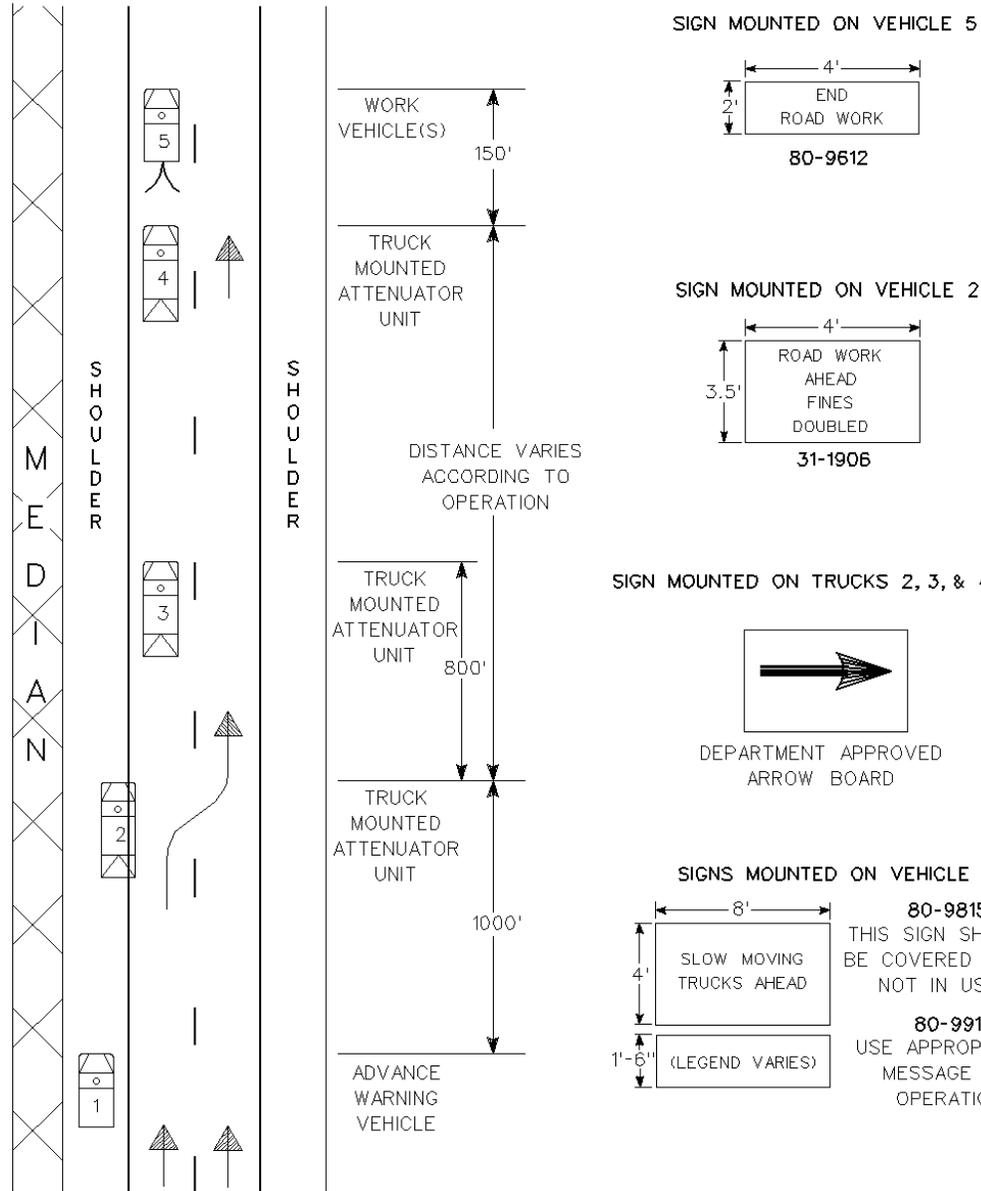
CONNECTICUT
DEPARTMENT OF TRANSPORTATION
BUREAU OF ENGINEERING &
HIGHWAY OPERATIONS
DIVISION OF TRAFFIC ENGINEERING

CONSTRUCTION
TRAFFIC CONTROL PLAN
PLAN 20

SCALE NONE

APPROVED John D. McCall DATE 1-30-02
PRINCIPAL ENGINEER

MOVING OPERATION IN LEFT LANE AND INSIDE SHOULDER AT THE SAME TIME MULTILANE HIGHWAY



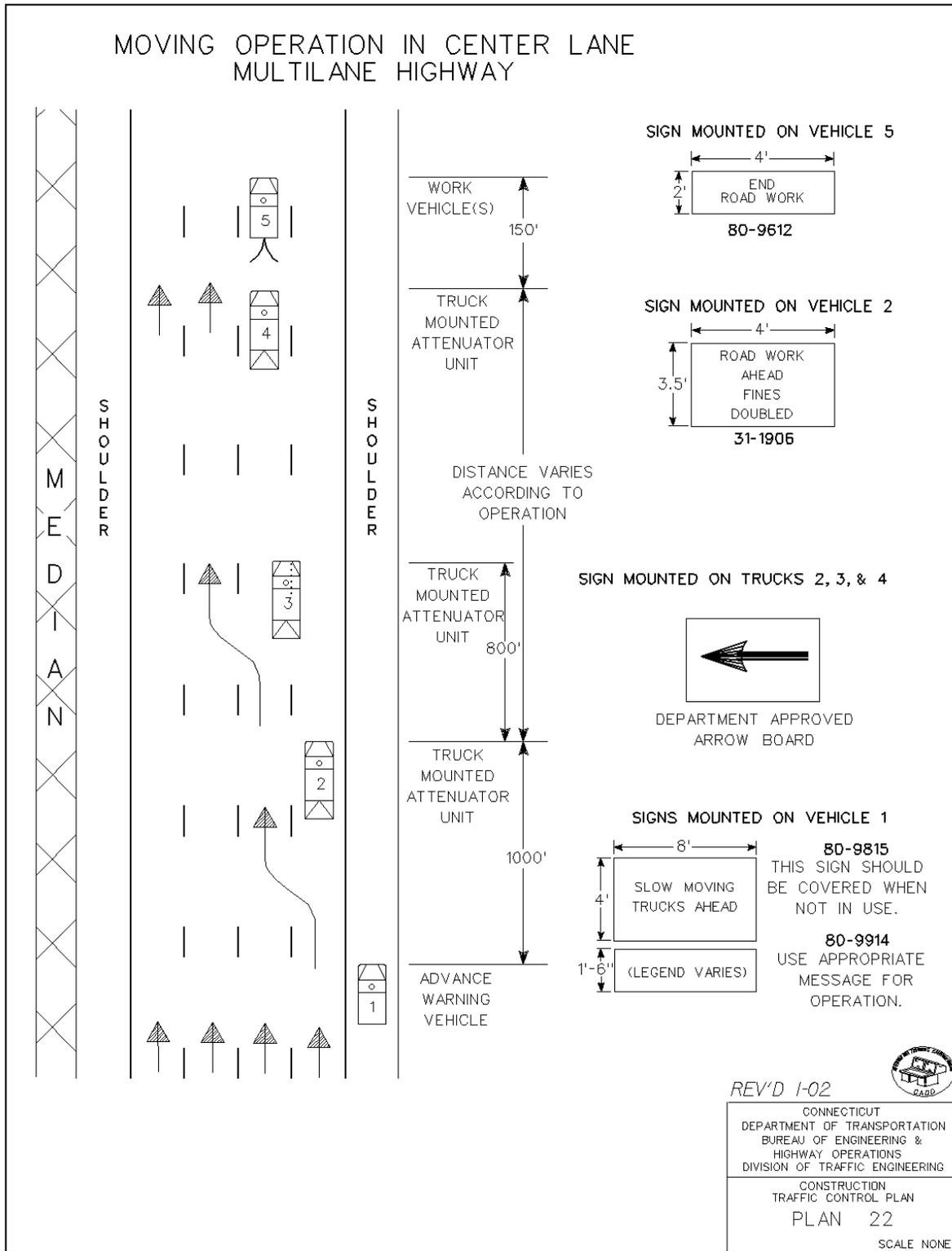
WHEN THE LEFT SHOULDER WIDTH CANNOT ACCOMMODATE A VEHICLE, THEN
ADVANCE WARNING VEHICLE 1 MAY DRIVE PARTIALLY IN THE LANE.

REV'D 1-02

 CONNECTICUT DEPARTMENT OF TRANSPORTATION BUREAU OF ENGINEERING & HIGHWAY OPERATIONS DIVISION OF TRAFFIC ENGINEERING	
CONSTRUCTION TRAFFIC CONTROL PLAN PLAN 21	
SCALE NONE	

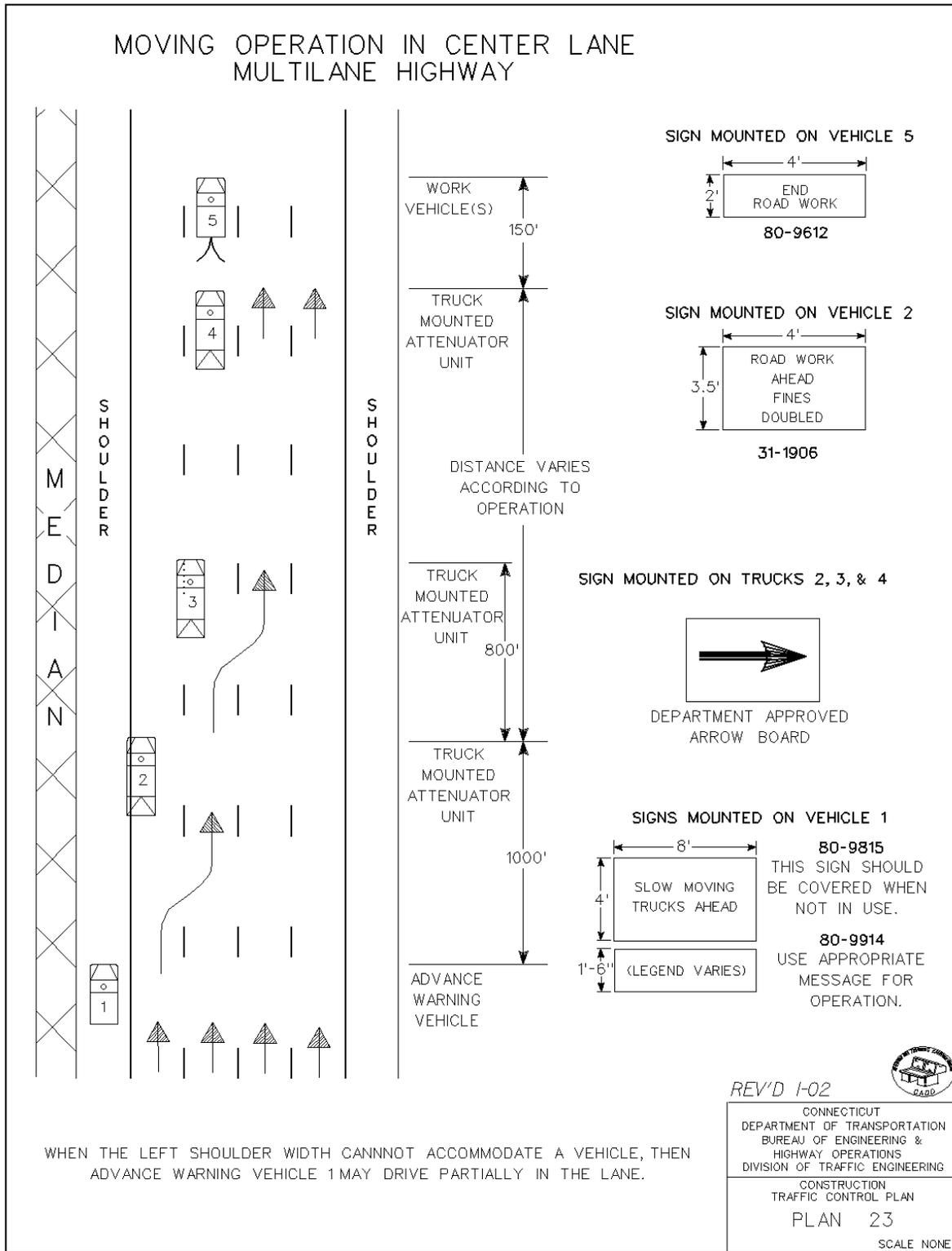
APPROVED John D. McCall DATE 1-30-02
PRINCIPAL ENGINEER

MOVING OPERATION IN CENTER LANE MULTILANE HIGHWAY

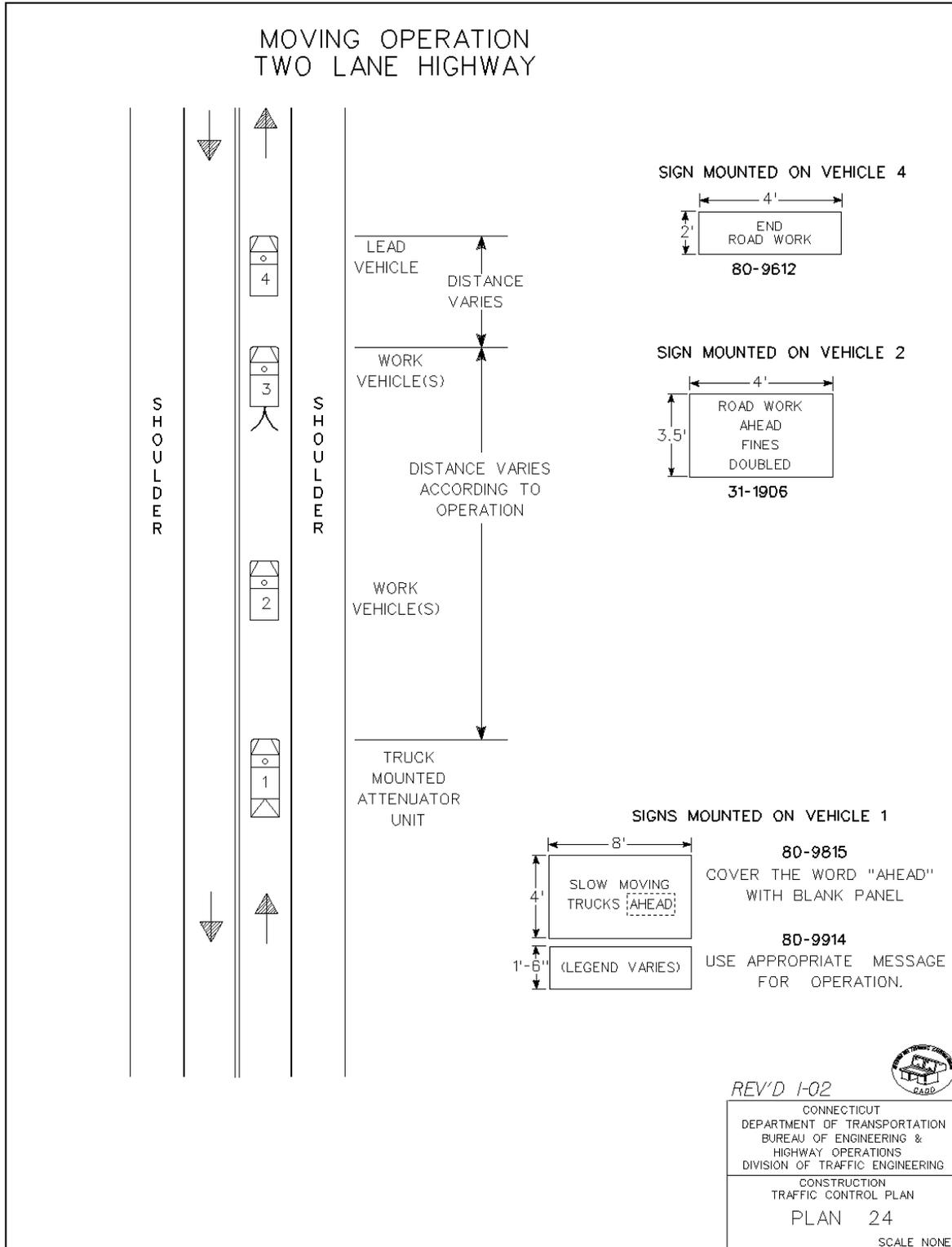


APPROVED John D. McCall DATE 1-30-02
PRINCIPAL ENGINEER

MOVING OPERATION IN CENTER LANE MULTILANE HIGHWAY



APPROVED John D. Micali PRINCIPAL ENGINEER DATE 1-30-02



APPROVED John D. McCall DATE 1-30-02
PRINCIPAL ENGINEER

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

The temporary relocation of signs and supports, and the furnishing, installation and removal of any temporary supports shall be paid for under the item “Maintenance and Protection of Traffic”. Temporary overhead sign supports and foundations shall be paid for under the appropriate item(s).

The cost of furnishing, installing, and removing the material for the 4H:1V traversable slope shall be paid for under the item “Maintenance and Protection of Traffic.”

ITEM #0975004A - MOBILIZATION AND PROJECT CLOSEOUT

9.75.01 – Description:

This item shall consist of all work necessary for the movement of personnel and furnishing equipment to the project site, and for the establishment of all Contractors' field offices, buildings and other facilities necessary to the performance of the work. In addition, this item shall include the preparation of work plans and submittals necessary to facilitate the commencement of physical construction. These initial submittals are identified elsewhere in the contract and may include project schedules, project management plans, safety plans, quality plans, erosion and sedimentation control plans and similar submittals addressing the general sequencing and management of the project. This item shall also include demobilization of plant and equipment, completion of all punchlist work, and administrative closeout items necessary to satisfy all contract requirements.

This item may not be subcontracted, in whole or part.

9.75.04 – Method of Measurement:

This work will be measured for payment in the manner described hereinafter; however, the determination of the total contract price earned shall not include the amount of mobilization earned during the period covered by the current monthly estimate - but shall include amounts previously earned and certified for payment.

1. When the first payment estimate is made, 25 percent of the lump sum bid price for this item or 2.5 percent of the total original contract price, whichever is less, shall be certified for payment.
2. When the initial project submittals necessary to begin construction are accepted by the Engineer, 50 percent of the lump sum bid price for this item or 5.0 percent of the total original contract price, whichever is less, minus any previous payments, shall be certified for payment.
3. When the initial project submittals are accepted by the Engineer, and 15 percent of the total original contract price is earned, 70 percent of the lump sum price of this item or 7.0 percent of the total original contract price, whichever is less, minus any previous payments, will be certified for payment.
4. When 30 percent of the total original contract price is earned 85 percent of the lump sum price of this item or 8.5 percent of the total original contract price, whichever is less, minus any previous payments, will be certified for payment.
5. When the requirements of Article 1.08.13 have been satisfied 95 percent of the lump sum price of this item, minus any previous payments, will be certified for payment.
6. When the requirements of Article 1.08.14 have been satisfied 100 percent of the lump sum price of this item, minus any previous payments, will be certified for payment.

Nothing herein shall be construed to limit or preclude partial payments otherwise provided for by the contract.

9.75.05 – Basis of Payment:

This work will be paid for at the contract lump sum price for “Mobilization and Project Closeout” which price shall include materials, equipment, tools, transportation, labor and all work incidental thereto.

This item shall not be paid more than one time. If the Contractor is required to mobilize equipment or facilities more than one time, due to reasons solely the responsibility of the Department, any additional efforts will be paid as Extra Work under Section 1.04.05.

Pay Item	Pay Unit
Mobilization and Project Closeout	l.s. (l.s.)

ITEM #0979003A - CONSTRUCTION BARRICADE TYPE III

Article 9.79.01 – Description: The Contractor shall furnish construction barricades to conform to the requirements of NCHRP Report 350 (TL-3) and to the requirements stated in Article 9.71 “Maintenance and Protection of Traffic,” as shown on the plans and/or as directed by the Engineer.

Article 9.79.02 – Materials: Prior to using the construction barricades, the Contractor shall submit to the Engineer a copy of the Letter of Acceptance issued by the FHWA to the manufacturer documenting that the devices conform to NCHRP Report 350 (TL-3).

Alternate stripes of white and orange Type III or Type VI reflective sheeting shall be applied to the horizontal members as shown on the plans. Application of the reflective sheeting shall conform to the requirements specified by the reflective sheeting manufacturer. Only one type of sheeting shall be used on a barricade and all barricades furnished shall have the same type of reflective sheeting. Reflective sheeting shall conform to the requirements of Article M.18.09.01.

Construction barricades shall be designed and fabricated so as to prevent them from being blown over or displaced by the wind from passing vehicles. Construction barricades shall be approved by the Engineer before they are used.

Article 9.79.03 – Construction Methods: Ineffective barricades, as determined by the Engineer and in accordance with the ATSSA guidelines contained in “Quality Standards for Work Zone Traffic Control Devices”, shall be replaced by the Contractor at no cost to the State.

Barricades that are no longer required shall be removed from the project and shall remain the property of the Contractor.

Article 9.79.04 – Method of Measurement: Construction Barricade Type III will be measured for payment by the number of construction barricades required and used.

Article 9.79.05 – Basis of Payment: “Construction Barricade Type III” required and used will be paid for at the Contract unit price per each. Each barricade will be paid for once, regardless of the number of times it is used.

Pay Item

Construction Barricade Type III

Pay Unit

EA.

ITEM #0980001A – CONSTRUCTION STAKING

9.80.01—Description: The work under this item shall consist of construction layout and reference staking necessary for the proper control and satisfactory completion of all work on the project, except property lines, highway lines, or non-access lines.

9.80.02—Materials: All stakes used for control staking shall be of the same quality as used by the Department for this purpose. For slope limits, pavement edges, gutter lines, etc., where so-called "green" or "working" stakes are commonly used, lesser quality stakes will be acceptable, provided the stakes are suitable for the intended purpose.

9.80.03—Construction Methods: The Department will furnish the Contractor such control points, bench marks, and other data as may be necessary for the construction staking and layout by qualified engineering or surveying personnel as noted elsewhere herein.

The Contractor shall be responsible for the placement and preservation of adequate ties to all control points, necessary for the accurate re-establishment of all base lines, center lines, and all critical grades as shown on the plans.

All stakes, references, and batter boards which may be required for construction operations, signing and traffic control shall be furnished, set and properly referenced by the Contractor. The Contractor shall be solely and completely responsible for the accuracy of the line and grade of all features of the work. Any errors or apparent discrepancies found in previous surveys, plans, specifications or special provisions shall be called to the Engineer's attention immediately for correction or interpretation prior to proceeding with the work.

During roadway construction (or site work), the Contractor shall provide and maintain for the periods needed, as determined by the Engineer, reference stakes at 100 foot intervals outside the slope limits. Further, the Contractor shall provide and maintain reference stakes at 50 foot intervals immediately prior to and during the formation of subgrade and the construction of all subsequent pavement layers. These stakes shall be properly marked as to station, offset and shall be referenced to the proposed grade, even if laser or GPS machine controls are used.

The Contractor shall provide and maintain reference stakes at drainage structures, including reference stakes for the determination of the structure alignments as may be needed for the proper construction of the drainage structure. The reference stakes shall be placed immediately prior to and maintained during the installation of the drainage structure. These stakes shall be properly marked as to station, offset and shall be referenced to the proposed grade.

The Contractor shall furnish copies of data used in setting and referencing stakes and other layout markings used by the Contractor after completion of each operation.

The Contractor shall provide safe facilities for convenient access by Department forces to control points, batter boards, and references.

All staking shall be performed by qualified engineering or surveying personnel who are trained, experienced and skilled in construction layout and staking of the type required under the contract. Prior to start of work, the Contractor shall submit for review and comment the qualifications of personnel responsible for construction staking on the project. On all projects with an original contract value greater than \$25 million and bridge rehabilitation and

reconstruction projects greater than \$10 million, surveying shall be performed under the direct supervision of a Professional Surveyor licensed in the State of Connecticut. The submission shall include a description of the experience and training which the proposed staff possesses and a list of state projects the personnel have worked on previously. All field layout and staking required for the project shall be performed under the direct supervision of a person, or persons, of engineering background experienced in the direction of such work and acceptable to the Engineer. If the personnel responsible for construction staking change during the course of the project, then a revised submittal will be required.

The Department may check the control of the work, as established by the Contractor, at any time as the work progresses. The Contractor will be informed of the results of these checks, but the Department by so doing in no way relieves the Contractor of responsibility for the accuracy of the layout work. The Contractor shall correct or replace, at the Contractor's own expense, any deficient layout and construction work which may be the result of the inaccuracies in the Contractor's staking operations or the failure to report such inaccuracies, or the Contractor's failure to report inaccuracies found in work done by the Department or by others. If, as a result of these inaccuracies, the Department is required to make further studies, redesign, or both, all expenses incurred by the Department due to such inaccuracies will be deducted from any monies due the Contractor.

The Contractor shall furnish all necessary personnel, engineering equipment and supplies, materials, transportation, and work incidental to the accurate and satisfactory completion of this work.

For roadways where the existing pavement markings need to be reestablished:

Prior to any resurfacing or obliteration of existing pavement markings, the Contractor and a representative of the Engineer must establish and document pavement marking control points from the existing markings. These control points shall be used to reestablish the positions of the lanes, the beginnings and endings of tapers, channelization lines for on and off ramps, lane use arrows, stop bars, and any lane transitions in the project area. The Contractor shall use these control points to provide appropriate premarking prior to the installation of the final markings.

The Contractor shall provide and maintain reference stakes and/or markings at 100 foot intervals immediately off the edge of pavement to be used to reestablish the existing pavement markings. The Contractor shall also provide and maintain reference stakes and/or markings at any point where there is a change in pavement markings to reestablish the existing pavement markings.

For non-limited access roadways

On non-limited access roadways it may be necessary to adjust the final locations of the pavement markings to accommodate pedestrians and bicyclists where feasible. Prior to any resurfacing or obliteration of existing pavement markings, the Contractor, a representative of the Engineer, and a representative of the Division of Traffic Engineering must establish and document pavement marking control points from the existing markings as described above. The control points at that time may be adjusted to provide minimum shoulder widths of 4 to 5 feet wherever possible while maintaining travel lane widths of no less than 11 feet and no more than 12 feet.

9.80.04—Method of Measurement: Construction staking will be at the Contract lump sum for construction staking.

When no price for "Construction Staking" is asked for on the proposal form, the cost of the work described above shall be included in the general cost of the work and no direct payment for "Construction Staking" will be made.

9.80.05—Basis of Payment: Construction staking will be paid for at the Contract lump sum price for "Construction Staking," which price shall include all materials, tools, equipment, labor and work incidental thereto. A schedule of values for payment shall be submitted to the Department for review and comment prior to payment.

Pay Item	Pay Unit
Construction Staking	l.s.

ITEM #1002202A – TRAFFIC CONTROL FOUNDATION – MAST ARM

Description: Work under this item shall consist of designing and constructing drilled shaft foundations for mast arm assemblies, in accordance with the details shown on the plans, in accordance with these specifications and as ordered by the Engineer.

Materials: The reinforcing steel shall be uncoated, ASTM A615, Grade 60 reinforcement conforming to the requirements of Article M.06.01.

The concrete for the drilled shaft shall be dense, homogeneous, fluid, resistant to segregation and consolidate under self-weight. The concrete for the drilled shaft shall be a Contractor designed Portland cement concrete with a 3/8" (No. 8) maximum coarse aggregate size and a minimum of 705 lbs/cubic yard of cementitious materials. The initial concrete slump shall be 7" \pm 1". The concrete shall maintain a minimum 4" slump for the duration of the concrete placement. The concrete shall contain 1% - 7% air entrainment. The 28 day minimum compressive strength of the concrete in the constructed foundation shall be 4,000 psi. The concrete mix design, including admixtures, shall be submitted to the Engineer for approval.

The slurry shall be Contractor designed mineral slurry that meets the range of values listed herein. The slurry mix design, including admixtures, shall be submitted to the Engineer for approval.

Rigid metal conduit, ground rod sleeves and related hardware, and end caps shall be galvanized steel conduit, and shall conform to Article M.15.09.

Ground rods shall be 5/8" in diameter by 12'-0" long copper clad steel. The copper cladding shall be a minimum thickness of 0.128". The ground clamp shall be a square-head bolt type, approved for direct burial.

Bare copper wire shall conform to Article M.15.13.

Topsoil shall conform to Article M.13.01.

Fertilizer shall conform to Article M.13.03.

Seed mixture shall conform to Article M.13.04.

Mulch shall conform to Article M.13.05.

Erosion control matting shall conform to Article M.13.09.

Construction Methods: For the purpose of bidding this item, the Contractor shall assume that the subsurface conditions for each drilled shaft foundation location consists of cohesionless, medium dense, granular soil (AASHTO A-1 or A-2) with cobbles present and a high

groundwater table which requires the use of wet construction/concreting methods. During excavation and construction of each foundation, should the Contractor encounter subsurface conditions that differ materially from those assumed at the time of bid, the Contractor shall notify the Engineer. All matters regarding increased cost relating to an agreed upon change in subsurface conditions will be handled per Section 1.04.04 – Differing Site Conditions.

The design of drilled shaft foundations shall conform to the requirements of AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaries and Traffic Signals – latest edition, including the latest interim specifications, available prior to the advertising date of the contract, amended as follows:

- The foundation shall be designed for the soils and rock properties and parameters based on the subsurface conditions (character of the soil and rock, presence of ground water, etc.) in the location of, adjacent to and below the drilled shaft foundation excavation. The need and extent of all subsurface explorations and investigations shall be determined by the Contractor.
- The specified compressive strength, f'_c , of the concrete used in the design shall be 4,000 psi.
- The reinforcement shall be uncoated and conform to ASTM A615, Grade 60.
- The foundation shall be designed for the mast arm assembly reactions of all group loads and load combinations. The reactions shall include axial, shear, flexural and torsional load effects. No reduction of the reactions or increase in the allowable stresses of the materials is permitted.
- The diameter of the drilled shaft foundation shall be 3'-0", unless otherwise allowed by the Engineer.
- The design of the drilled shaft foundation shall include embedment of the foundation in soil, the embedment of the foundation in rock or the embedment of the foundation partially in soil and partially in rock, as applicable.
- The design of the drilled shaft embedment depth shall account for the slope of the finished grade.
- The minimum embedment for a drilled shaft foundation, constructed entirely in soil, shall be no less than 12'-0" below the finished grade at the low side of a sloping grade. The minimum embedment for a drilled shaft foundation, constructed entirely in rock shall be no less than 8'-0" below the finished grade at the low side of a sloping grade.
- The embedment depth for a drilled shaft foundation, determined by the Brom's design method, shall have a minimum factor of safety of 3.25 applied to the shear

and moment load effects. The factor of safety applied to the torsional load effect shall be no less than 1.3.

- The load factor method shall be used for the structural design of the drilled shaft foundation. The load factor applied to all loads, dead, wind and ice, and their effects, axial, shear, flexure and torsion, shall be no less than 1.6. The drilled shaft may be designed in accordance with the load factor method presented in the latest edition of the Building Code Requirements for Reinforced Concrete”, ACI 318.
- The structural design of the drilled shaft shall be based on stress and strain compatibility in the circular drilled shaft cross section. The use of methods equating circular to rectangular drilled shaft cross sections is not permitted.
- The drilled shaft foundation shall be reinforced with longitudinal and transverse reinforcement. The area of longitudinal reinforcement should be no less than the sum of the reinforcement required for flexure and the longitudinal reinforcement required for torsion. The area of transverse reinforcement should be no less than the sum of the reinforcement required for shear and the transverse reinforcement required for torsion.
- The minimum number of longitudinal reinforcing bars shall be 16. The minimum size of longitudinal reinforcing bars shall be #8. The minimum area of longitudinal reinforcing bars shall be no less than 1% of the gross cross-sectional area of the shaft. The minimum clear distance between longitudinal reinforcing bars shall be no less than 5 times the maximum aggregate size or 5”, whichever is greater. The reinforcement shall extend full length of the drilled shaft foundation, including the pedestal. Splicing of the longitudinal reinforcement is not permitted.
- The drilled shaft foundation shall be transversely reinforced with spirals or circular, one piece, enclosed ties. The minimum size of the transverse reinforcement shall be #4. The maximum spacing/pitch of the transverse reinforcement shall be no more than 6”. The minimum spacing/pitch of the transverse reinforcement shall be no more than 4”. The spiral reinforcement shall be terminated at the top and the bottom with 1 ½ turns of the reinforcing and a 135° standard hook. Spirals may be spliced with lap splices or mechanical connectors. For spirals, the minimum lap splice length shall be 1.7 times the tension development length (including modification factors) of the bar or 48 bar diameters, whichever is greater. For spirals, the mechanical connectors shall develop both in tension and compression 125% of the specified yield strength of the bar and conform to the latest edition of the AASHTO LRFD Bridge Design Specifications, including the latest interim specifications. For ties, the minimum lap splice length shall be no less than 1.7 times the tension development length (including modification factors) of the bar. Tie lap splices shall be alternated.

- The design of the foundation shall be coordinated with the traffic structure to avoid conflicts between the embedded support anchorage and the foundation reinforcement.

The Contractor's foundation designer shall obtain a Professional Liability Insurance Policy in accordance with the requirements of Article 1.05.02-2a. A Contractor shall submit a copy of the certificate of insurance to the Engineer in accordance with the requirements of Article 1.05.02-2a.

Prior to excavating for the foundation, the Contractor shall submit working drawings and design computations for each mast arm assembly foundation to the Engineer for review in accordance with Article 1.05.02. An individual, independently packaged set of working drawings and computations, with all details and documents necessary for fabrication and construction, including a copy of the certificate of insurance, shall be prepared and submitted for **each** mast arm assembly foundation. **A single set of drawings with tabulated data for multiple foundation locations is not permitted.** The alpha-numeric support identifier shall be included on these documents. The working drawings and computations shall be prepared in Customary U.S. units.

The packaged set of working drawings and computations for each mast arm assembly foundation shall be submitted in an individual file in electronic portable document format (.pdf) with appropriate bookmarks and commenting enabled. The packaged set shall include the following:

- title sheet
- table of contents
- contact information for designer – contact information should include name and address of design firm, name of contact person with phone number and email address
- copy of the certificate of insurance
- foundation working drawings
- foundation design computations

The working drawings and design computations shall be **signed, dated and sealed** by a Professional Engineer licensed in the State of Connecticut, who shall also be available for consultation in interpreting his computations and drawings, and in the resolution of any problems which may occur during the performance of the work. Each working drawing shall be signed, dated and sealed. The cover/first sheet for the computations shall be signed, dated and sealed.

The electronic portable document format (.pdf) working drawings shall be created on ANSI D (22" x 34") full scale (1" electronic file = 1" paper) sheets. (The purpose of creating the drawings on ANSI D sheets is so that the sheets may be printed/plotted at that size or smaller without loss of legibility.) Each drawing shall have a border and title block. Located in the

lower right hand corner of the drawing adjacent to the title block, each drawing shall have a rectangular box, 2 ¼” wide x 1 ¾” high, for the reviewers stamp. On the ANSI D full scale sheets, the minimum text height and width shall be 1/8”. All letter characters shall be uppercase. The electronic files for the design computations, procedures and other supporting data shall be created on ANSI A (8 ½” x 11”) letter sheets.

The working drawings shall include complete details of all foundation components. The drawings shall include, but not be limited to the following:

- the project number, town and support identification number
- reference to the design specifications, including interim specifications
- material specifications for all components
- embedment depths for foundation in soil, rock and a combination of soil and rock
- anchor bolt details, including dimensions, embedment and projection

The design computations shall include, but not be limited to the following:

- the project number, town and support identification number
- references to design specifications, including interim specifications, and the applicable code section and articles
- description/documentation for all computer programs used in the design
- drawings/models of the foundation with dimensions, loads and references to the local and global coordinate systems used (as applicable), to facilitate review of the results
- sign support reactions of all group loads and load combinations
- soil and rock design parameters
- computations demonstrating the geotechnical and structural capacity of the drilled shaft is adequate for all group load combinations

The Contractor shall submit the packaged set of working drawings and calculations to the project’s “Engineer of Record”. The project’s “Engineer of Record” is identified in the signature block on the mast arm assembly foundation contract plans. A copy of the transmittal shall be sent to the District Construction office administering the project.

The reviewed and stamped working drawings and calculations shall be sent by the reviewer, along with a recommendation regarding acceptance, to the District Construction office for review, comment and distribution. After the District Construction office has reviewed the working drawings and calculations, ensured all comments have been addressed and have found the submittal to be acceptable, in addition to distributing copies of the working drawings and calculations to the Contractor and District offices, a copy of each packaged set of working drawings and calculations shall be sent to the project's "Engineer of Record".

Prior to excavating for the foundation, the Contractor shall submit the following:

Reinforcing Steel Shop Drawings: Based on the accepted foundation design, the Contractor shall prepare reinforcing steel shop drawings for each foundation in accordance with Subarticle 1.05.02-3. The drawings shall be reviewed and stamped approved (or approved as noted) by the foundation designer. Four copies of each reviewed and stamped drawing shall be submitted to the Engineer at the District Construction office. One copy of each reviewed and stamped drawing shall be submitted to the project's "Engineer of Record".

Concrete and Slurry Mix Designs: The Contractor shall submit to the Engineer at the District Construction office the concrete mix design and the slurry mix design, including admixtures, for review.

Foundation Construction Procedure: The Contractor shall submit to the Engineer at the District Construction office a written foundation construction procedure outlining the equipment; drilling procedure for soil and rock, including removal of obstructions and removal of excavated spoils; temporary casing placement and removal; slurry placement; reinforcement, anchor bolt and conduit placement; and concrete placement required for the drilled shaft foundation construction for review. The procedure should include contingencies for the various soil, rock and subsurface water conditions that may be encountered during the foundation construction. Also required in this submission are the following;

The Engineer will evaluate the foundation construction procedure for conformance with the contract documents and will then notify the Contractor of any additional information required and/or changes necessary to meet the contract requirements. All procedural approvals given by the Engineer shall be subject to trial in the field and shall not relieve the Contractor of the responsibility to satisfactorily complete the work as detailed in the plans and specifications. The Contractor shall not commence construction of the drilled shafts until the Engineer has accepted the foundation construction procedure.

Excavations required for shafts shall be performed through whatever materials are encountered, to the dimensions and elevations in the working drawings or as ordered by the Engineer. The methods and equipment used shall be suitable for the intended purpose and materials encountered. Shaft excavation may be performed by combinations of augering, rotary drilling,

down-the-hole hammer, reverse circulation drilling, clamming, scraping, or other means approved by the Engineer. Generally, either the dry method, wet method, or temporary casing method may be used, as necessary, to produce sound, durable concrete foundation shafts free of defects. The Contractor shall select and use the method that is needed to properly accomplish the work, as determined by site conditions and subject to the approval of the Engineer. The Contractor is responsible for maintaining the stability of the shaft excavation during all phases of construction.

The dry method consists of drilling the shaft excavation, removing accumulated water and loose material from the excavation, and placing the shaft concrete in a relatively dry excavation. The dry construction method shall be used only at sites where the groundwater table and site conditions are suitable to permit construction of the shaft in a relatively dry excavation, and where the sides and bottom of the shaft are stable and may be visually inspected prior to placing the concrete. The use of the dry construction method is permitted if less than one foot of water accumulates in the bottom of a hole without pumping over a one hour period, the excavation remains stable and any loose material and water can be removed prior to placement of concrete.

The wet construction method shall be used at sites where a dry excavation cannot be maintained for placement of the shaft concrete. Wet construction methods consist of using a mineral slurry to maintain stability of the hole perimeter while advancing the excavation to final depth, placing the reinforcing cage and shaft concrete. This procedure may require desanding and cleaning the slurry; final cleaning of the excavation by means of a bailing bucket, air lift, submersible pump or other devices; and placing the shaft concrete with a tremie. Unless it is demonstrated to the satisfaction of the Engineer that the surface casing is not required, temporary surface casings shall be provided to aid shaft alignment and position, and to prevent sloughing of the top of the shaft excavation. Surface casing is defined as the amount of casing required from the ground surface to a point in the shaft excavation where sloughing of the surrounding soil does not occur.

The temporary casing construction method shall be used at all sites where the dry or wet construction methods are inappropriate. Temporary casing construction method consists of advancing the excavation through caving material by the wet method. Temporary casing may be installed by driving or vibratory procedures in advance of excavation to the lower limits of the caving material. When a nearly impervious formation is reached, a casing is placed in the hole and sealed in the nearly impervious formation. After the drilling fluid is removed from the casing, drilling may proceed as with the dry method except that the casing is withdrawn when the shaft concrete is placed. If seepage conditions prevent use of the dry method, excavation is completed using the wet method. Temporary casing may be installed by driving or vibratory procedures in advance of excavation to the lower limits of the caving material. Slurry may be omitted if the casing can be installed with only minor caving of the hole.

If the Engineer determines that the foundation material encountered during excavation is unsuitable or differs from that anticipated in the design of the shaft, or if rock is encountered at an unanticipated elevation, the Contractor's foundation designer shall determine if the foundation embedment should be revised from that shown on the working drawings. If rock is encountered, the Engineer shall be notified to inspect and determine the elevation of the top of competent

rock. Any revisions to the foundation embedment during construction shall be reviewed by the Engineer.

Excavated materials which are removed from the shaft excavation and any drilled fluids used shall be disposed of by the Contractor as directed by the Engineer and in accordance with Section 1.10.

Casings shall be metal, smooth, clean, watertight, and of ample strength to withstand both handling and driving stresses and the pressure of both concrete and the surrounding earth materials. The outside diameter of casing shall not be less than the specified size of the shaft. Temporary casings shall be removed while the concrete remains workable (i.e., a slump of 4" or greater). Before the casing is withdrawn and while the casing is being withdrawn, a 5'-0" minimum head of fresh concrete in the casing shall be maintained so that all the fluid trapped behind the casing is displaced upward without contaminating the shaft concrete. The required minimum concrete head may have to be increased to counteract groundwater head outside the casing. Separation of the concrete by hammering or otherwise vibrating the casing, during withdrawal operations, shall be avoided. Casing extraction shall be at a slow, uniform rate with the pull in line with the shaft axis.

Slurry used in the drilling process shall be a mineral slurry. The slurry shall have both a mineral grain size that will remain in suspension and sufficient viscosity and gel characteristics to transport excavated material to a suitable screening system. The percentage and specific gravity of the material used to make the suspension shall be sufficient to maintain the stability of the excavation and to allow proper concrete placement. The level of the slurry shall be maintained at a height sufficient to prevent caving of the hole.

The mineral slurry shall be premixed thoroughly with clean fresh water at a temperature above 41° F and adequate time allotted for hydration prior to introduction into the shaft excavation. The elevation of the slurry within the shaft foundation shall be maintained within 24" of the top casing and at least 48" above the existing water level during drilling and until the concrete placement is essentially complete. The slurry properties shall be maintained at all times, including non-working periods and stoppages. The slurry shall be circulated and agitated, continuously if necessary, to maintain the slurry properties and to prevent it from setting up in the shaft.

The Contractor, in the presence of the Engineer, shall perform control tests on the slurry to ensure that the density, viscosity, and pH fall within the acceptable limits tabulated below. The Contractor shall provide all equipment required to perform the tests. If desanding is required, sand content shall not exceed 4% (by volume) at any point in the shaft excavation as determined by the American Petroleum Institute sand content test.

Range of Values (at 68°F)

Property (Units)	Time of Slurry Introduction	Time of Concreting	Test Method
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(in Hole)			
Density (pcf)	64.3 to 69.1	64.3 to 75.0	Density Balance
Viscosity (seconds per quart)	28 to 45	28 to 45	Marsh Cone
pH	8 to 11	8 to 11	pH paper or meter

The control tests to determine unit weight (density), viscosity, and pH values of the slurry shall be done during the shaft excavation to establish a consistent working pattern.

Prior to placing shaft concrete, slurry samples shall be taken from the bottom and at intervals not exceeding 10'-0" for the full height of slurry. Any heavily contaminated slurry that has accumulated at the bottom of the shaft shall be eliminated. The mineral slurry shall be within specification requirements immediately before shaft concrete placement.

The hole shall be covered when left unattended.

After completing the shaft excavation, all loose material existing at the bottom of the hole shall be removed.

Prior to placing the reinforcement into the shaft, the Contractor, in the presence of the Engineer, shall determine the shaft dimensions, depth and alignment of the shaft. The concrete shaft shall not be out of plumb by more than ¼ inch per foot of depth. The Contractor shall provide all equipment necessary for checking the shaft excavation. The Engineer shall inspect the shaft and verify that it has been properly cleaned.

The reinforcing steel shall be fabricated and assembled in accordance with Article 6.02.03. All reinforcement shall be assembled with wire ties. Welding to assemble the reinforcement is not permitted.

Immediately after the shaft excavation has been inspected and approved by the Engineer and prior to placement of the concrete, the assembled reinforcing steel cage, including cage stiffener bars, spacers, centralizers, and other necessary appurtenances, shall be carefully placed into the shaft excavation as a unit. Dropping or forcing cages into the shaft will not be allowed. The reinforcing steel in the shaft shall be tied and supported so that the reinforcing steel will remain within allowable tolerances of its intended position until the concrete will support the reinforcing steel. When concrete is placed by tremie methods, temporary hold-down devices shall be used to prevent uplifting of the reinforcing steel cage during concrete placement. Concrete spacers or other approved noncorrosive spacing devices shall be used at sufficient intervals not exceeding 5'-0" along the shaft to insure concentric location of the cage within the shaft excavation. When the size of the longitudinal reinforcing steel is larger than a #8 bar, such spacing shall not exceed 10'-0". After placement of the reinforcing cage, the Engineer shall inspect the shaft to ensure that it has remained clean. If the inspection indicates that loose material has accumulated at the bottom of shaft excavation, the Contractor shall remove the reinforcing cage and reclean the shaft.

If directed by the Engineer, the top of the shaft shall be formed square with the length of the sides matching the diameter of the shaft.

Concrete construction shall conform to Subarticle 6.01.03-2,3,4,5 and 6 as amended herein.

Concrete shall be placed in the shaft excavation as soon as possible, but no more than 4 hours after completion of excavation and cleaning of the bottom of the excavation, and no more than 2 hours after placement of the reinforcing steel cage. Concrete shall be placed in a continuous operation to the top of the shaft. The concrete level shall be horizontal during the pouring operations. Concrete placement shall continue after the shaft is full until good quality concrete is evident at the top of the shaft. The elapsed time from the beginning of concrete placement in the shaft to the completion of placement shall not exceed 2 hours.

In dry construction, concrete shall be placed in a single continuous operation with the flow of concrete down the center of the shaft excavation so as to consolidate the concrete on impact. During placement operations, the concrete is not permitted to hit the reinforcing steel. A dropchute, consisting of a hopper and flexible hose, may be used to direct the concrete down the center of the foundation and prevent the concrete from hitting the reinforcing steel. Accumulated water shall be removed before placing the concrete. At the time of concrete placement, no more than 2" of water may exist at the bottom of the excavation and loose sediment no more than 1/2" over one-half the base is acceptable.

In wet (slurry) construction, concrete to be placed by the tremie method, where the concrete displaces the slurry from bottom of the excavation to the top. The concrete shall be placed through a top metal hopper and into a rigid leak-proof elephant trunk tremie tube, sufficiently large enough to permit free flow of concrete. The tremie tube shall be positioned so that it can be removed without disturbing the reinforcing. Initially, the discharge end of the tremie tube shall be sealed closed (plugged) to prevent slurry from entering the tube after it is placed in the excavation and before the tube is filled with concrete. After concrete placement has started, the tremie tube shall be kept full of concrete to the bottom of the hopper to maintain a positive concrete head. The flow of concrete shall be induced by slightly raising the discharge end of the tube, always keeping the tube end in the deposited concrete. No horizontal movement of the tremie tube will be permitted.

The shaft concrete shall be vibrated or rodded to a depth of 5'-0" below the ground surface except where soft uncased soil or slurry remaining in the excavation will possibly mix with the concrete.

Exposed concrete shall be cured and finished in accordance with Subarticle 6.01.03-7, 9 and 10.

Anchor bolt assemblies shall be embedded in the concrete as shown on the working drawings. A template plate shall be used to hold the anchor bolt assemblies, conduits and ground rod sleeve in the correct position. The anchor bolts shall be installed plumb.

All conduit ends terminating below grade shall be capped with a malleable iron caps. All above-grade conduit ends shall be terminated with an insulated bonding bushing with tinned insert.

Ground rod and ground wire shall be installed as shown on the plans.

No construction operations that would cause soil movement adjacent to the shaft, other than mild vibration, shall be conducted for at least 48 hours after shaft concrete has been placed.

The top of the foundations shall be backfilled and the adjacent disturbed ground surfaces restored to match the surrounding area after the concrete has cured and the forms are removed. Placement of topsoil shall conform to Articles 9.44.01 and 9.44.03. Turf establishment shall conform to Article 9.50.03.

The mast arm assemblies shall not be erected on the foundation until the concrete in the shaft has attained a 28 day compressive strength, f'_c , greater than or equal to 4,000 psi.

Method of Measurement: This work will be measured for payment by the number of foundation units, each completely installed and accepted.

The work to remove rock from the foundation excavation will be measured from the top of rock to the bottom of rock excavation.

Basis of Payment: The work will be paid for at the contract unit price each for "Traffic Control Structure – Mast Arm," completed and accepted in place, which price shall include all equipment, materials, tools and labor incidental to the subsurface exploration, design, fabrication, construction and disposal of drilling spoils, of the foundations at the locations specified on the plans.

Backfilling and restoration of adjacent ground surfaces (pavement, slope protection, topsoil & seed, etc.) in all areas disturbed by the work will not be paid for separately, but will be included as part of the work. The Engineer will determine the type, thickness and horizontal limits of the surfaces to be restored.

When rock is encountered within the limits of excavation, its removal will be paid for at the contract unit price per vertical foot for "Rock in Foundation Excavation," which price shall include any additional excavation to remove the rock and any additional concrete required to fill the excavation beyond the designed foundation hole dimensions. Rock, in so far as it applies to "Rock in Foundation Excavation," shall be defined as rock in definite ledge formation, boulders, or portions of boulders, cement masonry structures, concrete structures or portland cement concrete pavement which has a cross-sectional area that exceeds 50% of the cross-sectional area of the designed foundation hole.

ITEM #1003906A - REMOVE LIGHT STANDARD

DESCRIPTION: Under this item the contractor shall remove an existing light standard with transformer base, bracket, luminaire, and ballast as indicated on the plans or as directed by the Engineer. Removed light standards, transformer bases, brackets, luminaires, lamps, and remote ballasts, shall remain the property of the Contractor.

MATERIALS: The Contractor shall be responsible for damage to all equipment and material incurred during removal and hauling. All repairs or replacements due to damage or loss by the Contractor shall be made at the Contractor's expense.

CONSTRUCTION METHODS: The Contractor shall remove a light standard, base, bracket, luminaire, and ballast, where required. Removed light standards with transformer bases, brackets, luminaires and ballasts, shall remain the property of the Contractor. All light standards, transformer bases, lamps, and remote ballasts shall be disposed of by the Contractor.

H.I.D. lamps which are to be disposed of by the Contractor, must be handled as hazardous waste, and be subject to the provisions of the Resources Conservation and Recovery Act (RCRA) Subtitle C and chapter 446 of the Connecticut General Statutes. The removed lamps shall not be landfilled or incinerated, but must be handled and disposed of, or recycled, at an approved facility.

METHOD OF MEASUREMENT: This work will be measured for payment by the number of light standards with associated equipment removed and disposed of or delivered to the specified location, complete and accepted.

BASIS OF PAYMENT: This work will be paid for at the contract unit price each for "Remove Light Standard" complete, which price shall include the removal of light standards with associated transformer bases, brackets, luminaires, lamps, cable and hardware, delivering, disposing, hauling, storing, and including all materials, tools, equipment, labor and work incidental thereto.

ITEM #1003912A - REMOVE CONCRETE LIGHT STANDARD BASE

DESCRIPTION: Under this item the contractor shall remove existing concrete bases where shown on the plans or as directed. The removed concrete bases shall remain the property of the contractor.

CONSTRUCTION METHODS: The contractor shall remove concrete bases where required, and they shall be disposed of by the contractor. The hole shall be backfilled and graded to match surroundings, unless otherwise noted on the plans.

METHOD OF MEASUREMENT: This work will be measured for payment by the number of concrete bases removed and disposed of, complete and accepted.

BASIS OF PAYMENT: This work will be paid for at the contract unit price each for "Remove Concrete Light Standard Base", which price shall include all materials, equipment and work incidental thereto including excavation, backfill when necessary, hauling and disposing of concrete base.

ITEM #1003916A - REMOVE AND RELOCATE LIGHT STANDARD

DESCRIPTION: Under this item the Contractor shall remove, temporarily store as required, and install an existing light standard where shown on the plans, or as directed by the Engineer. The installation shall consist of erecting the light standard with bracket, ballast, luminaire and lamp on a new foundation, and making all necessary electrical connections for proper operation. The new foundation and removal of the existing foundation shall be covered under their separate bid items.

MATERIALS: The Contractor shall be responsible for damage to all equipment and materials incurred during removal and hauling to the specified area. All repairs or replacements due to damage or loss by the Contractor shall be made at the Contractor's expense.

No. 10 single conductor shall be #10 AWG, THHN rated for 600 volts. No. 8 bare grounding conductor shall conform to M.15.13. Fuse holders and fuses shall conform to M.15.05.

CONSTRUCTION METHOD: The Contractor shall remove a light standard, bracket, luminaire, ballast base, and foundation where required, or as directed by the Engineer. The relocated light standard shall be bolted securely to the anchor bolts of the new foundation (foundation to be installed and paid for under a separate item). The completely assembled light standard shall be erected plumb with the aid of aluminum shims, if necessary. The luminaire optics shall be cleaned and made ready for operation.

The existing No. 10 AWG conductors from the luminaire ballast shall be connected to the lighting circuit conductors in the pole base with new breakaway fuse kits suitable for outdoor use. If the existing No. 10 conductors are of insufficient length, then new No. 10 conductors shall be installed between the luminaire and pole base. The light standard shall be connected to the grounding system and ground rod with a No. 8 bare copper grounding conductor.

All work shall be in strict conformance with the National Electric Code.

METHOD OF MEASUREMENT: The work will be measured for payment by the number of light standards and associated equipment removed and relocated, complete and accepted.

BASIS OF PAYMENT: This work will be paid for at the contract unit price each for "Remove and Relocate Light Standard" as specified, which price shall include removal, storage, delivery, and installation of the light standard with bracket and luminaire, lamp conductors, connections, fuse holders and fuses, and all work, tools and equipment incidental thereto.

ITEM #1008901A REMOVE CONDUIT

DESCRIPTION: This item shall consist of removing lighting circuit conduits complete, as shown on the plans or as ordered and in accordance with these specifications. Cable located within the conduit which will be pulled back and removed shall be included in this item. The removed cable and conduit shall remain the property of the Contractor.

CONSTRUCTION METHOD: The Contractor shall remove conduit and cable where required. The removed conduit and cable shall be disposed of by the Contractor.

METHOD OF MEASUREMENT: The quantity of conduit and incidental cable removed will be measured for payment by linear foot.

BASIS OF PAYMENT: This work will be paid for at the contract lump sum for "REMOVE CONDUIT" as adjusted in accordance with the provision above, which price shall include all equipment, labor and work incidental thereto.

ITEM #1010052A – CAST IRON HANDHOLE COVER

ITEM #1010054A – CAST IRON HANDHOLE COVER – TYPE II

Article 10.10.05 - Basis of Payment:

After the words “Cast Iron Handhole Cover, insert the phrase “of the type called for”.

Add to the list of pay items:

Pay Item	Pay Unit
Cast Iron Handhole Cover	EA.
Cast Iron Handhole Cover Type II	EA.

ITEM #1010902A - REMOVE CONCRETE HANDHOLE

DESCRIPTION: Under this item the contractor shall remove existing concrete handholes where shown on the plans or as directed. The removed concrete handholes shall remain the property of the contractor.

CONSTRUCTION METHODS: The contractor shall remove concrete handholes where required, and they shall be disposed of by the contractor. The hole shall be backfilled and graded to match surroundings, unless otherwise noted on the plans.

METHOD OF MEASUREMENT: This work will be measured for payment by the number of concrete handholes removed and disposed of, complete and accepted.

BASES OF PAYMENT: This work will be paid for at the contract unit price each for "Remove Concrete Handhole", which price shall include all materials, equipment and work incidental thereto including excavation, backfill when necessary, hauling and disposing of concrete handholes.

ITEM #1014901A REMOVE CABLE

DESCRIPTION: This item shall consist of removing lighting circuit conductors complete, as shown on the plans or as ordered and in accordance with these specifications. The removed cable shall remain the property of the Contractor.

CONSTRUCTION METHOD: The Contractor shall remove cable where required. The removed cable shall be neatly coiled and tied upon removal. The removed cable shall be disposed of by the Contractor

METHOD OF MEASUREMENT: The quantity of conductor removed will be measured for payment per linear foot for each group of wire pulled between the two removal points (conduit), independent of the number of conductors pulled.

BASIS OF PAYMENT: This work will be paid for at the contract per linear foot (L.F.) for "REMOVE CABLE" as adjusted in accordance with the provision above, which price shall include all equipment, labor and work incidental thereto.

ITEM #1017034A - INSTALL SERVICE

Description:

The work under this item shall consist of the Contractor coordinating and scheduling the service installation/connection of the electrical service by the Utility Company from the utility service source to the meter socket on the service cabinet, Traffic Management System (TMS) Cabinet, Highway Advisory Radio (HAR), Portable Variable Message Sign (PVMS) location or direct service connection from a cabinet or location with metered service to the previously mentioned cabinets. This work will also entail installation of the meter by the Utility Company, installation of riser conduit, installation of conductors underground or overhead between the utility service source and the meter socket on the service cabinet, Traffic Management System (TMS) Cabinet, TMS Mini-Hub Cabinet. The work shall also include energizing the metered or un-metered service connection.

The Utility Company may render a service charge to the Contractor for installation and connection of underground and (or) overhead services. This will include all conductors and utility poles needed to supply power to the meter located on the service cabinet. These charges are to be paid for under this item.

Materials:

The materials for this work shall conform to the Special Provisions herein, utility specifications and the National Electric Code

Construction Methods:

The Contractor will need to coordinate with utilities in order to relocate SNET Pole 9417 and SNET Pole 94X7 that supplies power, telephone, and T1 service to the PVMS 214/Camera 148 Service Cabinet.

The Contractor shall contact the Utility Company listed in the Section 1.07 of these Special Provisions at least 30 days in advance to coordinate the service connection work to be performed by the Contractor and the Utility Company. The date the service is connected and energized shall be recorded for billing purposes and provided to the Engineer or his designated representative. All work performed by the Contractor under this item shall be in accordance with the utility requirements, the National Electric Code. The Contractor shall obtain the necessary utility specifications prior to any service work.

The Contractor shall complete the required service request forms for all service locations. This item shall include all required service conductors on the load side of the meter socket.

At all locations, the service installation shall be inspected and approved by the Engineer or his designated representative prior to the service being energized.

Method of Measurement:

This work will be measured for payment by the number of electric services installed, energized, complete and accepted by the Engineer and Utility Company.

Basis of Payment:

This work will be paid for at the contract unit price for each "Install Service", complete, energized and accepted in place which shall include meter, service conductors between utility service source and meter socket, load side service conductors, circuit breakers, riser conduit, stub poles, all Utility Company charges, and all material, equipment, tools, labor and incidental expense.

ITEM #1019027A - PRE-ASSEMBLED AERIAL CABLE

DESCRIPTION: This work shall consist of furnishing and installing pre-assembled aerial cable, with insulators and brackets, on proposed poles at the location indicated on the plans to maintain illumination circuits.

MATERIALS: Pre-assembled aerial cable shall be 7 strand aluminum containing a No. 6 AWG bare messenger with three No. 6 AWG cross-linked polyethylene insulated conductors rated at 600 volts.

CONSTRUCTION METHOD: The pre-assembled aerial cable shall be attached to poles with insulators, including all connections as indicated on the plans or as directed by the engineer. Pre-assembled aerial cable used for temporary lighting shall be removed once the permanent lighting is installed and operational. Removed aerial cable shall remain the property of the Contractor.

METHOD OF MEASUREMENT: This work will be measured for payment by the actual number of linear feet of pre-assembled aerial cable installed and accepted and removed, including attachments.

BASIS OF PAYMENT: This work will be paid for at the contract unit price per linear foot for "Pre-Assembled Aerial Cable" of the size and voltage specified, complete in place, which price shall include, insulators, entrance cap and attachment, bracket, all materials, tools, connections, equipment, labor, and work incidental thereto. The unit cost for this item is a one time only cost. The cost of removing and relocating the aerial cable to maintain different illumination circuits in addition to the removal of said cable upon completion of temporary phasing shall be included in the unit cost.

ITEM #1020030A - TEMPORARY ILLUMINATION UNIT

DESCRIPTION: Under this item the Contractor shall furnish and install a breakaway fiberglass light pole, anchors, bracket, luminaire with ballast, and necessary hardware for temporary lighting during construction, as indicated on the plans or as directed by the Engineer. At the end of the project the temporary illumination unit shall become the property of the Contractor.

MATERIALS: The pole shaft shall be fiberglass reinforced composite (FRC). The pole shaft shall be constructed by the filament winding process from thermosetting polyester resin and contain a minimum of 65 percent of “E” type fiberglass by weight. The filament windings shall be continuously applied with uniform tension and shall be placed on the pole helically at low angles to provide axial strength. Additional windings shall be placed on the pole in a circular manner to provide compressive strength. The resin is to be uniformly pigmented to match the final grey color of the finished FRC pole. The pole is to contain solid coloration throughout the entire wall thickness and is to contain ultraviolet (UV) inhibitors. The pole is to be round, tapered, hollow, and reinforced in the support arm and hardware attachment areas. The pole is to be non-conductive and chemically inert. A 2 ½” x 5” handhole shall be provided at the base of the pole shaft at approximately 18” above the finished grade line. The pole shall meet the current AASHTO LTS-2 *Street Lighting Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals*, and shall be approved by FHWA for use on Federal Aid projects. Direct buried poles shall meet the latest AASHTO breakaway requirements.

The pole exterior surface is to be grey with a natural (textured) finish. The surface of the pole will be uniform for the entire length of the pole. The laminate shall contain colored pigment, the color of the final coating, and be of uniform color throughout the entire wall thickness of the pole. A coating shall be applied to the pole to maintain surface integrity against the damaging effects of sunlight and extremes in weather. The coating is to be highly weather resistant pigmented polyurethane. The coating thickness shall have minimum dry film thickness of 1-1/2 mils.

The surface shall be tested for a minimum of 5000 hours of accelerated testing in accordance with ASTM G154 (UV-A lamp 340 NM wave length, 130 degree F, cycle lamp 4 hours on 4 hours off) with the following results:

- Fiber exposure: none
- Crazing: none
- Checking: none
- Chalking: none
- Color: may dull slightly

The minimum pole weight shall be 130 lbs. The weight of each pole shall not deviate from the specified weight by more than +/- 10 lbs.

For direct buried break-away poles the butt end shall be enlarged so as to provide resistance to rotation and pull out.

Where indicated on the plans, the pole shaft shall be equipped with an anchor base with of heavy duty A356-T6 aluminum which shall be permanently bonded to the outside of the fiberglass shaft.

Each pole is to be permanently marked in characters 3/16" minimum high on a brass or stainless steel plate with the manufacturer's identification symbol, month and year of manufacture. Each pole shall be individually packaged for protection during shipping and storage. The pole shall be warranted to be free of defects in materials and workmanship for a period of three years from the date of purchase.

The top of the pole is to be pre-drilled for two 5/8" thru bolts on 9-1/2" centers starting 4 inches below the top of the pole. A 1-1/2" wire exit hole shall be centered 1/2 the distance between the two holes.

A cast aluminum removable cap shall be securely mounted to the top of the pole. The cap shall be corrosion resistant and must remain in place when subjected to the maximum wind loading for which the pole is designed.

The luminaire bracket arm shall be 12' in length (single member) of an upsweep design fabricated from tubular aluminum. The luminaire end shall have a 2-3/8" outside diameter.

Anchors shall conform to the pertinent requirements of Article M.16.04-2b, c, d, and e.

The luminaire shall conform to the pertinent requirements of Article M.15.05, and shall be high pressure sodium. The luminaire wattage shall be 200 watt or as called for on the plans. The socket shall be adjustable to provide I.E.S. light distribution type M-S-II. The ballast shall be under guarantee of the manufacturer for a period of one year commencing when the unit is installed and accepted

CONSTRUCTION METHOD: The fiberglass pole shall be set in the earth to the required depth and proper compaction of backfill provided around the pole and then attached to the anchors with guys as necessary. The bracket shall be attached to the pole and shall provide a luminaire mounting height of 30' over the roadway or as called for on the plans. The bracket and luminaire assembly shall be installed perpendicular to the center line of the roadway. When necessary, the temporary light pole and luminaire shall be relocated to maintain different illumination circuits as dictated by the construction stages.

Where indicated on the plans an anchor base type pole shall be supplied and securely bolted to the anchor bolts of the foundation and leveled with the aid of aluminum shims if necessary.

Upon completion of the project the temporary illumination unit shall be removed and shall remain the property of the Contractor.

Upon removal of the pole, the resulting excavation shall be properly backfilled to match the surrounding area.

METHOD OF MEASUREMENT: This work will be measured for payment by the number of temporary illumination units installed and accepted.

BASIS OF PAYMENT: This work will be paid for at the contract unit price each for "TEMPORARY ILLUMINATION UNIT" complete in place, which price shall include all materials, fiberglass poles, breakaway base, anchor base (when required), anchors, guys, brackets, luminaires, lamps, ballasts, hardware, connections, hauling, and all equipment, tools, labor and all work incidental thereto including excavating, augering, removal of bituminous overlay, backfilling, removal, hauling, relocation, and disposal. The unit cost for this item is a one-time only cost. The cost of removing and relocating the temporary illumination unit to maintain different illumination circuits shall be included in the unit cost.

ITEM #1103021A 28' STEEL SPAN POLE

ITEM #1103022A 30' STEEL SPAN POLE

ITEM #1103029A 31' STEEL SPAN POLE

Article 11.03.02 - Materials

Article M.16.04.01 – Steel Poles

Add the following to subsection (d) Finish:

When indicated on the plans, the steel span pole, including luminaire bracket, shall be painted after it is galvanized.

The color of the finish coat shall be indicated on the plans.

If indicated as: **Charcoal Gray**, the color shall be **federal standard 595, color No. 26134**.

If indicated as: **Dark Green**, the color shall be **federal standard 595, Color No. 14056**.

The factory applied coating system over hot dip galvanizing shall be one of the following:

SHERWIN WILLIAMS

Prime Coat Recoatable Epoxy Primer

Finish Coat Hi - Solids Polyurethane

KEELER AND LONG

Primer Coat Kolor-Poxy #3200

Finish Coat Kolorane U-Series Enamel

CARBOLINE

Primer Coat Carboline 801 Primer

Finish Coat Carbothane 134 HB Enamel

VALSPAR

Primer Coat Val Chem 13-F-62 Primer

Finish Coat V40 Series Urethane Enamel

Steel surface defects such as fins, slivers, tears, delaminations, burrs, sharp edges and other defects shall be ground down with the use of a power disc grinder or other tools approved by the Engineer, to afford as close to a continuous surface characteristic as possible for coating material application and continuous film build. Defects that, in the opinion of the inspection

personnel, are so large or deep that grinding may not rectify the defect shall be referred to the Engineer for resolution.

After the span poles have been fabricated, welds ground smooth, flux and splatter removed, they shall be hop-dip galvanized in accordance with ASTM A123.

After the span pole and accessories have been galvanized to ASTM A123 the span pole shall be baked at 190 degrees C for 2 hours. The span pole and accessories shall be painted in accordance with the following:

A site foreman shall be provided to oversee the surface preparation and painting operations. The foreman shall have the following:

Copy of this provision

Wet film thickness gauge

Dry film thickness gauge

Surface temperature and relative humidity gauges

Psychometric charts or psychometric tables from the U.S. Weather Bureau

Product data sheets and applicable instructions for the products specified

Material safety data sheets for the products specified

Surface Preparation: Surface preparation shall consist of cleaning galvanized and stainless steel surfaces in accordance with the methods listed herein. The cleaned surface shall be approved by the Engineer or his appointed inspector prior to any painting. Exposed bare steel surfaces on galvanized structures shall be touched up in accordance with ASTM A 780 prior to applying paint system.

All foreign matter such as oil, grease, and dirt shall be cleaned from the surface using a biodegradable cleaner (i.e. Carboline #3 Cleaner or Dev-Prep 88) in accordance with Steel Structures Painting Council Surface Preparation No. 1 (SSPC-SP1) "Solvent Cleaning". All surfaces shall then be brush blasted in accordance with SSPC-SP7 "Brush-Off Blast Cleaning" using a fine abrasive at nozzle pressures not to exceed 0.4 Mpa. Brush blasting must be performed to 100% of the surface area being coated.

All surfaces brush blasted must be primed the same day.

Application: Handling, mixing, and all other facets of application and curing of paint shall be in accordance with the manufacturer's written instructions unless otherwise instructed by the manufacturer.

Paint, substrate, and air temperature at the time of application shall be between 15 and 38 degrees C unless otherwise specified by the manufacturer.

Paint shall not be applied unless the temperature of the surfaces being coated is, and will remain, at least 3 degrees C above the dew point until the coating is dry "to touch".

The relative humidity shall be less than 85% during application.

The paint shall be thoroughly mixed prior to and during application. Mechanical agitation during application may be necessary to keep pigment in suspension. Paint shall not be transferred (other than to simplify mixing) until all pigment has been incorporated. Air shall not be used directly for agitation.

Paint materials may not be used beyond the recommended pot life.

Thinners shall not be added to paint unless it is absolutely necessary for application. The amount of thinner used shall not exceed the manufacturer's recommendations for quantity and type. If used, the thinner shall only be added in accordance with the manufacturer's instructions, under the engineer's presence.

Spraying is the preferred method of application. Brushing, rolling and/or mitt application may be used where appropriate.

The paint system shall have the following thickness':

Galvanized Surfaces

Primer Coat 75 to 125 microns Dry Film Thickness

Finish Coat 38 to 63 microns Dry Film Thickness

Aluminum and Stainless Steel Surfaces

Primer Coat 50 to 75 microns Dry Film Thickness

Finish Coat 38 to 63 microns Dry Film Thickness

Paint thickness will be determined in accordance with SSPC-PA-2 "Measurement of Dry Paint Thickness with Magnetic Gages". The number of readings will be a minimum of that stated in SSPC-PA-2.

Completed work shall be free from runs, drips, sags, holidays, voids and other imperfections.

Any coating damaged prior to or during the installation of shall be repaired. Areas to be repaired shall be clean, dry, free from grease, oil, corrosion products and other contamination. If contaminated, power wash or scrub with stiff brush and clean water. Repair areas may be brushed or sprayed as appropriate. If the Contractor elects to spray he must provide overspray containment. The minimum overspray containment shall conform to the requirements of SSPC Guide 6 for the Class 3A level.

All defective work shall be corrected by the Contractor at no cost to the Department.

Compliance with Regulations: The Contractor is required to meet all OSHA and EPA as well as state and local government regulations regarding worker safety and protection,

hazardous waste handling and disposal through the use of appropriate containment, engineering controls, respirators, monitors, etc.

Subsection (i) Wire Entrance Fitting:

Remove the following from the second sentence:

“required to accept the cables”.

ITEM #1104026 A – 25' STEEL MAST ARM ASSEMBLY**ITEM #1104031 A – 35' STEEL MAST ARM ASSEMBLY**

Description: Work under this item shall consist of designing, fabricating and installing a mast arm assembly to carry traffic appurtenances (such as traffic signals, signs, antenna, etc.) of the type specified, on a prepared foundation, in accordance with the details shown on the plans, in accordance with these specifications and as ordered by the Engineer.

Materials: The tubular components, such as the pole, arm and luminaire arm shall be made of steel with a minimum yield stress of 35,000 psi.

The structural plate components, such as the baseplates, handhole frames, and the plates in the arm to pole ring stiffened, built-up box connection, shall be made of steel that conforms to the requirements of ASTM A709, Grade 50T2.

Anchorage plates shall conform to the requirements of ASTM A709, Grade 50T2.

The steel for arm and pole members; structural plate components, such as the baseplates, connection/flange plates, gusset plates, handhole frames and the plates in the arm to pole connection, shall meet the following Charpy V-notch impact testing requirements:

Yield Strength	Thickness in.	Minimum Test Value Energy ft.-lbs.	Minimum Average Energy, ft.-lbf
$F_y \leq 36$ ksi	≤ 4	20	25 at 40°F
36 ksi < $F_y \leq 50$ ksi	≤ 2	20	25 at 40°F
36 ksi < $F_y \leq 50$ ksi	$2 < t \leq 4$	24	30 at 40°F
50 ksi < $F_y \leq 70$ ksi	≤ 4 (100)	28	35 at -10°F
Charpy V-notch sampling and testing shall be in accordance with AASHTO T243, "P" piece frequency.			

The non-structural components, such as hand hole covers, caps and anchor bolt covers, shall be made of steel with minimum yield strength of 36,000 psi.

The filler metal shall have a matching strength relationship with the base metal.

All high strength bolts shall conform to ASTM A325, Type 1. Nuts shall conform to ASTM A563, Grade DH. Circular, flat, hardened steel washers shall conform to ASTM F436. The bolts, nuts and washers shall be galvanized in accordance with ASTM A153 or ASTM B695, Grade 50. The nuts shall be overtapped to the minimum amount required for the bolt assembly and all surfaces of the nuts shall be lubricated with a lubricant containing a visible dye of any color that contrasts with the color of the galvanizing. The high strength bolts shall conform to the requirements of Subarticle M.06.02-3.

The anchor bolts shall conform to ASTM F1554, Grade 105. The nuts shall conform to ASTM A563, Grade DH. The washers shall conform to ASTM F436. The bolts, nuts and washers shall be galvanized in accordance with ASTM A153. The nuts shall be overtapped to the minimum amount required for the bolt assembly and all surfaces of the nuts shall be lubricated with a lubricant containing a visible dye of any color that contrasts with the color of the galvanizing. Prior to shipping the anchor bolts, the nuts and washers shall be installed by hand on the anchor bolts to ensure that the nuts can be run on the threads. Only anchor bolts on which the nuts are free running shall be shipped. The anchor bolts shall be shipped with the nuts and washers on the threads.

All steel components, including anchor bolts, shall be completely hot-dip galvanized, after fabrication, in accordance with ASTM A123 or ASTM A153, as applicable. Repairs to damaged areas of the hot-dip galvanized coatings shall conform to the requirements of ASTM A780 amended as follows:

Paints containing zinc dust, if used for repairs, shall contain either between 65% to 69% metallic zinc by weight or greater than 92% metallic zinc by weight in dry film.

The silicone sealant shall be a 1-component, 100% silicone sealant recommended for use with galvanized steel.

Neoprene gasket material for the access openings shall conform to ASTM D1056, Grade 2A2 or 2A3. Other grades of neoprene approved by the Engineer may be used.

Closed cell elastomer for sealing the space between the foundation and base plate shall conform to ASTM D1056, Grade 2A2 or 2A3 and shall have a pressure-sensitive adhesive backing on one side for adhesion to steel. Closed cell elastomer contained within the anchor bolt pattern shall not interfere with the anchor bolt leveling nuts and shall not block the opening in the base plate.

Bare copper grounding conductor shall be #8 AWG stranded bare copper wire conforming to M.15.13. The grounding bolt shall be stainless steel with a hex head.

All materials used in the finished structure shall be new. The use of materials that have been previously used in a structure or salvaged from a structure is not permitted.

The Contractor shall submit Certified Test Reports and Materials Certificates in conformance with Article 1.06.07 for the steel used in the mast arm members and components, high-strength bolts (including nuts and washers) and anchor bolts (including nuts and washers). The Certified Test Reports shall include the following:

- a. Mill test reports that indicate the place where the material was melted and manufactured.
- b. High-strength bolt test results for proof load tests, wedge tests, and rotational-capacity tests that indicate where the tests were performed, date of tests, location of where the components were manufactured and lot numbers.
- c. Galvanized material test results that indicate the thickness of the galvanizing.

Prior to incorporation into the work, the Contractor shall submit samples in conformance with Article 1.06.02 for the steel used in the mast arm members and components, high-strength bolts (including nuts and washers) and anchor bolts (including nuts and washers).

Construction Methods: The design and fabrication of the mast arm assembly, including its anchorage (into the foundation), shall conform to the requirements of the latest edition of the AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals, including the latest interim specifications, available prior to the advertising date of the contract, amended as follows:

- The design wind speed shall be 120 mph. The computation of wind pressures in accordance with Appendix C is not permitted.
- The minimum design life for mast arms shall be 50 years.
- The wind importance factor, I_r , for wind pressure shall be 1.00.
- The mast arms shall be designed to support fixed mounted traffic signals and signs. The wind drag coefficient for traffic signals and luminaires shall be 1.2.
- The mast arms shall be designed for fatigue importance category I for cantilever structures. The mast arms shall be designed for the wind load effects due to galloping, natural wind gusts and truck-induced gusts. The luminaire arms shall be designed for the wind load effects due to natural wind gusts. The design pressure for the truck-induced gust shall be based on a truck speed of 65 mph. The design of the mast arms shall assume that vibration mitigation devices will not be installed.
- The vertical deflection of the free end of the arm due to the wind load effects of galloping and truck-induced gusts shall not exceed 8”.

- The maximum stress ratio (the ratio of the computed stress to the allowable stress) or combined stress ratio in any mast arm component due to each group load shall not exceed 0.85. The purpose for limiting the CSR is to allow for future additional appurtenance configurations.
- The maximum arm length shall be 40'-0", measured from the centerline of the pole to the tip of the arm.
- The maximum luminaire arm length shall be 15'-0".
- The maximum diameter of the pole at its base shall be 18".
- The maximum diameter of the arm at the arm-pole connection shall be 15".
- The minimum wall thickness of the arm at the pole connection and the pole shall be 5/16". The minimum wall thickness of the pole shall be 5/16". The wall thickness of the pole and arm component members shall be uniform throughout their lengths. The use of multiple plies (laminations) to obtain the required arm and pole thickness is not permitted. The use of shop-fabricated stepped members is not permitted.
- The arm, luminaire arm and pole shall be tubular members with either round or multisided cross-sections. Multisided tubular members with other than 8, 12 or 16 sides are not permitted. Multisided tubular members with fluted sides are not permitted. The arm and luminaire arm shall be fabricated with a taper (change in diameter).
- Multisided tubular members less than or equal to 13" in diameter shall have a minimum of 8 sides. Multisided tubular members greater than 13" in diameter and less than or equal to 18" in diameter shall have no less than 12 sides.
- Multisided tubular members shall have a minimum internal bend radius of 5 times the tubular member thickness or 1", whichever is greater.
- Joining 2 tubular members together with a circumferential weld to fabricate a pole is not permitted.
- A maximum of one slip-type field splice is permitted in the arm. Slip-type field splices are not permitted in the pole.
- The arm may be fabricated with no more than 1 longitudinal seam weld. The pole may be fabricated with no more than 2 longitudinal seam welds. The seam welds shall be ground smooth and flush with the adjacent base metal.

- The longitudinal seam welds within 6" of the member ends shall be complete joint penetration groove welds.
- 100% of partial joint penetration longitudinal seam welds shall be non-destructively tested in accordance with the magnetic particle method. 100 % of complete joint penetration seam welds in members less than 1/4" thick shall be non-destructively tested in accordance with the magnetic particle method on both the inside and outside surfaces. 100% of complete joint penetration seam welds in members greater than or equal to 1/4" thick shall be non-destructively tested in accordance with the ultrasonic method in accordance with AWS D1.1 Annex S.
- All tubular member to transverse plate connections shall be made with a complete joint penetration groove weld with or without a backing ring. Backing rings may be connected to the inside surface of the tubular member with a continuous fillet welds only in tubular members greater than or equal to 16" in diameter. 100% of the complete joint penetration groove welds shall be non-destructively tested by the ultrasonic method after fabrication and prior to galvanizing. 100% of the complete joint penetration groove welds shall also be non-destructively tested by the ultrasonic method for toe cracks after galvanizing. 100% of backing ring fillet welds shall be non-destructively tested by the magnetic particle method after fabrication prior to galvanizing. After galvanizing, at locations where the backing ring is not welded to the transverse plate or the tubular member, the joint between the backing ring and transverse plate or tubular member shall be sealed with silicone sealant to prevent the ingress of moisture.
- The strength of a connection made with a complete joint penetration groove weld shall be no greater than the strength of the base metal. In connections joining base metal with different yield strengths, the base metal with the lower yield strength shall govern the design.
- The flange plate connection in the arm to pole in the ring stiffened, built-up box connection shall be designed as slip critical connections with standard holes. The minimum number of high-strength bolts in a flange splice shall be 8. Consideration should be given to the use of smaller diameter bolts since they require lower specified minimum bolt tensions.
- The minimum flange plate thickness shall no less than 2". The determination of the plate thickness in the tubular member to transverse plate connections shall consider the potential for the plate to warp due to the heat from welding. Consideration should be given to the use of thicker plates to allow for subsequent machining of warped plates to a flat surface so that removal of material will not compromise the required strength of the plate.
- The minimum thickness of the ring plates and gusset plates in the ring stiffened, built-up box connection shall be 1/2".

- The size of fillet welds specified in designed connections shall be no less than 5/16". The use of seal and tack welds is not permitted. No welding shall be performed after galvanizing.
- The use of stiffeners at tubular member to transverse plate connections and at the arm to pole connection is not permitted.
- The minimum base plate thickness shall no less than 2 1/2" or at least as thick as the anchor bolt diameter, whichever is greater. The determination of the plate thickness in the tubular member to transverse plate connections shall consider the potential for the plate to warp due to the heat from welding. Consideration should be given to the use of thicker plates to allow for subsequent machining of warped plates to a flat surface so that removal of material will not compromise the required strength of the plate.
- The opening in the base plate shall be sized to allow for proper galvanizing and allow conduits projecting from the foundation to pass through it. The size of the opening shall be kept to a minimum to reduce the flexibility of the baseplate.
- The pole base plate anchor bolt circle diameter shall be 24".
- The anchor bolt to base plate connection shall be designed as a double-nut connection with shear holes. The minimum distance from the center of the anchor bolt hole to the edge of the base plate shall be no less than 2 times the diameter of the anchor bolt. The anchor bolts shall use an embedded anchorage plate, 1/2" minimum thickness, to transmit loads from the pole base to the concrete foundation. The use of hooked anchor bolts is not permitted. The minimum number of anchor bolts shall be 8. The minimum anchor bolt diameter shall be 2". The minimum anchor bolt embedment, the distance from the top of the foundation to the top of the embedded anchorage plate, shall be 3'-6" or the tension development length of the vertical foundation reinforcement plus the end concrete cover, whichever is greater. Each anchor bolt shall be supplied with 4 nuts and 4 washers. Washers shall be placed on the top and bottom surfaces of the pole base plate and anchorage plate. Welding to the anchor bolts is not permitted. The use of lock washers with the anchor bolt assembly is not permitted.
- The horizontal deflection of the free end of the arm under the Group Load Combinations II and III due to wind and ice loads only shall not exceed $(L + H)/150$, where L is the span length of the cantilever arm measured from centerline of the pole to the free end of the arm and H is the height of the pole measured from the top of the baseplate to the centerline of the arm. The vertical deflection of the free end of the arm under the Group Load Combinations II and III due to wind and ice loads only shall not exceed $(L + H)/150$, where L is the span length

of the cantilever arm measured from centerline of the pole to the free end of the arm and H is the height of the pole measured from the top of the baseplate to the centerline of the arm.

The mast arm shall be designed for the load effects due to the actual traffic appurtenances (signals, signs, luminaires, cameras, etc.). The mast arms shall also be designed for the effects of traffic appurtenances during all stages of construction that may exist during the project under which the mast arms are installed. The mast arms shall be designed to support traffic appurtenances with properties no less than those tabulated on the plans.

The dimensions of the mast arm assemblies are shown on the traffic plans, elevations, cross-sections or in the special provisions. The arm, luminaire arm and pole lengths and the attachment heights shall be verified by the Contractor based on the finished grade at the site, top of foundation elevation, the locations of overhead utility cables and the traffic appurtenance mounting heights. If either the arm or pole length is inadequate, the Contractor shall notify the Engineer.

The minimum vertical clearance from the top of the finished road to the bottom of the traffic signals shall be 16'-0". The maximum vertical clearance from the top of the finished road to the bottom of the traffic signals shall be 18'-0". The traffic signals shall be installed so that the bottom of all the signals for each approach is at the same elevation.

The arm to pole connection shall be made with a ring stiffened, built-up box. The luminaire arm to pole connection shall be made with either a built-up box or a ring stiffened built-up box. A minimum of 8 high-strength bolts shall be used to connect the arm flange plate to the built-up box connection plate. A minimum of 4 high-strength bolts shall be used to connect the luminaire arm flange plate to the built-up box connection plate. All fasteners and their components used in the each connection shall be visible. The use of tapped holes in the plates of each connection is not permitted. A hole(s) shall be provided in each connection to allow wires to pass from the pole to the arm and luminaire arm. The sides of all holes in each connection shall be ground smooth and the edges rounded by grinding to prevent the wires from chafing.

Vent and drain holes shall be provided for galvanizing. The number, size and location of vent and drain holes should be coordinated with the galvanizer prior to the submission of the mast arm assembly design. The area of vent and drain holes at each end of a member shall be at least 30% of the inside area of the member for members 3" in diameter and greater and 45% of the inside area of the member for members smaller than 3" in diameter. The vent and drain holes shall be strategically located for reducing stress and for proper galvanizing. The holes shall be made by drilling. Flame cut holes are not permitted. The edges of all holes shall be rounded by grinding. After galvanizing, exposed holes placed in the sign support components for galvanizing shall be sealed with neoprene plugs.

A J-hook shall be welded to the inside of the pole at the top for wire handling and support.

The mast arm shall have a handhole, reinforced with a frame, located at the base of the pole. The handhole shall be located with a normal direction that is 90° to the plane formed by the pole and arm. The minimum clear distance from the top of the baseplate to the outside face of the bottom of the handhole frame shall be no less than the diameter of the tubular member or 1'-9", whichever is greater. The handhole frame shall have a minimum 4" wide by minimum 6" high clear opening. The maximum width of the handhole opening, the clear opening plus twice the frame thickness, shall not be greater than 40% of the tubular member diameter at that section. The inside corners of the handhole frame shall be rounded to a radius of 30% to 50% of the width of the clear opening. The minimum thickness of the handhole frame shall be no less than the thickness of the pole or 5/16", whichever is greater. The handhole frame shall be connected to the pole with a partial joint penetration groove weld reinforced with a fillet weld. The handhole weld shall start and end at the point that is coincident with the longitudinal axis of symmetry of the tubular member and the longitudinal axis of symmetry of the handhole frame. 100% of the weld shall be non-destructively tested in accordance with the magnetic particle method. The handhole shall be provided with a cover connected to the frame with no less than 4 stainless steel screws. The cover shall be installed with a neoprene gasket matching the dimensions of the cover. The cover shall also be attached to the frame with a 1'-6" long stainless steel chain. The inside bottom of the frame shall have a hole tapped for the stainless steel grounding bolt.

The mast arm shall be supplied with a pole cap plate, arm cap plate, and anchor bolt covers. The cap plates shall be attached with fasteners. The joint between the tubular member and plate shall be sealed with a neoprene gasket matching the dimensions of the plate.

The luminaire arms shall be fabricated of pipe with a minimum thickness equal to schedule 40. Single arm luminaires shall be used for luminaires with arm lengths less than or equal to 8'-0". Truss type luminaires shall be used for luminaires with arm lengths greater than 8'-0". The truss type luminaires shall consist of an upper and lower members joined with vertical members at the tip and midspan. To accommodate the luminaire fixture, the size of the pipe in the luminaire arm at the tip shall be 2" diameter, schedule 40. If necessary, a reducing tenon shall be installed at the tip of the arm to accommodate the luminaire fixture.

The luminaire arm(s) shall be connected to the pole with clamp connections. Each clamp connection shall use 4 high-strength bolts. The installed nuts shall be prevented from loosening while in service. The use of lock washers to meet this requirement is not permitted. The arms shall be fillet welded, all-around, to the clamp(s). The size of the weld shall be no less than ¼". A hole shall be provided in the clamp, (upper arm clamp for truss type arms) and pole to allow for wires to pass from the pole to the luminaire arm. The sides of all holes in the connection shall be ground smooth and edges rounded by grinding to prevent the wires from chafing.

Prior to fabrication, the Contractor shall submit working drawings and design computations for each mast arm assembly to the Engineer for review in accordance with Article 1.05.02. An individual, independently packaged set of working drawings and computations, with all details and documents necessary for fabrication and erection of the structure and its components, including a copy of the certificate of insurance, shall be prepared and submitted for **each** mast

arm. **A single set of drawings with tabulated data for multiple mast arm locations is not permitted.** The alpha-numeric mast arm identifier shall be included on these documents. The working drawings and computations shall be prepared in Customary U.S. units.

The packaged set of working drawings and computations for each mast arm assembly shall be submitted in an individual file in electronic portable document format (.pdf) with appropriate bookmarks and commenting enabled. The packaged set shall include the following:

- title sheet
- table of contents
- contact information for designer, fabricator and galvanizer – contact information should include name and address of each firm and the name of contact person with phone number and email address
- copy of the certificate of insurance
- copy of fabricator's AISC certification
- copy of the traffic signal control plan detailing mast arm assembly
- mast arm assembly working drawings
- mast arm assembly design computations
- welding procedures
- mast arm installation procedure, including the method to plumb the pole

The working drawings and design computations shall be **signed, dated and sealed** by a Professional Engineer licensed in the State of Connecticut, who shall also be available for consultation in interpreting his computations and drawings, and in the resolution of any problems which may occur during the performance of the work. Each working drawing shall be signed, dated and sealed. The cover/first sheet for the computations shall be signed, dated and sealed.

The electronic portable document format (.pdf) working drawings shall be created on ANSI D (22" x 34") full scale (1" electronic file = 1" paper) sheets. (The purpose of creating the drawings on ANSI D sheets is so that the sheets may be printed/plotted at that size or smaller without loss of legibility.) Each drawing shall have a border and title block. Located in the lower right hand corner of the drawing adjacent to the title block, each drawing shall have a rectangular box, 2 1/4" wide x 1 3/4" high, for the reviewers stamp. On the ANSI D full scale sheets, the minimum text height and width shall be 1/8". All letter characters shall be uppercase. The electronic files for the design computations, procedures and other supporting data shall be created on ANSI A (8 1/2" x 11") letter sheets.

The working drawings shall include complete details of all mast arm components. The drawings shall include, but not be limited to the following:

- the project number, town and mast arm identification number
- reference to the design specifications, including interim specifications

- reference to the design specifications design criteria, such as design wind speed, minimum design life, fatigue category, vehicle speed, etc.
- material specifications for all components
- material designations for the arm and pole, with an explanation of the alpha numeric characters (equivalent thickness, in inches, shall be provided for gage numbers)
- non-destructive weld testing requirements
- details of the location of the longitudinal seam welds in the arm, luminaire arm and pole
- vent and drain holes for galvanizing
- dead load and permanent camber
- a plan view of the anchor bolt layout relative to the orientation of the arm
- anchor bolt dimensions, including embedment and projection
- mast arm installation procedure, including the method to plumb the pole

The design computations shall include, but not be limited to the following:

- the project number, town and alpha-numeric mast arm identifier
- references to design specifications, including interim specifications, and the applicable code section and articles
- description/documentation for all computer programs used in the design
- drawings/models of the structure, components and connections, with dimensions, loads and references to the local and global coordinate systems used (as applicable), to facilitate review of the results
- a tabulation of the section properties of the tubular members at each analyzed section. The tabulated values should include the diameter, D (if round member); effective width, b (if multisided member, AASHTO 5.5.2); equivalent diameter (if multisided member, AASHTO 5.6), wall thickness, t ; inside bend radius, r_b (if multisided member, AASHTO 5.5.2), cross-sectional area, A ; moment of inertia, I ; section modulus, S ; radius of gyration, r . AASHTO Table B-1 may be used to

determine the section properties. If Table B-1 is used, the radius measured to the mid-thickness of the wall shall also be provided.

- coefficients and factors used in the design
- results of all group loads and load combinations
- stress ratios and combined stress ratios for all group loads and load combinations
- horizontal and vertical deflections due to Group Load Combinations I, II and III for dead, wind and ice loads
- vertical deflection of the free end of the arm due to the wind load effects of galloping and truck-induced gusts

The Contractor shall submit the packaged set of working drawings and calculations to the “Engineer of Record”. The “Engineer of Record” is identified in the signature block on the mast arm assembly contract plans. A copy of the transmittal shall be sent to the District Construction office administering the project.

Please mail to:

Abdul Mohammed, P.E.
City Traffic Engineer
City of Danbury
155 Deer Hill Avenue
Danbury, Connecticut 06810
(203) 797-4643

The reviewed and stamped working drawings and calculations shall be sent by the reviewer, along with a recommendation regarding acceptance, to the District Construction office for review, comment and distribution. After the District Construction office has reviewed the working drawings and calculations, ensured all comments have been addressed and have found the submittal to be acceptable, in addition to distributing copies of the working drawings and calculations to the Contractor and District offices, a copy of each packaged set of working drawings and calculations shall be sent to the following Department offices:

Bridge Safety and Evaluation
Research and Materials
Traffic Engineering
Traffic Signal Lab
Engineer of Record

The mast arm assemblies shall be fabricated in accordance with the latest edition of the AASHTO LRFD Bridge Construction Specifications, including the latest interim specifications, amended herein.

The steel fabricator shall be AISC certified for the fabrication to the Standard for Bridge and Highway Metal Component Manufacturers (CPT).

Fabrication of the mast arm may begin only after the working drawings and design computations have been reviewed and the Engineer has authorized fabrication to begin. The Contractor shall submit to the Engineer, no less than 2 weeks prior to the start of fabrication, the name and location of the fabrication shop where the work will be done so that arrangements can be made for an audit of the facility and the assignment of the Department Quality Assurance (QA) inspector. No fabrication will be accepted unless the QA inspector is present during fabrication. No changes may be made during fabrication without prior written approval by the Department.

The Contractor shall furnish facilities for the inspection of material and workmanship in the shop by the Engineer. The Engineer and his representative shall be allowed free access to the necessary parts of the premises.

The Engineer will provide QA inspection at the fabrication shop to assure that all applicable Quality Control plans and inspections are adequately adhered to and maintained by the Contractor during all phases of the fabrication. A thorough inspection of a random selection of elements at the fabrication shop may serve as the basis of this assurance.

Prior to shipment to the project, each individual piece of steel shall be marked in a clear and permanent fashion by a representative of the fabricators' Quality Control (QC) Department to indicate complete final inspection by the fabricator and conformance to the project specifications for that piece. The mark must be dated. A Materials Certificate in accordance with Article 1.06.07 may be used in lieu of individual stamps or markings, for all material in a single shipment. The Materials Certificate must list each piece within the shipment and accompany the shipment to the project site.

Following the final inspection by the fabricator's QC personnel, the Engineer may select pieces of steel for re-inspection by the Department's QA inspector. Should non-conforming pieces be identified, all similar pieces must be re-inspected by the fabricator and repair procedure(s) submitted to the Engineer for approval. Repairs will be made at the Contractor's expense.

The pieces selected for re-inspection and found to be in conformance, or adequately repaired pieces, may be marked by the QA inspector. Such markings indicate the Engineer takes no exception to the pieces being sent to the project site. Such marking does not indicate acceptance or approval of the material by the Engineer.

All welding details, procedures and nondestructive testing shall conform to the requirements of AWS D1.1 Structural Welding Code - Steel.

Personnel performing the nondestructive testing shall be certified as a NDT Level II technician in accordance with the American Society for Non Destructive Testing (ASNT), Recommended Practice SNT-TC-1A and approved by the Engineer.

All nondestructive testing shall be witnessed by Engineer. Certified reports of all tests shall be submitted to the Engineer for examination. Each certified report shall identify the structure, member, and location of weld or welds tested. Each report shall also list the length and location of any defective welds and include information on the corrective action taken and results of all retests of repaired welds.

The Department reserves the right to perform additional testing as determined by the Engineer. Should the Engineer require nondestructive testing on welds not designated in the contract, the cost of such inspection shall be borne by the Contractor if the testing indicates that any weld(s) are defective. If the testing indicates the weld(s) to be satisfactory, the actual cost of such inspection will be paid by the Department.

All members and components shall be hot-dip galvanized in a single dip. Double-dipping of members and components is not permitted. All exterior and interior surfaces of the mast arm members and components, including the interior of the ring-stiffened built-up box connection, shall be completely galvanized.

Galvanized members and components shall be free from uncoated areas, blisters, flux deposits, and gross inclusions. Lumps, projections, globules, or heavy deposits of zinc which will interfere with the intended use of the material will not be permitted.

All damaged areas of the hot-dip galvanized surfaces shall be repaired in accordance with the requirements of ASTM A780. If paint containing zinc dust is used for repairs, the dry coating thickness shall be at least 50% greater than the thickness of the adjacent hot-dip galvanized coating, but no greater than 4.0 mils. The paint shall be brush applied. The use of aerosol spray cans shall not be permitted. The color of the finished repair area shall match the color of the adjacent hot-dip galvanized surface at the time of the repair to the satisfaction of the Engineer.

Prior to shipping, all galvanized surfaces of the members and components shall be inspected, in the presence of the Engineer, to determine the acceptability of the galvanized coating. Galvanized coatings may be found acceptable by the Engineer if all surfaces of the members and components meet the galvanizing requirements herein. Only mast arm members and components with acceptable galvanized coatings shall be shipped. If the galvanized coating on any member or component is found not acceptable, the Contractor shall submit a repair procedure to the Engineer for review.

After fabrication, the arm to pole bolted connection shall be assembled in the fabricator's shop, in the presence of the Engineer, to determine the acceptability of the connection. The faying surfaces shall be free of dirt, loose scale, burrs, other foreign material and other defects that would prevent solid seating of the parts. Prior to assembly, the galvanized faying surfaces shall be scored by wire brushing. The faying surfaces of the connection plates shall be checked with a

straight edge to ensure that the surfaces are not distorted and the entire faying surface of each plate will be in contact when assembled. The high-strength bolts, including nuts and washes, shall be installed and tensioned in accordance with Subarticle 6.03.03-4(f). A connection may be found acceptable by the Engineer if the faying surfaces of the flange (connection) plates are in firm, continuous contact after properly tensioning the bolts. Only mast arm assemblies with acceptable arm to pole bolted connections shall be shipped. If a bolted connection is found not acceptable, the Contractor shall submit a procedure to repair the connection to the Engineer for review. The use or installation of galvanized hardened steel washer between the faying surfaces of the connection is not permitted. Galvanized surfaces damaged by the repair procedure shall be hot dip galvanized. Repair of the damaged galvanized surfaces in accordance with the requirements of ASTM A780 or with a galvanizing repair stick is not permitted. Bolts, nuts and washers used for the trial shop fit-up shall not be reused in the final field assembly.

After fabrication and prior to shipping, aluminum identification tags shall be attached to the arm and pole members with self-tapping tamper resistant screws.

The finished members and components shall be protected with sufficient dunnage and padding to protect them from damage and distortion during transportation. Damage to any material during transportation, improper storage, faulty erection, or undocumented fabrication errors may be cause for rejection of said material at the project site. All costs associated with any corrective action will be borne by the Contractor.

Following delivery to the project site, the Engineer will perform a visual inspection of all material to verify shipping documents, fabricator markings, and that there was no damage to the material or coatings during transportation and handling.

The Engineer is not responsible for approving or accepting any fabricated materials prior to final erection and assembly at the project site.

High-strength bolts, nuts and washers shall be stored in accordance with Subarticle 6.03.03-4(f).

The mast arm shall be erected, assembled and installed in accordance with these specifications and the procedures and methods submitted with the working drawings. The Contractor and the mast arm designer are responsible to ensure that the erection and assembly procedures and methods in this specification are acceptable for use with the mast arm assembly. Changes to these method and procedures shall be submitted with the working drawings and computations.

Prior to installation of the mast arm pole, the exposed threads of all the embedded anchor bolts shall be cleaned of accumulated dirt and concrete and lubricated. The threads and bearings surfaces of all the anchor bolt nuts shall be cleaned and lubricated. The anchor bolts and nuts are properly lubricated if the nuts can be turned by hand on the anchor bolt threads. The lubricant shall contain a visible dye of any color that contrasts with the color of the galvanizing. Re-lubricate the threads of the anchor bolts and nuts if more than 24 hours has elapsed since earlier lubrication, or if the anchor bolts and nuts have become wet since they were first lubricated.

Install (turn) the leveling nuts onto the anchor bolts and align the nuts to the same elevation or plane. The distance from the bottom of the leveling nuts to the top of the foundation shall not exceed 1". Place a structural hardened washer on top of each leveling nut, 1 washer on each anchor bolt.

The pole shall be erected so that the centerline of the pole will be plumb after the application of all the dead loads. The pole may be initially installed raked in the opposite direction of the overhead member to obtain the plumb condition. Raking the pole may be accomplished by installing the leveling nuts in a plane other than level.

Install the pole base plate atop the washers resting on the leveling nuts, place a structural hardened washer on each anchor bolt resting it on the top of the base plate, and install (turn) a top nut on each anchor bolt until the nut contacts the washer. The leveling nuts and washers shall be inspected, and if necessary the nuts (turned), so that the washers are in full contact with the bottom surface of the base plate.

Tighten the top nuts to a snug tight condition in a star pattern. Snug tight is defined as the maximum rotation resulting from the full effort of one person using a 12" long wrench or equivalent. A star tightening pattern is one in which the nuts on opposite or near-opposite sides of the bolt circle are successively tightened in a pattern resembling a star (e.g., For an 8-bolt circle with bolt sequentially numbered 1 to 8, tighten nuts in the following bolt order: 1, 5, 7, 3, 8, 4, 6, 2.).

Tighten leveling nuts to a snug tight condition in a star pattern.

Before final tightening of the top nuts, mark the reference position of each top nut in a snug-tight condition with a suitable marking on 1 flat with a corresponding reference mark on the base plate at each bolt. Then incrementally turn the top nuts using a star pattern one-sixth of a turn beyond snug tight. Turn the nuts in at least two full tightening cycles (passes). After tightening, verify the top nut rotation. The top nuts shall have full thread engagement. The distance from the bottom of the leveling nuts to the top of the foundation shall not exceed 1".

High-strength bolts, including nuts and washes, shall be installed and tensioned in accordance with Subarticle 6.03.03-4(f). The arm shall be temporarily and fully supported while all the high-strength bolts are installed and tensioned. The temporary arm support shall not be removed until the Engineer has confirmed that the faying surfaces of the flange (connection) plates are in firm, continuous contact and the high-strength bolts were properly installed and tensioned. All high-strength bolts in the arm to pole bolted connection shall be inspected (in accordance with Subarticle 6.03.03-4(f)) to confirm the high-strength bolts were properly tensioned. The use or installation of galvanized hardened steel washer between the faying surfaces of the connection is not permitted.

After erecting the mast arm, the mast arm shall be electrically grounded by attaching the bare copper grounding conductor to the inside of the handhole frame with a stainless steel bolt and to the ground rod with a ground clamp. The rigid metal conduit shall be electrically grounded by

attaching the bare copper grounding conductor to the insulated bonding bushing and to the ground rod with a ground clamp.

After erection of the mast arm and before the installation of the traffic appurtenances, if the structure exhibits excessive vibration, oscillations or deflections as determined by the Engineer, the Contractor shall immediately stabilize the structure to the satisfaction of the Engineer. Stabilizing the structure may require the removal of a portion of the structure or the entire structure.

The traffic appurtenances shall be located and mounted on the arm as shown on the cross-sections. Holes, if required for wires, shall be located adjacent to the appurtenances and shall be drilled in the bottom of the arm. A rubber grommet shall be installed in each hole to protect the wires from chafing.

After installation of the traffic appurtenances, the anchor bolt nuts (leveling and top anchor nut) and washers shall be in full contact with the top and bottom surfaces of the pole base plate and the centerline of the pole shall be plumb.

After installation of the traffic appurtenances, if the structure exhibits excessive vibration, oscillations or deflections as determined by the Engineer, the Contractor shall design and construct devices to mitigate the movements. The Contractor is responsible for immediately stabilizing the structure to the satisfaction of the Engineer. Stabilizing the structure may require the removal of the traffic appurtenances or the entire structure. Prior to installation of any mitigation device, the Contractor shall submit drawings, design computations other documentation to the Engineer for review in accordance with Article 1.05.02.

The last character of the mast arm identification number shall be stenciled with black paint, unless otherwise specified, on the pole of each mast arm. The character shall be 3" high and placed approximately 12" above the top of the base plate facing the centerline of the roadway.

Method of Measurement: This work will be measured for payment by the number of steel mast arm assemblies of the type specified, completed and accepted in place.

Basis of Payment: This work will be paid for at the contract unit price each for "XX Steel Mast Arm Assembly" or "XX Steel Combination Mast Arm Assembly", of the type specified, complete in place, which price shall include all equipment, materials, tools and labor incidental to the design, fabrication and installation, including mitigation devices if required, of the mast arms at the locations specified on the plans.

ITEM #1105001A - 1 WAY, 1 SECTION SPAN WIRE TRAFFIC SIGNAL

ITEM #1105003A - 1 WAY, 3 SECTION SPAN WIRE TRAFFIC SIGNAL

ITEM #1105007A - 2 WAY, 3 SECTION SPAN WIRE TRAFFIC SIGNAL

ITEM #1105101A - 1 WAY, 1 SECTION MAST ARM TRAFFIC SIGNAL

ITEM #1105103A - 1 WAY, 3 SECTION MAST ARM TRAFFIC SIGNAL

ITEM #1105303A - 1 WAY, 3 SECTION PEDESTAL MOUNTED TRAFFIC SIGNAL

Article 11.05.03 – Construction Methods:

Add the following paragraph:

Circular indications that have an identification mark (such as an arrow) on the top of the lens shall be installed with that mark at the 12 o'clock position.

Article M.16.06 - Traffic Signals

Sub Article 3 - Housing:

In the last sentence, between the words “housing” and “shall” add “and all internal hardware”.

Add the following after the last paragraph.

Each section of the housing shall be provided with a removable visor. The visor shall be the cap type, unless otherwise noted on the plan. The visor shall be a minimum .05 inch (.13 mm) thick. The visor shall be the twist on type and secured to the signal by four equidistant flat tabs screwed to the signal head.

Sub Article 4 - Brackets:

Add the following at the end of the last paragraph:

Install a 2” wide yellow retroreflective strip (Type IV sheeting) along the perimeter of the face of the backplate.

Delete Sub Article 5 - Optical Unit and Sub Article 6 – Lamp Socket and replace with the following:

Optical Unit, Light Emitting Diode:

(a) General:

Only Optical Units that meet the requirements contained herein supplied by the below manufacturers that have been tested by the Department's Signal Lab will be accepted. Final approval for model numbers will be done at the time of the catalog cut submittals.

Duralight
Trastar, Inc.
860 N. Dorothy Dr., Suite 600
Richardson, TX 75081

GE Lighting Solutions
Corporate Headquarters
1975 Noble Road Building 338E
East Cleveland, OH 44112-6300

Dialight
1501 Foute 34 South
Farmingdale, NJ 07727

Leotek
726 South Hillview Drive
Milpitas, CA 95035

The materials for Light Emitting Diode (LED), Optical Unit, circular and arrow, shall conform to the following:

- The ITE Performance Specification for Vehicle Traffic Control Signal Heads – Light Emitting Diode (LED) Circular Signal Supplement for circular indications dated June 27, 2005.
- The ITE Performance Specification for Vehicle Traffic Control Signal Heads – Light Emitting Diode (LED) Vehicle Arrow Traffic Signal Supplement for arrow indications dated July 1, 2007.

Section 4, Adjustable Traffic Signals and General Housing sections of the **Department of Transportation Functional Specifications for Traffic Control Equipment, current edition governs**. Where the Department of Transportation Functional Specifications conflict with this Special Provision or the 2005/2007 ITE Performance Specifications, this Special Provision and the 2005/2007 ITE Performance Specifications shall govern.

The Optical Unit shall have an Incandescent look and be made up of a smooth surfaced outer shell, multiple LED light sources, a filtered power supply and a back cover, assembled into a sealed unit. The Optical Unit shall be certified as meeting the 2005/2007 ITE Specifications by Intertek Testing Services, Inc. (ITSNA, formerly ETL) or another organization currently recognized by

the Occupational Safety and Health Administration (OSHA) as a Nationally Recognized Testing Laboratory (NRTL.) The Optical Unit shall perform to the requirements of the ITE Specification for a minimum of 60 months.

A “Swing Test” will be performed by the Department to ensure no significant dimming or blanking occurs, until the lamp is obscured by the visor. All L.E.D Lamps will be subjected to further field testing for reliable operation.

The Arrow Optical Unit shall be “Omni-Directional” so that it may be oriented in a right, left or straight configuration without degradation of performance.

(b) Electrical Requirement:

Operating voltage:

80 to 135 Volts AC with cutoff voltage (no visible indication) below 35Volts AC.

Power requirements:

Circular Indications: 12”, (300 mm) – no more than 16 Watts

Circular Indications: 8”, (200mm) - no more than 16 Watts

Arrows Indications: 12”, (300mm) - no more than 16 Watts

Power Supply:

Fused and filtered to provide excess current protection and over voltage protection from electrical surges and transient voltages.

(c) Photometric Requirement:

Beam Color:

Meet 2005/2007 ITE Specifications

(d) Mechanical Requirements:

Diameter:

The Circular Optical Unit shall fit into standard 12” (300mm) or 8” (200mm) housing.

The Arrow Optical Unit shall fit 12” (300mm) housings only.

Enclosure:

UV (Ultraviolet) stabilized polycarbonate back cover.

Clear lens cover for all Red, Yellow and Green Circular Optical Units.

For Arrow Optical Units the arrow indication segment of the lens shall be clear.

Enclosure sealed and waterproofed to eliminate dirt contamination and be suitable for installation in all weather conditions.

Clearly mark on the housing the following information:

- Manufacturer & model number
- Date of manufacture (must be within one year of installation)

The model number shall end with the number of LEDs used to comprise the unit as the last digits of the model number. Example, if the unit comprised of 3 LEDs and the model is x12y, then the new model number shall read x12y3.

Operating temperature:

Meet 2005/2007 ITE Specification

Wiring: L.E.D. lamps shall have **color coded 16 AWG wires** for identification of heads as follows:

RED L.E.D. Lamps	RED with WHITE neutral
YELLOW L.E.D. Lamps	YELLOW with WHITE neutral
GREEN L.E.D. Lamps	GREEN or Brown with WHITE neutral
RED L.E.D. ARROWS	RED/WHITE with WHITE neutral
YELLOW L.E.D. ARROWS	YELLOW/WHITE with WHITE neutral
GREEN L.E.D. ARROWS	GREEN/WHITE or BROWN/WHITE with WHITE neutral
GREEN/YELLOW L.E.D. ARROWS	GREEN/WHITE or BROWN/WHITE, YELLOW/WHITE, with WHITE neutral

Wires shall be terminated with a Block Spade, 6-8 stud/ 16-14 wire size.

All Circular Optical Units shall be supplied with a minimum 40" pigtail and all Arrow Optical Units Supplied with a minimum 60" pigtail.

Sub Article 9 - Painting:

Third coat: Replace the first two sentences with the following:

All brackets and hardware shall be painted **Dark Green** by the manufacturer. The color shall be **federal standard 595, Color No. 14056.**

ITEM #1106001A- 1 WAY PEDESTRIAN SIGNAL POLE MOUNTED

ITEM #1106003A- 1 WAY PEDESTRIAN SIGNAL PEDESTAL MOUNTED

Section 11.06.02 Pedestrian Signal, Materials

Section M.16.07 C. Optical Unit

Delete 2. LED: and replace with the following:

General

- Meet requirements of current MUTCD Section 4E.
- Meet current ITE specifications for Pedestrian Traffic Control Signal Indications - (PTCSI) Part 2: Light Emitting Diode (LED).
- Meet CT DOT, 2008 - 2010 Functional Specifications for Traffic Control Equipment; Section 5D, LED Pedestrian Signal with Countdown Timer.
- Meet EPA Energy Star® requirements for LED Pedestrian Signal Modules.

Operational

- Countdown display only during the flashing Pedestrian Clearance (Ped Clr) Interval. Timer goes blank at end of flashing ped clr even if countdown has not reached zero.

Physical

- Sealed optical module to prevent entrance of moisture and dust.
- Self-contained optical module, including necessary power supplies.
- Designed to securely fit into standard housing without the use of special tools or modifications to the housing.
- Identification information on module: manufacturer's name, model number, serial number, and date code.

Optical

- Multiple LED sources; capable of partial loss of LED's without loss of symbol or countdown message.
- Two complete self contained optical systems. One to display the walking person symbol (walk) and the hand symbol (don't walk). One to display the countdown timer digits.
- Visual Image similar to incandescent display; smooth, non-pixelated.
- Symbol and countdown digit size as shown on the plan.
- Solid hand/person symbol; outline display not allowed.
- Overlaid hand/person symbols and countdown digits arranged side by side.
- Countdown digit display color: Portland Orange in accordance with ITE requirements.
- Countdown digits comprised of two seven segments, each in a figure 8 pattern.
- Photometric Requirements: Luminance, Uniformity, and Distribution in accordance with ITE requirements.
- Color Uniformity in accordance with ITE requirements.
- Blank-Out design; symbols and digits illegible even in direct sunlight when not illuminated.

Electrical

- Operating voltage: 89 VAC to 135 VAC.
- Low Voltage Turn-Off: 35 VAC.
- Turn-On and Turn-Off times in accordance with ITE specifications.
- Combined Hand – Countdown Digits wattage: ≥ 20 Watts.
- Input impedance at 60 Hertz sufficient to satisfy Malfunction Management Unit (MMU) requirements.
- Two separate power supplies. One to power the walking person symbol. One to power the hand symbol and the countdown digits.
- Meet Federal Communication Commission (FCC) regulations concerning electronic noise.
- Filtered and protected against electrical transients and surges.

Warranty

- Five years from date ownership is accepted.

Section M.16.07 F. Painting:

Third coat: Replace the first two sentences with the following:

All brackets and hardware shall be painted dark green by the manufacturer. The color shall be No. **federal standard 595, Color No. 14056.**

ITEM #1107007A - PEDESTRIAN PUSHBUTTON AND SIGN (PIEZO)

Article M16.08 - Pedestrian Push Button:

Delete the entire section and replace with the following:

A. General

- Size and force compliant with ADA, Section 14.2.5, Crossing Controls.
- Tamper-proof, and Vandal-proof, Weatherproof, Freeze-proof, Impact-resistant design and construction.
- Completely insulated to preclude electrical shock under any weather conditions.
- Wire entrance through the rear.
- Stainless steel mounting hardware.

B. Actuation

1. Mechanical:

- Single momentary contact switch with tactile feedback.
- Rated at 10 amps, 125 volts.
- Normally open, closed when actuated.

2. Piezo:

- Either non-movable or minimal movement (< 1/16" (1.6)) pressure activation.
- Audible confirmation beep to correspond with circuit closure.
- Minimum 100,000,000 actuations.

C. Housing

- Die cast aluminum meeting requirements of ASTM B85.
- Designed to attach 9" x 12" (230 x 300) four-hole advisory sign.
- Flat back to facilitate surface mount.
- Available hardware to either pedestal top-mount or pole side-mount on diameter range of 3½" (89) to 15" (380).

D. Finish

- Method: Either
 1. Painted with 3 coats of infrared oven-baked paint before assembly.
 - Primer: Baked iron oxide which meets or exceeds FS TT-P-636.
 - Second coat: Exterior-baking enamel, light gray, which meets or exceeds FS TT-E-527.
 - Third coat: Exterior-baking enamel, which meets or exceeds FS TT-E-489.
 2. Electrostatic powder coated after chemically cleaned.

Article M.16.08 Painting:

Third coat: Replace with the following:

All brackets and hardware shall be painted yellow by the manufacturer. The color shall be No. 13538, Federal Standard No. 595.

At intersections at Merritt Parkway interchanges, all brackets and hardware shall be painted dark green by the manufacturer. The color shall be No. 14056, Federal Standard No. 595.

ITEM #1108187A - SYSTEM INTEGRATION

Description:

Work under this item shall involve integration of Local Traffic Controllers furnished under this contract with the City's Centralized *Centracs* Traffic Control System utilizing NTCIP protocol. The work shall include development of system control databases, graphics, communication and all other necessary functions so as to successfully integrate and coordinate traffic signals operation of the North Street (State Route 37) corridor intersections.

Materials:

The work shall involve integration of 2070LX field hardware and firmware/software with the City's existing Central *Centracs* System for coordination of traffic operations utilizing NTCIP protocol, fiber optic media and gigabit Ethernet communication.

Construction Methods:

The work shall involve development of traffic control database for six (6) intersections and integrating it with the existing *Centracs* Central Traffic Control operation. The Central Control System shall poll intersections once per minute to gather data on corridor vehicle occupancy, speed and headways for the purpose of determining the appropriate intersection splits and offsets. Optimization of intersection splits and offsets shall take place every ten (10) minutes or as desired by the operator. The contractor shall be responsible for development of a city map and intersection graphics that are to be utilized as part of the system. The maps could be based on g GIS information, Traffic plans or other sources. In addition, the work shall involve furnishing and set-up of hardware and software for remote system communication via mobile devices including cell phones, PC tablets, notebooks for monitoring of operations and transmission of normal and emergency alert messages.

Method of measurement:

This item shall be measured at the contract "Lump Sum" price based on the acceptable integration of the North Street (Ste Route 37) Corridor intersections into the City's Centralized *Centracs* control system as well as development of intersection graphics and remote system communication via mobile devices.

Basis of Payment:

This item shall be paid for at the contract Lump Sum price for "System Integration". This price shall cover labor, equipment, tools and incidentals thereof in the development of database, intersection electronic /digital maps as well as system remote communication as described herein.

ITEM No.	Description	Unit
1108187A	System Integration	L.S.

ITEM No. 1108649A - ADVANCED TRANSPORTATION CONTROLLER MODEL 2070

Description:

Work under this item shall consist of furnishing and installing 332D cabinet and an open architecture 2070LX controller to provide the required sequence and timing operation as indicated on the signal plans. The 2070LX controller shall be manufactured by any company approved by Caltrans. Unless noted otherwise, all equipment, firmware and software shall be provided with a minimum of three (3) year warranty for labor, parts and support. Shop drawings to be submitted for the item shall accompanied by manufacturers' warranty documents for review and approval by the City.

Materials:

All materials furnished, assembled, fabricated, and furnished as part of this item shall be new, corrosion resistant and in strict accordance with the latest provisions set forth by the March 12, 2009 State of California Department of Transportation (Caltrans) TEES Specifications or latest. The Caltrans Specifications are available at: <http://www.dot.ca.gov/hq/traffops/tech/tees.html>

A. Type 332D Cabinet:

The controller cabinet shall be primed and powder coated in accordance with ConnDOT specification to provide a Dark Green finish as per Federal Standard 595, color code No. 14056. The cabinets shall meet or exceed the following general minimum standards:

- Two (2) 19" shelves assembled to meet EIA rack assembly specifications
- Two (2) Slide-out shelf drawer storage unit
- One (1) Black Box Model SP215A rack-mount surge suppression unit or equivalent with six (6) outlets for cabinet accessories. A maximum peak clamping of 260 volts, maximum surge energy resistance of 33,000 Amps, peak transient of 330 volts and EMI/RFI resistance of up to 60dB and a 15 A resettable circuit breaker
- One (1) 50 Amp Circuit Breaker switch for the incoming utility power supply
- A Crydom Mercury-free solid-state SCR output or equivalent with 50A @ 90-280 VAC, a maximum transient peak voltage of 600, surge current of 625 Amps, and a minimum power factor of 0.5.
- Two (2) fluorescent lamps for front and rear doors
- Two (2) Fan assemblies
- Two (2) Heavy duty plastic envelopes for storage of documents
- One (1) six foot long cord for Police door manual operations

Other specific features and capabilities of the cabinet shall include the following:

Input and Output Files:

- Two (2) Input files
- One (1) Standard Output file with Model 1804946 Phoenix Blocks and Surge Suppressor
- One (1) Auxiliary Output file with Model 1804946 Phoenix Blocks and Surge Suppressor

Relays, Load Switches, Flashers, Isolators and Amplifiers:

- Four (4) Model 430 Heavy Duty Transfer Relays
- Two (2) Model 204 Circuit Flashers
- Three (3) Model 242 DC Isolators
- A full bay of Model 200 Load Switches

Power Supply, Distribution and Conflict Management:

- One (1) 206L Energy Efficiency Power Supply
- One (1) Power Distribution Assembly
- One (1) Model 2018ip conflict monitor

Cabinet Surge Suppressor:

One (1) Maxivolt Model No. ICP 110S or equivalent surge suppression unit with the following characteristics:

- 8 pin base
- Voltage Application: 120V 2W
- Maximum Continuous Line Voltage (RMS): 130
- Nominal Clamping Voltage (Peak): 170
- Maximum Peak Current: 6500 (8x20)
- Transient Energy (Joules): 155
- Maximum Current (A): 3

B. 2070LX Controller:

The 2070LX controller shall meet or exceed the latest Caltrans TEES specifications including but not limited to the following:

- Open architecture: software and firmware compatibility such as ability to support ASC/3 firmware directly or using a third party loader
- Operating System: Linux 2.6.18 kernel or latest.
- CPU Module: Freescale series MPC 82xx/83xx or equivalent microprocessor
- Memory: 32 Mb Flash, 64 Mb DRAM and 1Mb SRAM memory
- NTCIP compliant
- One (1) 32MB CPU Data key with model SFK32Mb or equivalent
- One (1) Universal Time Base module 2070-7G

C. Rack Mount Fiber Optic Distribution Enclosure:

One (1) 2U 19" Rack mount fiber optic enclosure with the minimum characteristics:

- Slide-out drawer type
- Powder coated corrosion resistant metal housing
- Full frontal access for installation and maintenance of fiber optic cables
- Twelve (12) LC connectors with stepped adapter plug-ins
- Two (2) splice trays, each tray provided for up to 12 fibers splices
- Routing spool(s) for slack management
- Other mounting hardware and accessories as required

D. Network Communication Devices:

One (1) hardened ComNet Model CNGE3FE7MS2, Ruggedcom Model RS900G or equivalent Gigabit Managed Ethernet switch comprised of the following items and features:

- Wavelength: 1310nm
- Minimum seven (7) 10/100 Mbps copper ports
- Minimum two (2) 1000Mbps LC fiber optic ports
- Minimum 25 km maximum transmission distance
- Minimum 19 dBm optical loss power budget
- Two (2) ten foot Duplex Single Mode patch cable with LC-LC connectors
- Ten (10) ten foot Cat 6 Ethernet cable

E. Testing, Quality Control and Documentation:

The controller and cabinet shall be accompanied by a Quality Testing certification and all other documents in accordance with the latest Caltrans TEES Specifications.

F. Operation Manuals and Documentation:

Up to date manuals and technical drawings or charts describing schematics, assembly, operations, maintenance and diagnostic procedures for devices shall be furnished as part of this item.

G. Warranty:

All equipment, firmware and software furnished under this item shall be covered by a minimum of three (3) year manufacturer's warranty from the date of installation. The warranty shall cover labor, parts and support.

Construction Methods:

The housing of the cabinet shall be fabricated utilizing type 5052-H32 0.125 inch aluminum. The bottom cabinet attachment flange (lips) shall 0.25 inch in thickness. The housing shall have the capability 80 mph sustained winds, a 100 pound point load applied horizontally at the top of the cabinet. In addition the cabinet shall be rainproof with the top of the enclosure crowned to prevent standing water. All exterior of the cabinet shall be continuously welded utilizing a Heliarc method and shall be smooth. The cabinet top, doors and each side of the cabinet shall each be single sheet aluminum. The cabinet locks shall be brass and with a swing away cover. Two No. 2 Connecticut keys shall be provided.

Gasket shall be provided on all doors openings and shall be dust tight. The gasket shall be 0.25 inch minimum in thickness, closed cell neoprene or silicone or equal and permanently bonded to metal. The cabinet doors shall be louvered vents which shall be provided with removable and reusable pleated filter.

The controller, mounted in the controller cabinet, shall be installed at the location shown on the plans. The controller cabinet shall be bolt mounted on a Type V Precast controller foundation that shall be paid under a separate item. A mastic type compound conforming to ASTM C-647 shall be utilized to seal the seam between the cabinet and foundation for control of moisture, rain and rodents penetration. All cables and accessories to be installed in the cabinet shall be labeled.

A loading resistor having a nominal value of 2,000 ohms – 11 watt shall installed between the ground buss and each green and yellow signal output field connection terminal for each phase one through eight including overlap phases and pedestrian walks phases. Additional 2,000 ohms - 11 watt loading resistors shall be installed between ground buss and red signal output field connection terminal for all odd vehicle phases, overlap phase and pedestrian don't walk phase. All field output circuits shall be terminated on a non-fused terminal block with a minimum rating of 20 amps.

All signal cables, video detection cables as well as video process cards shall be labeled for identification purposes.

Method of Measurement:

This work shall be measured for payment by the number of fully actuated controllers furnished and installed as part of this project, complete, operating and accepted in place.

Basis of Payment:

The fully actuated traffic controller shall be paid at the contract unit price which cover cost for furnishing a 332D cabinet, 2070LX controller, 2018ip Conflict Monitor, Network Communication Devices, Rack mount Fiber optic enclosure, Load Switches, Relays, modules, fittings, hardware, manuals, warranty, materials, equipment, testing and quality control, tools and labor incidental thereto.

ITEM No.	Description	Unit
1108649A	Advanced Transportation Controller, Model 2070	Each

ITEM #1108724A - PHASE SELECTOR

ITEM #1112410A - DETECTOR (TYPE A)

ITEM #1112470A - PRE-EMPTION SYSTEM CHASSIS

ITEM #1113550A - DETECTOR CABLE (OPTICAL)

System Description:

The emergency vehicle traffic signal priority control system shall enable designated vehicles to remotely cause the traffic signal controller to advance to and/or hold a desired traffic signal display by using existing controller functions. The control shall be activated at a minimum distance of 1,800 feet (548.6m) along an unobstructed "line of sight" path. The control shall not terminate until the vehicle is within 40 feet (12.2m) of the detector or at the intersection.

The system shall consist of the following components:

- A. Vehicle Emitter which shall be mounted on the emergency vehicle and shall transmit optical energy signals only in the forward direction. If the municipality presently uses optical pre-emption, the emitters shall be of the same manufacture currently used by the Town.
- B. Phase Selector (minimum 2 channel) which shall cause the signal controller to advance to and/or hold the desired traffic signal display for the emergency vehicle. A pre-emption system chassis shall house two phase selectors.
- C. Optical Detector which shall be mounted on or near a traffic signal and shall receive the optical energy signals generated by the Vehicle Emitter.

Detector (Type A), 1 Direction, 1 Channel

- D. Detector Cable (Optical).

System Operation:

- A. The operating sequence shall be initiated when the optical detector receives the required optical energy signal from the Emitter.
- B. The phase selector shall cause the traffic signal controller to advance to and/or hold the desired traffic signal display for the emergency vehicle.

- C. The phase selector shall cause the controller to advance to and/or hold the desired traffic signal display even if the optical energy signals cease before the desired display is obtained.
- D. The phase selector shall allow the traffic signal controller to resume normal operation within ten seconds after optical energy signals cease if the optical energy signals cease after the desired traffic signal display is obtained.
- E. The phase selector shall not respond to optical energy signals from an emergency vehicle if it is already processing optical energy signals from another emergency vehicle.

System Components:

A. Vehicle Emitter:

The emitter assembly consists of an emitter and power supply and an emitter control switch assembly. The emitter assembly is mounted on a vehicle and produces a flashing optical signal when in operation.

1. Shall operate on ten to fifteen volts DC input voltage, but shall not be damaged by input voltage surges up to twenty-five volts DC.
2. Shall be controlled by a single on/off switch that requires no other adjustments by the operator. The on/off condition shall be indicated by a light located adjacent to the switch.
3. Shall be automatically disabled or de-activated by one or a combination of the following: seat switch, emergency brake switch, door switch, transmission safety switch.
4. Shall operate over an ambient temperature range of minus 30⁰ F. to plus 140⁰ F. (minus 34⁰ C to plus 60⁰ C.)
5. Shall operate in 0 to 95 % humidity.
6. Shall be a pulsed optical energy source with a controlled repetition rate.
7. Shall not generate voltage transients on the battery input line which exceed battery voltage by more than four volts.
8. Shall produce optical energy in a cone of not more than 90 degrees horizontal and not more than 30 degrees vertical. The detectors and/or phase selector shall not sense a pre-emption signal from an emitter outside this cone.

B. Optical Detector:

The optical detector receives the high intensity optical pulses produced by the emitter. These optical energy pulses are transformed by the detector into appropriate electrical signals which are transmitted to the phase selector. The optical detector is mounted at or near the intersection in a location which permits an unobstructed line of sight to vehicular approaches. The units may be mounted on signal span wires, mast arms or other appropriate structures.

1. Shall be of solid state construction.
2. Shall operate over an ambient temperature range of minus 30⁰ F. to plus 140⁰ F. (minus 34⁰ C to plus 60⁰ C.)
3. Shall have internal circuitry potted in a semi-flexible compound to ensure moisture resistance.
4. Shall operate in 0 to 95 % humidity.
5. Shall have a cone of detection of not more than 13 degrees. The detector and/or phase selector shall not sense a pre-emption signal from an emitter outside this cone.

C. Phase Selector:

The phase selector supplies power to and receives electrical signals from the optical detector. When detector signals are recognized as a valid call, the phase selector causes the signal controller to advance to and/or hold the desired traffic signal display. This is accomplished by activating the pre-empt input to the controller.

The phase selector is capable of assigning priority traffic movement to one of two channels on a first-come, first-serve basis. Each channel is connected to select a particular traffic movement from those normally available within the controller. Once a call is recognized, "commit to green" circuitry in the phase selector functions so that the desired green indication will be obtained even if optical communication is lost. After serving a priority traffic demand, the phase selector will release the controller to follow normal sequence operation.

1. Shall include an internal power supply to supply power to the optical detectors.
2. Shall have minimum two-channel operation with the capability of interfacing with an additional phase selector for expansion of channels of operation.
3. Shall have adjustable detector range controls for each channel of operation, from 40 feet (12m) to 1800 feet (548m).
4. Shall have solid state indicator lights for power on and channel called.

5. Shall operate over an ambient temperature range of minus 30⁰ F. to plus 140⁰ F.
6. (minus 34⁰ C to plus 60⁰ C)
7. Shall operate in 0 to 95 % humidity.

D. Detector Cable (Optical):

1. 3-Conductor cable with shield and ground wire.
2. AWG #20 (7x28) stranded.
3. Individually tinned copper strands.
4. Conductor insulation: 600 volt, 167⁰ F. (75 deg. C).
5. 1 Conductor-yellow; 1 Conductor-blue; 1 Conductor-orange.
6. Aluminized mylar shield tape or equivalent.
7. AWG #20 (7x28) stranded uninsulated drain wire
8. DC resistance not to exceed 11.0 ohms per 1000 feet (305m).
9. 9. Capacitance from one conductor to other two conductors and shield not to exceed 48 pf/ft. (157pf/m).
10. Jacket: 600 volts, 176⁰ F. (80 deg. C), minimum average wall thickness – 0.045” (1.14mm).
11. Finished O.D.: 0.3” (7.62mm) max.

System Interface:

System shall be capable of operating in a computerized traffic management system when appropriate interfacing is provided by the computer supplier.

General:

The Contractor shall furnish the manufacturer the phasing diagrams indicating controller sequence and timing.

The Contractor shall secure from the manufacturer a guarantee for the equipment for a period of sixty (60) months, which time shall commence from the date of delivery. Manufacturer shall certify upon request that all materials furnished will conform to this specification. The manufacturer or his designated representative shall be responsible for determining and setting all required range and emitter intensity for the emergency vehicle operation.

Construction Methods:

All equipment except the vehicle emitter assembly shall be installed and wired in a neat and orderly manner in conformance with the manufacturers’ instructions. The vehicle emitter assembly shall be delivered to a designated town representative. Installation of the vehicle emitter assembly shall be the responsibility of the town.

Traffic signals owned and maintained by the State that have optical pre-emption equipment owned and maintained by the town shall have an Auxiliary Equipment Cabinet (AEC) attached to the controller cabinet. The optical pre-emption equipment shall be housed in the AEC. Traffic signals owned and maintained by the town do not require an AEC to house the pre-emption equipment.

Detector cables shall be continuous with no splices between the optical detector and the AEC.

Detector locations shown on the plan are for illustration purposes only. Exact location shall be determined by the contractor or the designated representative for the best possible line of sight.

If not present in an existing traffic controller cabinet, the following items shall be installed and connected, in conformance with the current Functional Specifications for Traffic Control Equipment, "D" Cabinet Requirements (Pre-emption Type):

- Controller "D" harness and adapter.
- Pre-emption termination panel with terminal block and relay bases.
- Pre-emption disconnect switch, mounted on the emergency switch panel (on inside of cabinet door).
- Pre-emption test buttons, mounted on the pre-emption termination panel.

All connections from the phase selector to the "D" harness and to the cabinet wiring shall be made at the termination panel. The termination panel shall have AC+ Lights, AC-, and a switched logic ground. The switched logic ground feeds all the pre-empt inputs to the phase selector. When switched off by the pre-emption disconnect switch, the traffic controller shall not be affected by pre-empt calls from the optical pre-emption system. A minimum of two test buttons shall be provided. If there are more than two pre-empt runs, a button for each shall be installed. A chart or print out indicating the program steps and settings shall be provided along with the revised cabinet wiring diagrams.

Test the Pre-emption System According to the following Guidelines:

1. Notify the system owner/user, such as the municipal fire chief or public works director, of the scheduled inspection
2. Request a fire department representative and an emergency vehicle, which has an emitter to conduct the test. If not available, the contractor shall provide an emitter.
3. In the presence of the Engineer and the municipal representative, test each pre-empted approach with the emergency vehicle. Test the following items of the system:
 - * Confirm that the emitter activates the phase selector and the phase selector activates the correct pre-emption input to the controller.

- * Confirm adequate range. The traffic signal must be pre-empted to green sufficiently in advance of the emergency vehicle arrival. The vehicle emitter shall initiate pre-emption at a minimum distance of 1800 FT. (548.6m).
 - * Confirm there are no false calls. Keep the emitter active as the emergency vehicle passes through the intersection. No other optical detectors shall sense the strobe.
4. Document the test. Provide the Engineer and, upon request, the municipality copies of the test results.

If a malfunction is found or the system needs adjustment (such as range, emitter intensity, or detector location), schedule a follow-up test. Repeat the above steps for all approaches that did not pass.

All adjustments such as emitter intensity, phase selector range, sensitivity, detector placement, shall be made at the intersection by the contractor so that the optical pre-emption operates correctly with other major manufacturers' equipment currently owned by the town.

Method of Measurement:

Optical Detectors, Phase Selectors, System Chassis will be measured for payment by the number of each supplied, installed and accepted. Detector Cable (Optical) will be measured by the number of linear feet (meters) supplied, installed and accepted. Vehicle Emitters will be measured by the number of each supplied to the Town and accepted.

Basis of Payment:

Payment for Optical Detectors, Phase Selector, System Chassis and Detector Cable (Optical) will include the item unit cost, including all manufacturer's required mounting hardware and the cost of installation and supervision by the manufacturer or his designated representative, including travel and subsistence, and all materials, equipment and labor incidental thereto. Payment for termination panel, "D" harness, test buttons, program chart (or print out) and revised cabinet wiring diagrams shall be included in the item PRE-EMPTION SYSTEM CHASSIS. Payment for Vehicle Emitters will include the item unit cost only.

<u>Pay Items</u>	<u>Pay Units</u>
Detector (TYPE A)	Ea.
Phase Selector	Ea.
Detector Cable (Optical)	L.F.
Pre-Emption System Chassis	Ea.

ITEM NO. 1111201A – TEMPORARY DETECTION (SITE NO. 1)

ITEM NO. 1111202A – TEMPORARY DETECTION (SITE NO. 2)

ITEM NO. 1111203A – TEMPORARY DETECTION (SITE NO. 3)

ITEM NO. 1111204A – TEMPORARY DETECTION (SITE NO. 4)

ITEM NO. 1111205A – TEMPORARY DETECTION (SITE NO. 5)

Description:

Provide a Temporary Detection (TD) system at signalized intersections throughout the duration of construction, as noted on the contract plans or directed by the Engineer. TD is intended to provide an efficient traffic-responsive operation which will reduce unused time for motorists travelling through the intersection. A TD system shall consist of all material, such as pedestrian pushbutton, conduit, handholes, cable, messenger, sawcut, loop amplifier, microwave detector, Video Image Detection System (VIDS), Self Powered Vehicle Detector (SPVD), etc. that is needed to achieve an actuated traffic signal operation.

Materials:

Material used for TD is either owned by the Contractor that is in good working condition or existing material that will be removed upon completion of the contract. Approval by the Engineer is needed prior to using existing material that will be incorporated into the permanent installation. New material that will become part of the permanent installation is not included or paid for under TD.

Construction Methods:

This item includes furnishing, installation, relocating, realigning, and maintaining the necessary detection systems as to provide vehicle detection during each phase of construction. If not shown on the plan, program the TD modes (pulse or presence) as the existing detectors or as directed by the Engineer. If the TD method (loops [saw cut or preformed], SPVD, microwave, VIDS, or other) is not shown on the contract plan it may be the Contractor's choice. The method chosen for TD must be indicated on the TD Plan submission.

The traffic signal plan-of-record, if not in the controller cabinet will be provided upon request. Ensure the controller phase mode (recall, lock, non-lock) and phase timing are correct for the TD. Adjust these settings as needed or as directed by the Engineer.

At least 30 days prior to implementation of each phase of construction submit a TD proposal to the Engineer for approval. Submit the TD proposal at the same time as the Temporary Signalization plan. Indicate the following information for each intersection approach:

- Phase Mode

- Temporary Detection Method
- Area of Detection
- Detector Mode

Submit the proposed temporary phase timing settings and the TD installation schedule with the TD proposal. See the example below.

Example Proposed Temporary Detection and Timing

Site 1

Warren, Rt. 45 at Rt. 341, Location #149-201

Approach	Phase	Phase Mode	TD Method	Area of Detection	Det Mode
<i>Rt. 45 NB</i>	<i>2</i>	<i>Min Recall</i>	<i>VIDS</i>	<i>150' from Stop Bar</i>	<i>Pulse</i>
<i>Rt. 45 SB</i>	<i>2</i>	<i>Min Recall</i>	<i>SPVD</i>	<i>150' from Stop Bar</i>	<i>Pulse</i>
<i>Rt. 341</i>	<i>4</i>	<i>Lock</i>	<i>Microwave</i>	<i>30' from Stop Bar</i>	<i>Pulse</i>

Temporary Phase Timing Settings:

Phase	Min	Ped	Ped Clr	Ext	Max 1	Max2	Yel	Red
<i>2</i>	<i>20</i>	<i>0</i>	<i>0</i>	<i>6</i>	<i>45</i>	<i>60</i>	<i>4</i>	<i>1</i>
<i>4</i>	<i>14</i>	<i>7</i>	<i>9</i>	<i>3</i>	<i>27</i>	<i>35</i>	<i>3</i>	<i>1</i>

Scheduled TD: *July 4, 2011***Site 2**

Scotland, Rt. 14 at Rt. 97, Location #123-201

Approach	Phase	Phase Mode	TD Method	Area of Detection	Det Mode
<i>Rt. 15 WB Left Turn</i>	<i>1</i>	<i>Non-Lock</i>	<i>VIDS</i>	<i>5' in front to 10' Behind Stop Bar</i>	<i>Presence</i>
<i>Rt. 14 EB</i>	<i>2</i>	<i>Min Recall</i>	<i>Existing Loop</i>	<i>150' from Stop Bar</i>	<i>Pulse</i>
<i>Rt. 14 WB</i>	<i>6</i>	<i>Min Recall</i>	<i>VIDS</i>	<i>150' from Stop Bar</i>	<i>Pulse</i>
<i>Rt. 97</i>	<i>4</i>	<i>Lock</i>	<i>Loop, Pre- formed</i>	<i>20' from Stop Bar</i>	<i>Pulse</i>

Temporary Phase Timing Settings:

Phase	Min	Ped	Ped Clr	Ext	Max 1	Max2	Yel	Red
<i>1</i>	<i>5</i>	<i>0</i>	<i>0</i>	<i>2</i>	<i>12</i>	<i>18</i>	<i>3</i>	<i>0</i>
<i>2 & 6</i>	<i>24</i>	<i>0</i>	<i>4</i>	<i>4</i>	<i>26</i>	<i>36</i>	<i>4</i>	<i>1</i>
<i>4</i>	<i>14</i>	<i>7</i>	<i>9</i>	<i>3</i>	<i>27</i>	<i>35</i>	<i>3</i>	<i>1</i>

Scheduled TD: *July 4, 2011*

When at any time during construction the existing vehicle detection becomes damaged, removed, or disconnected, install TD to actuate the affected approaches. Install TD sensors and

make operational prior to removing existing detection. TD must be operational throughout all construction phases.

Provide to the Engineer a list of telephone numbers of personnel who will be responsible for the TD. If the TD malfunctions or is damaged, notify the Engineer and place the associated phase on max recall. Respond to TD malfunctions by having a qualified representative at the site within three (3) hours. Restore detection to the condition prior to the malfunction within twenty-four (24) hours.

If the Engineer determines that the nature of a malfunction requires immediate attention and the Contractor does not respond within three (3) hours following the initial contact, then an alternative maintenance service will be called to restore TD. Expenses incurred by the State for alternative service will be deducted from monies due to the Contractor with a minimum deduction of \$500.00 for each service call. The alternate maintenance service may be the traffic signal owner or another qualified Contractor.

TD will terminate when the detection is no longer required. This may be either when the temporary signal is taken out of service or when the permanent detectors are in place and fully operational.

Any material and equipment supplied by the Contractor specifically for TD will remain the Contractor's property. Existing material not designated as scrap or salvage will become the property of the Contractor. Return and deliver to the owner all existing equipment used as TD that is removed and designated as salvage.

Method of Measurement:

Temporary Detection is measured as a percentage of the contract Lump Sum price. Fifty percent (50%) shall be paid when Temporary Detection is initially set up, approved, and becomes fully operational. Fifty percent (50%) shall be paid when Temporary Detection terminates and all temporary equipment is removed to the satisfaction of the Engineer.

Basis of Payment:

This work will be paid at the contract Lump Sum price for "Temporary Detection (Site No.)". The price includes furnishing, installing, relocating, realigning, and maintaining the necessary detection systems and all incidental material, labor, tools, and equipment. This price also includes any detector mode setting changes, timing or program modifications to the controller that are associated with TD. All Contractor supplied material that will remain the Contractor's property will be included in the contract Lump Sum price for "Temporary Detection (Site No.)". Any items installed for TD that will become part of the permanent installation will not be paid for under this item but are paid for under the bid item for that work.

<u>Pay Item</u>	<u>Pay Unit</u>
Temporary Detection (Site No.)	L. S.

ITEM #1111401A - LOOP VEHICLE DETECTOR

ITEM #1111451A - LOOP DETECTOR SAWCUT

Replace Section 11.11, LOOP VEHICLE DETECTOR AND SAWCUT, with the following:

11.11.01 – Description:

1. Furnish and install a loop vehicle detector amplifier.
2. Sawcut pavement. Furnish and install loop detector wire in sawcut.

11.11.02 – Materials:

Article M.16.12

M.16.12 - LOOP VEHICLE DETECTOR AND SAWCUT

1. Loop Vehicle Detector:

- Comply with National Electrical Manufacturers Association (NEMA) standards, Section 6.5, Inductive Loop Detectors.
- Comply with the current CT DOT Functional Specifications for Traffic Control Equipment, Section 3 B, Loop Vehicle Detector With Delay/Extend Option.

2. Sawcut:

(a) Wire in sawcut:

- International Municipal Signal Association (IMSA) Specification 51-7, single conductor cross-linked polyethylene insulation inside polyethylene tube.
- # 14 AWG

(b) Sealant:

(1) Polyester Resin Compound

- Two part polyester which to cure, requires a liquid hardener.
- Use of a respirator not necessary when applied in an open air environment.
- Cure time dependent on amount of hardener mixed.
- Flow characteristics to guarantee encapsulation of loop wires.
- Viscosity: 4000 CPS to 7000 CPS at 77 degrees Fahrenheit (25° C).
- Form a tack-free skin within 25 minutes and full-cure within 60 minutes at 77 degrees Fahrenheit (25° C).
- When cured, resist effects of weather, vehicular abrasion, motor oil, gasoline, antifreeze, brake fluid, de-icing chemicals, salt, acid, hydrocarbons, and normal roadway encounters.
- When cured, maintain physical characteristics throughout the ambient temperature ranges experienced within the State of Connecticut.
- When cured, bonds (adheres) to all types of road surfaces.
- Weight per Gallon (3.8 l): 11 lbs ±1 lb (5kg ± .45kg)

- Show no visible signs of shrinkage after curing.
- 12 month shelf life of unopened containers when stored under manufacturers specified conditions.
- Cured testing requirements:
 - Gel time at 77 degrees F (25° C): 15 - 20 minutes, ASTM C881, D-2471
 - Shore D Hardness at 24 hours: 55-78, ASTM D-2240
 - Tensile Strength: > 1000 psi (6895 kPa), ASTM D-638
 - Elongation: 18 - 20 %, ASTM D-638
 - Adhesion to steel: 700 - 900 psi (4826 - 6205 kPa), ASTM D-3163
 - Absorption of water, sodium chloride, oil, and gasoline: < 0.2%, ASTM D-570
- Include in the Certificate of Compliance:
 - Manufacturer's confirmation of the uncured and cured physical properties stated above.
 - Material Safety Data Sheet (MSDS) stating sealant may be applied without a respirator in an open air environment.
- Designed to allow clean-up without the use of solvent that is harmful to the workers and the environment.

(2) Elastomeric Urethane Compound:

- One part urethane which to cure, does not require a reactor initiator, or a source of thermal energy prior to or during its installation.
- Use of a respirator not necessary when applied in an open air environment.
- Cure only in the presence of moisture.
- Flow characteristics to guarantee encapsulation of loop wires.
- Viscosity such that it does not run out of the sawcut in sloped pavement during installation; 5000 CPS to 85,000 CPS.
- Form a tack-free skin within 24 hours and 0.125 inch (0.33mm) cure within 30 hours at 75 degrees Fahrenheit (24° C).
- When cured, resist effects of weather, vehicular abrasion, motor oil, gasoline, antifreeze, brake fluid, de-icing chemicals, salt, acid, hydrocarbons, and normal roadway encounters.
- When cured, maintain physical characteristics throughout the ambient temperature ranges experienced within the State of Connecticut.
- Show no visible signs of shrinkage after curing.
- Shelf life when stored under manufacturers specified conditions:
 - Caulk type cartridges: minimum 9 months
 - Five gallon containers: minimum 12 months
- Designed for application when the pavement surface temperature is between 40 and 100 degrees Fahrenheit (4° and 38° C).
- Uncured testing requirements:
 - Weight/Gallon: ASTM D-1875
 - Determination of Non-volatile Content: ASTM D-2834
 - Viscosity: ASTM D-1048B
 - Tack-free Time: ASTM D-1640
- Cured testing requirements:
 - Hardness: ASTM D-2240
 - Tensile Strength & Elongation: ASTM D-412A
- Include in the Certificate of Compliance:
 - Manufacturer's confirmation of the uncured and cured physical properties stated above.
 - Material Safety Data Sheet (MSDS) stating sealant may be applied without a respirator in an open air environment.

- Designed to allow clean-up without the use of solvent that is harmful to the workers and the environment.

3. Miscellaneous:

- (a) Liquidtight Flexible Nonmetallic Conduit
 - UL listed for direct burial
 - UL 1660
 - Smooth polyvinyl chloride inner surface
- (b) Water Resistant Pressure Type Wire Connector
 - UL listed for direct burial and wet locations
 - UL 486D

11.11.03 - Construction methods:

1. Loop Vehicle Detector

- Shelf-mount the detector amplifier in the controller cabinet.
- Terminate the harness conductors with crimped spade connectors. Connect conductors to appropriate terminals, eg, black wire to 110vac, white wire to 110vac neutral.
- Tie loop harness and conductors to controller cabinet wiring harness. Leave enough slack in loop harness so that amplifier may be moved around on cabinet shelf; ± 2 feet (0.6 meter) slack.
- Attach a loop identification tag to the harness. Record pertinent detector information on the tag with indelible ink. See example below.
 - Loop No.: *D4*
 - Phase Call: *Phase 4*
 - Field Location: *Rt. 411(West St.)*
 - *Eastbound, Left Lane*
 - Detector No.: *4*
 - Cabinet Terminals: *234, 235*

2. Loop Detector Sawcut

- Loop size, number of turns, and location is shown on the intersection plan.
- Do not cut through a patched trench, damaged or poor quality pavement without the approval of the Engineer.
- Wet-cut pavement with a power saw using a diamond blade $\frac{3}{8}$ inch (9.5mm) wide. Dry-cut is not allowed.
- Ensure slot depth is between 1 $\frac{3}{4}$ inch to 2.0 inch (45mm to 50mm).
- Overlap corners to ensure full depth of cut.
- To prevent wire kinking and insulation damage, chamfer inside of corners that are ≤ 120 degrees.
- Clean all cutting residue and moisture from slot with oil-free compressed air. Ensure slot is dry before inserting wire and sealing sawcut.
- Cut home-run, from loop to curb or edge-of-road, as shown on the typical installation sheet.
- To prevent cross-talk and minimize electrical interference, twist home-run wires, from edge of road to handhole, with at least 5 turns per foot (16 turns per meter). Tape together twisted home-run wires at 2 foot (0.6 meter) \pm intervals.
- In new or resurfaced pavement, install loops in the wearing course. If the wearing course is not scheduled for immediate placement (within 24 hours) after the base course, provide temporary detection when directed by the Engineer. Temporary detection may be sawcut

loops, preformed loops, microwave sensor, video, or other method approved by the Engineer.

- Splice(s) not allowed anywhere in loop wire either in loop or in home-run.
- Ensure wires are held in place at bottom of slot by inserting at 2 foot (0.6 m) intervals, 1 inch sections of foam backer rod or wedges formed from 1 inch (25mm) sections of the polyethylene tubing. Loop detectors with wires that have floated to the top of the sealant will not be accepted.
- To create a uniform magnetic field in the detection zone, wind adjacent loops in opposite directions.
- Use **polyester compound** as the sealant unless another type is allowed by the Engineer.
- Mix hardening agent into polyester resin with a power mixer or in an application machine designed for this type of sealant in accordance with the manufacturer's instructions.
- Apply the loop sealant in accordance with the manufacturer's instructions and the typical installation sheet. Do not apply sealant when pavement temperature is outside the manufacturer's recommended application range.
- Solder splice the loop wires to the lead-in cable and install water resistant connector as shown on the typical installation sheet.
- Test the loop circuit resistance, inductance, and amplifier power-interruption as shown on the typical installation sheet. Document all test results.

3. Damaged, Patched, or Excessively Worn Pavement

- Where the existing pavement is damaged, patched or excessively worn and is found to be not suitable for reliable loop detection, notify the Engineer.
- When directed by the Engineer, remove and replace an area of pavement to allow the proper installation of the loop.
- Remove a minimum of 3 inches (75mm) depth.
- Comply with the applicable construction methods of Section 2.02 Roadway Excavation, Formation Of Embankment and Disposal of Surplus Material, and Section 4.06 Bituminous Concrete, such as:
 - Cut Bituminous Concrete
 - Material for Tack Coat
 - Bituminous Concrete Class 1

4. Re-surface/Overlay Project

- Prior to disconnecting the existing loop confirm that the amplifier is operating properly and is programmed according to plan. Document loop operation. Report any discrepancies and malfunctions to Engineer.
- Remove all abandoned sawcut home-run wire from handhole.
- Sawcut new loop according to plan.
- Solder splice new loop wires to the existing lead-in cable and install new water resistant twist connectors as shown on the typical installation sheet. Do not re-use the removed connectors.
- Test the loop circuit resistance and inductance. Document results.
- Ensure the existing loop amplifier has re-tuned to the new loop and is operating according to plan.

11.11.04 – Method of Measurement:

1. Loop Vehicle Detector is measured by the number of installed, operating, tested, and accepted vehicle detector amplifiers of the type specified.
2. Loop Detector Sawcut is measured by the number of linear feet (meters) of installed, tested, operating, and accepted sawcut only where there is loop wire. Over-cuts at corners that do not contain wire are not measured.

11.11.05 – Basis of Payment:

1. Loop Vehicle Detector is paid at the contract unit price each of the type specified.
2. Loop Detector Sawcut is paid at the contract unit price per linear foot (meter). The price includes sawcut, loop wire, sealant, liquidtight flexible nonmetallic conduit, duct seal, water resistant splice connectors, testing, incidental material, equipment, and labor.

<u>Pay Item</u>	<u>Pay Unit</u>
Loop Vehicle Detector	ea. (ea.)
Loop Detector Sawcut	l.f. (m)

ITEM No. 1111414A CAMERA VIDEO DETECTION SYSTEM - TYPE 2 (2 CAMERAS)**ITEM No. 1111415A CAMERA VIDEO DETECTION SYSTEM - TYPE 3 (3 CAMERAS)****ITEM No. 1111416A CAMERA VIDEO DETECTION SYSTEM - TYPE 4 (4 CAMERAS)****ITEM No. 1112209A CAMERA EXTENSION BRACKET****ITEM No. 1113901A CAMERA CABLE****Description:**

Work under these items shall involve of furnishing and installing Video Detection Camera, Cables and Extended Bracket in accordance with traffic signal plans. The video system shall include video image sensors, interface panel, video processing cards, internal and external surge protectors, as well as vertical mounting hardware, camera cables and a video display monitor. The VDS shall be capable of vehicle presence and collection of traffic volume data. All devices to be furnished shall have at least one (1) authorized dealer within the United States for repair and maintenance. Unless noted otherwise, all equipment shall be provided with a minimum of three (3) year unlimited warranty for labor and parts. Shop drawings to be submitted for this item shall be accompanied by manufacturers' warranty documents for review and approval. Camera cables and Extension brackets shall be paid under Items - 1113901A and 1112209A respectively.

Materials:

The VDS shall comprise of a Camera Assembly, Machine Vision Processor, Application software and all other devices described herein. The VDS shall have ability to facilitate three-dimensional vehicle modeling for the purposes of detecting and approaching and departing vehicles at an intersection. The VDS shall meet or exceed the following described minimum features:

1. The camera assembly shall meet or exceed the following:
 - Connect to the MVP with a single Power-over-Ethernet (PoE) connection.
 - Able to simultaneously monitor more than one approach on a multi-lane roadway.
 - Possess an ultra-wide-angle lens to maximize field-of-view.
 - Possess a heater mechanism to prevent the formation of condensation.

2. The Machine Vision Processor (MVP) shall meet or exceed the following:
 - Feature an API for image and data retrieval.
 - Ability to save configurations and zone plans locally
 - Hardened to operate in extreme adverse environment conditions
 - Operate at 120-240 VAC, requiring 150W or less.
 - Operate at least 24 detector outputs.
 - Have USB, LAN and WAN RJ-45 interface ports

3. The Application Software shall meet or exceed the following:

- Ability to support the creation and modification of at least twenty-four (24) polygonal detection zones within the graphical user interface.
 - Ability to maintain an historical log of all configurations when a site is modified.
 - Ability to show images of the detection zones superimposed on the video image of traffic with replay functionality.
 - Ability to support direction of travel assignment within detection zones. The vehicle detection zone shall not activate for objects traveling any direction other than the one specified for detection. Cross-street and wrong way traffic shall not cause detection.
 - Ability to provide visual indication of the light state for each zone within the graphical user interface.
 - Ability to digitally pan, tilt, and zoom within the camera's field of view without movement of the camera.
 - Ability to maintain a database of current and historical traffic data, and allow for the user to run reports against this data to include traffic counts, turn movements, speed, and classification.
 - Ability to mask objects that occlude the camera field of view and/or disrupt the camera automatic gain and exposure control.
 - Ability for reporting for turning movement counts and vehicle classification.
4. The VDS shall be provided with the following miscellaneous features:

Operating Temperature: -34°C (-30° F) to +74°C (+165°F) degrees Celsius at 0 percent to 95 percent relative humidity, non-condensing.

Wind Load Factor: Camera, mounting hardware, and any related material shall withstand 150 mph wind speeds.

Waterproof and Dust Control: To meet the latest (National Electrical Manufacturers Association) NEMA-4 specifications.

Electromagnetic Interference Emissions: To meet FCC class B requirements.

Vibration and Shock resistance: To meet the requirements of Sections 2.1.9 and 2.1.10, respectively, of NEMA TS 2.

Detection System hardware: To meet the requirements in the Federal Communications Commission (FCC) 2005 Code of Federal Regulation (CFR) Title 47, Part 15 and shall not interfere with any known equipment.

Mounting: Each camera is to be provided with vertical mounting bracket and all associated hardware.

Remote Communication: Each VDS shall be provided with all the necessary hardware and software to transmit images to the control room for configuration and monitoring purposes.

Surge Suppression: Each camera shall be provided with Edco Model CX06-BNC, Emerson CX-06-MI-SBL BNC or approved equal, isolated surge suppressors inside the controller cabinet.

Harness: All jumper cables and connectors related with the VDS installation and operation shall be provided.

5. Each cabinet shall be furnished with a small video monitor. The minimum characteristics of the video monitor shall be as follows:
 - Compact LCD Flat Panel approximately 7-9 inches diagonal size.
 - Ability to withstand mechanical shock of 10 G's peak acceleration (11 ms, half sine wave).
 - Accepts 5 to 500 Hz at 1 G RMS random vibration.
 - Meets FCC, VCCI, EMC standards, CE approved, UL listed and Energy Star efficient standards.
 - MTBF Rating: 65,000 hours
6. Each cabinet shall be furnished with two (2) Encoders and each one shall have a maximum capability of two (2) BNC inputs. Corresponding number of encoders shall be furnished for the Traffic Control Room. The Decoders shall meet or exceed the following requirements:

Temperature: Field Encoders shall be hardened to meet NEMA standards. Central Control Room encoders may be non-hardened.

Mounting: Field Encoders shall be standalone Central Control Room encoders shall be rack mounted.

Video Compression Algorithm and Streaming: H.264 or MPEG 4

Protocols: RTSP, RTP, IP, UDP, IGMP, ICMP, ARP, SNMP, Telnet, Web Server and TCP etc.

IP Address: Static

7. Each Extension Bracket shall be provided with early streamer emitting devices located adjacent to each camera. The devices shall be manufactured by any reputable company in the US. The purpose of the streamer shall be to emit a streamer early in the streamer-formation phase of lighting strike, thereby becoming the preferred lighting attachment point. The early streamer length shall range between 36-48 inches and installed in accordance with UL-96A and NFPA 780 specifications
8. The CVDS shall be warranted free of defects in material and workmanship for at least three (3) years following the date of intersection acceptance and warranty registration. The warranty shall cover labor, parts, freight charges and support services at no cost to the City of Danbury.
9. All manuals, documents and testing certifications for the VDS shall be provided.

10. Camera Cable:

The Contractor shall furnish and install camera cable suitable for transmission of power, video and data. The cable shall incorporate all the necessary connectors and pigtails. The length of the cable shall be in accordance with the traffic signal plans or field measured. The cable shall be installed in a continuous manner between the cabinet surge suppressors and the external surge suppressors. This item shall be paid under Item No.

1113901A. The camera and cable furnished as part of this project must be made or supplied by the same equipment manufacturer.

11. Camera Extension Bracket:

The contractor shall furnish and install horizontal camera extension bracket of the length shown on the plans. Design of the horizontal camera extension brackets shall be in accordance with the State of Connecticut (ConnDOT) Detail Specifications No. TR_1111_02. The number and length of camera extension bracket at each location shall be in accordance with the traffic signal plans. This item shall be paid under Item No. 1112209A. The Extension bracket shall have ability to support a minimum of 30 pounds end with minimal movement from the wind.

The color of the Extension Bracket shall be same as that of the Span Pole Assembly conforming to Federal No. 595A-37038.

Method of Measurement:

The Video Detection Systems shall be measured for payment based on the set of video cameras that shall be furnished, installed, tested and accepted. The Camera Extension Bracket shall be based on the number of arms furnished and installed. The camera cable shall be paid based on footage of cable that shall be furnished and installed. The camera Extension Bracket and Cable shall be paid under separate items.

Basis of Payment:

The price VDS shall include the cost for furnishing and installing Video Detection System comprising of a set of video cameras specified in the Detailed Estimate Sheet, interface panel, video processor and extension cards, video display unit, vertical mounting hardware, early streamer, cables, BNC video output, camera jumper cables, connectors and surge suppressors. The price shall cover provision of software and updates, labor, tools, three (3) year unlimited warranty, documentation, testing and all incidental expenses thereto.

The camera extension brackets shall be paid based on the number of brackets furnished installed and accepted in place. The price shall cover labor, materials and all incidental expenses thereto. Payment for camera cable shall be based on the linear footage of cable installed and accepted in place. The price shall cover labor, materials, three (3) year unlimited warranty and all incidental expenses thereto.

<u>Item No.</u>	<u>Description</u>	<u>Unit</u>
1111414A	Camera Video Detection System - Type 2 (2 cameras)	EA
1111415A	Camera Video Detection System - Type 3 (3 cameras)	EA
1111416A	Camera Video Detection System - Type 4 (4 cameras)	EA
1112209A	Camera Extension Bracket	EA
1113901A	Camera Cable	L.F.

ITEM NO. 1112241A FIBER OPTIC CABLE SPLICE ENCLOSURE**Description:**

The work described under this item shall consist of furnishing and installing Aerial Fiber optic splice enclosure at locations specified in the plans or determined by the Engineer. The enclosure shall be Dome type manufactured by Corning, Coyote or approved equal. The furnished item must meet or exceed the following characteristics:

- Type: Dome for Buffer Tube (loose tube)
- Number of Cable Entry: Six (6) cables in butt configuration.
- Number of Splice Trays: Four (4) Low Profile trays each with capacity of 12 splices.
- End plates Type: Segmented plates for independent access of six (6) cables.
- Grounding: Provided with appropriate grounding
- Air Valve: Provided with factory installed air valve.
- Minimum Dimension: 6.5" x 17"

Other features and characteristics:

- Ability to be entered and reassembled without use of special tools.
- Contain space for storage of up to eight unopened buffer tubes.
- Tested in accordance to Telcordia GR-771 CORE standard specifications.
- Corrosion resistant aluminum and stainless steel hardware to support aerial.
- Operating Temperature: -37°C to +74°C (-22 °F to 165 °F),

Construction Methods:

Only fibers designated for splicing shall be spliced. Dark fibers shall be terminated in the controllers or stored in the splice enclosure in accordance with the splice charts. All others fiber strands shall be allowed to pass thru the enclosure without splicing. In addition, only tubes containing fibers that are to be terminated in the enclosure shall be opened. All others shall remain un-opened. Each aerial splice enclosure is to be provided with at least one hundred (100) feet of spare cable that shall be stored in the aluminum fabricated slack storage rack to be provided as part of this item. Fusion splicing method shall be utilized in the splicing all fibers. The average maximum splice loss shall be .01 dB when measured from both directions.

Method of Measurement:

The work under this item shall be measured for payment by the number of Fiber Optic Cable Splice Enclosure and all associated mounting hardware furnished, installed, tested and accepted in place. The payment shall also cover for provision of aluminum aerial slack storage rack and splicing.

Basis of Payment:

The Fiber Optic Cable Splice Enclosure at the unit price per each item finished, installed, tested and accepted in place. The price shall include aerial slack storage, cable splicing as well as equipment, fittings, labor, all materials and work incidental thereto.

<u>Item No.</u>	<u>Description</u>	<u>Unit</u>
1112241A	Fiber Optic Cable Splice Enclosure	EA.

ITEM # 1112252A – EQUIPMENT OPERATIONS

Description:

The purpose of this item is to provide the necessary services required to maintain the Incident Management System (IMS) equipment existing and newly installed, operating to the manufacturer's specifications, so as to provide a means to monitor, detect and manage incidents as they occur on the highway. The work included in this item for the existing IMS equipment will commence upon receiving the Notice to Proceed for this contract. The work included in this item for newly installed IMS equipment will commence upon completion of the 30 Day Operational Test

Materials:

All materials utilized to maintain and repair the Incident Management System (IMS) shall be in conformance with the specifications of this project or shall be in conformance with the specifications of the Procurement Contract, or as recommended by the manufacturer. The existing or newly installed IMS equipment shall include but not be limited to the operation of the following:

- CCTV Cameras
- Traffic Management System Cabinets (TMSC)
- Traffic Management System Mini-Hub Cabinets (TSMHC)
- Optical Video/Data Transceivers (OVDT/OVDR)
- Terminal (Port) Server
- Multi-Chanel Multiplexer/Demultiplexer and Repeater
- Traffic Flow Monitors (TFM)
- Highway Advisory Radio (HAR).
- Portable Variable Message Signs (PVMS)

The Contract Items for the new IMS equipment to be installed under the subject project include the purchase of spare parts. The Contractor shall procure and have available spare parts for the new IMS equipment on-hand and available for use so that expeditious repairs to the newly installed Incident Management System can be performed.

The Contractor shall provide all the cables, connectors, tools, replacement equipment and labor necessary to successfully maintain the equipment.

The existing IMS equipment may be maintained and repaired using replacement parts available from the State of Connecticut inventory in order to expedite the repair process. As soon as possible and to the State's satisfaction, the Contractor shall provide replacement equipment to be re-entered into the State's inventory.

The Contractor shall provide documentation certifying the manufacturer's repair or replacement of the spare equipment upon return of the equipment to the Department.

Construction Methods:

Certification:

The Contractor shall provide the State with evidence satisfactory to the State that they fully understand the purpose for which the equipment is intended and they are qualified and capable of fulfilling all provisions of this item. The Contractor as well as individual personnel performing this work shall be certified by all manufacturers of the equipment to be maintained as being capable of maintaining the equipment and also capable of obtaining and installing the necessary spare parts to keep the system on-line. The Contractor, prior to the commencement of the start of the equipment operations, shall be required to submit training certificates for all of the pertinent equipment.

Response Time:

The Contractor shall service and maintain the newly installed IMS equipment at the conclusion of the 30 Day Operational Test for each section and the existing IMS equipment as allowed by the Engineer. All IMS equipment shall be serviced and maintained on a twenty-four (24) hour a day, seven days a week basis. The Contractor shall provide a suitable means of communication between them and the Highway Operations Center (HOC). This shall include a twenty-four (24) hour telephone number, a fax number for emergency purposes and a fax number for daily communications and log activities. Repairs shall commence not more than 8 hours after notification and shall be completed within 24 hours of notification.

The Contractor shall keep a neat and accurate log book of all the malfunctions reported with the date and time that the information was received and the nature of the problem. The log book shall be submitted to the Engineer monthly or upon request by the Engineer. The Contractor shall include in the log book the time that each unit is checked for proper operation, the condition of each unit checked, and the date and time each unit was restored to proper operation or replaced.

Work performed under this item shall conform to the latest National Electrical Code standards, local electrical codes, and Department of Transportation installation requirements. The Contractor shall conform to these requirements as specified herein.

Any IMS equipment that has been damaged through the Contractors own actions shall be repaired and/or replaced by the Contractor at no cost to the State.

Method of Measurement:

This item shall be measured for payment as provided under Article 1.09.04 – Extra and Cost Plus Work.

The sum of money shown on the estimate and in the itemized proposal as “Estimated Costs” for this work will be considered the price bid even though payment will be made only for actual work performed. The estimated cost figure is not to be altered in any manner by the bidder. Should the bidder alter the amount shown, the altered figures will be disregarded and the original price will be used to determine the total amount bid for the contract.

Basis of Payment:

This work will be paid on a cost-plus basis according to Article 1.09.04 – Extra and Cost Plus Work. Warranties in effect for newly installed equipment associated with CCTV Cameras, Traffic Management System Cabinets (TMSC), Traffic Management System Mini-Hub Cabinets (TMSMHC), Optical Video/Data Transceivers (OVDT/OVDR), Traffic Flow Monitors (TFM) Highway Advisory Radio (HAR) and Portable Variable Message Signs (PVMS) operation shall be honored by the suppliers of the equipment. Contractor or sub-contractor will be responsible for securing warranted equipment and installation. There will be no payment for materials included under a manufacturers warrantee. Labor costs only will be reimbursed on a cost plus basis.

If warranties have expired, any equipment and labor that must be repaired will be paid on a cost plus basis.

ITEM #1113023A 12 FIBER OPTIC SINGLE MODE CABLE - AERIAL
ITEM #1113037A 12 FIBER OPTIC SINGLE MODE CABLE IN CONDUIT

Description:

The work described under this item shall consist of furnishing and installing 12 strand fiber optic cable as specified herein. The cable shall be installed from the northwest corner of Maple Avenue and Garmella Boulevard intersection at SNET Pole 2559 through intersection of North Street (State Route 37) and Balmforth Avenue and continue north to the intersection of Padanaram Road (State Route 37) and the northerly driveway serving the North Street Shopping Center. The Contractor shall furnish all materials, labor, equipment and accessories required for installation, mounting, termination, splicing and testing of the fiber optic cable system.

Materials:

A. 12 Fiber Optic Single Mode Cable

The fiber optic cable shall be ClearCurve manufactured by Corning, EZ Bend, or approved equal. The cable characteristics shall meet or exceed the following:

Fiber Optic Type:

- Mode: SMF operating at 1310/1383/1550 nm wavelength
- Maximum Attenuation: 0.35/0.35/0.25 dB/km
- Operation Environment: Outdoor /Indoor
- Gel-Free, ultra bend and all dielectric

Design Standards and Requirements:

- Telcordia GR-20
- ICEA - 60793-2-50 Type B1.1 & B1.3
- TIA/EIA 492-CAAB fiber
- ITU-T G. 652 (Tables A, B, C, &D)

Maximum Tensile Loads: Short-Term: 2700 N (600 lbf); Long-Term: 890 N (200 lbf)

Temperature (Outside Application):

- Storage: -40 ° to +70 ° C (-40 ° to +158 ° F)
- Installation: -30 ° to + 70 ° C (-22 ° to +158 ° F)
- Operating: -40 ° to +70 ° C (-40 ° to +158 ° F)

Glass and Coating Geometry:

- Core diameter: 8.2 μm
- Fiber Curl: $\geq 4.0\text{m}$ radius of curvature
- Core-Clad Concentricity: $\leq 0.5 \mu\text{m}$
- Cladding diameter: $125.0 \pm 0.7 \mu\text{m}$
- Cladding Non-circularity: $\leq 0.7\%$
- Coating Diameter: $242 \pm 5 \mu\text{m}$
- Coating Cladding Concentricity: $< 12 \mu\text{m}$

Other Characteristics:

- Maximum Fibers per Tube: 6
- Number of Tube Positions: 6
- Number of Active Tube: 2
- Central Member: Dielectric
- Nominal Outside Diameter mm (in): 10.5 (0.41)
- Nominal Cable Weight kg/km (lb/1000 ft): 73 (49) or less
- Dispersion Value: $\leq 18.0 \text{ ps}/(\text{nm} \cdot \text{km})$ at 1550 nm
 $\leq 22.0 \text{ ps}/(\text{nm} \cdot \text{km})$ at 1625 nm
- Zero Dispersion Wavelength (λ_0): $1310\text{nm} \leq \lambda_0 \leq 1324 \text{ nm}$
- Zero Dispersion Slope (S_0): $\leq 0.092 \text{ ps}/(\text{nm}^2 \cdot \text{km})$
- Cutoff wavelength: $\leq 1260\text{nm}$
- Mode Field Diameter: $9.2 \pm 0.4 \mu\text{m}$ at 1310 nm
 $10.4 \pm 0.5 \mu\text{m}$ at 1550 nm
- Polarization Mode Dispersion (PMD):
PMD Link Design Value: $\leq 0.06 \text{ ps}/(\text{km}^{0.5})$
Maximum Individual Fiber: $\leq 0.1 \text{ ps}/(\text{km}^{0.5})$

B. Connector Panel Assembly

At each intersection provided with an external aerial splice enclosure, one (1) rugged modular connector panel assembly manufactured by Corning, OFS or approved equal shall be furnished and installed in the traffic control cabinet. Each connector panel assembly shall have twelve (12) SMF pigtail cable and a panel comprised of LC UPC for twelve (12) SMF. The pigtails of the rugged module shall be fusion spliced overhead with the trunk cable in the aerial splice enclosure. Six (6) stands of the pigtail shall be color coded Green and spliced with the inbound trunk service cable. The other six (6) strands shall be color coded Blue and fusion spliced with the outbound service trunk cable. The length of the pigtails shall be determined in field but shall not be less than one hundred and fifty (150) feet. Any pigtail cable slack shall be stored overhead in the aerial slack storage rack to be provided as part of the aerial splice enclosure. The Connector Panel Assemblies shall meet or exceed GR-3122, GR-771, GR-3152 specifications and have the following features:

- Connector Type 1: Open, non-terminated
- Connector (Adapter) Type 2: LC-UPC
- Cable and Fiber Type: SMF
- Number of LC-UPC Adapters: 12
- Pigtail length: To be field determined but not less than 150 feet.
- LC-UPC Adapter Insertion Loss: < 0.5 dB when mated.
- LC-UPC Adapter Reflectance: <-50 dB

C. Fiber Termination Unit

At each intersection that is not provided with an aerial splice enclosure, a rack mount Fiber Termination Unit (FTU) shall be furnished and installed in the traffic cabinet. Six (6) of inbound and six (6) of the outbound service cables shall be spliced with twelve pre-manufactured pigtails that are to be provided with LC connectors. The FTU and SMF pigtails to be furnished and installed as part of this project shall meet or exceed the following characteristics:

FTU:

- Dimension: 3.5” H x 17” W x 12” D (2 rack units) or better
- Splice Trays: Two with ability to store 12 fusion splices
- Adapter Panel: Twelve (12) Duplex LC connectors
- Pigtail length: 3-6 feet
- Construction: 16 gauge metal
- Lockable front door
- Slide-out tray
- Powder coated with beige finish color

SMF Pigtail:

- Connector Type: LC
- Connector Housing Type: Composite
- Connector Ferrule Type: Ceramic
- Connector Insertion Loss: 0.25 dB
- Connector Reflectance: -50 dB or less
- Size: 90 μm

D. Jumper Cables

Each cabinet shall be furnished with two (2) pre-manufactured SMF duplex jumper cables that are provided with LC-LC UPC connectors. Each jumper cable shall measure at least 10 feet in length. The jumper cable shall meet or exceed the following requirements:

- Cable type: SMF operating 1310 nm
- Ferrule Type: Ceramic
- Housing Type: Composite

- Insertion Loss: 0.25 dB
- Reflectance: -50 dB or less

Construction Methods:

The aerial splice enclosure currently installed within close proximity of SNET Pole 2559 at the intersection of Garmella Boulevard and Maple Avenue shall be modified or replaced to facilitate entry and splicing of 12 strands SMF with the existing 36 strands fiber optic trunk running towards the Traffic Control Room at City Hall. Unless where called for, the fiber strands shall be continuous without or splicing. At intersections provided with aerial splice enclosures, the trunk cable shall be spliced with pig tails of the connector panel assembly as described above. Where the fiber run shall be located underground, the 12 SMF shall directly routed into the controller cabinet, spliced in the trays and terminated in the FTU utilizing LC connectors. Jumper cables shall be utilized to interface the Connector panel assemblies or the FTU with the traffic the Gigabit Switch. Appropriate number of Cat 6 cables each ten (10) feet in length shall be furnished and installed in each cabinet to interface the Gigabit Switch with the video camera processing cards as well as the 2070 controller.

Pre-installation Requirements:

The Contractor shall be responsible for transportation, storage, delivery, and installation and testing of the fiber optic cable. The Technician involved in installation, splicing, and termination functions of shall be certified. Copies of such certifications shall be provided to the project Engineer. At least fifteen (15) calendar days prior to start of fiber cable installation, the Contractor shall submit to the Engineer the following information for review and approval:

- Name, certification and experience information of the Fiber-optic technician.
- Manufacturer's certified test information the following information shall be provided:
 - Fiber Count
 - Reel Length
 - Attenuation

The manufacturer's information shall be accompanied by a certified document indicating the date, name of personnel and company that were involved in cable testing.

Post Installation Testing:

The Contractor shall be responsible for testing of all strands of fibers that shall be installed as part of this project. The testing in the presence of City Danbury staff and the Report in both hard and diskette copies shall be provided to the project engineer. It shall be the responsibility of the Contractor to arrange and notify the City of Danbury two (2) weeks in advance regarding the testing schedule. The testing shall be conducted for each fiber strand, section as well as the entire run from each direction. The Testing Report shall incorporate the following:

- Fiber length
- Attenuation for each strand
- Connector loss
- Event loss
- Splice profile and loss
- Signature traces

The Maximum allowed readings shall be as specified below:

Splice or event loss: ≤ 0.3 dB in either direction.

Paired connector loss: LC-LC Connectors: ≤ 0.5 dB

ST-ST Connectors: ≤ 0.5 dB

Attenuation: ≤ 0.4 dB/km + 0.3dB per splice / event + Connector loss

In case of any failure or rejection, the Contractor shall be responsible of rectify the fault. At the discretion of the project engineer, the contractor may be requested to replacement an entire SMF segment or link that has failed.

Method of Measurement:

The work under this item shall be measured for payment by linear foot of fiber optic cable of the type specified furnished, installed, tested and accepted in place. The price shall include cost for furnishing and installation of connector panel assemblies, fiber termination units, jumper cables as well as splicing, pairing and termination of cables.

Basis of Payment:

The Single Mode Fiber Optic cable shall be paid at the unit price per linear foot for the cable type specified, installed, tested and accepted in place. The price shall include furnishing, installation of fiber optic cable, aerial messenger, fiber mounting and storage hardware, FOC jumper cables, Cat 6 cables, Connector panel assembly, Fiber Termination Units, fiber pigtails, fittings, testing, splicing as well as equipment, labor, all materials and work incidental thereto.

<u>Item No.</u>	<u>Description</u>	<u>Unit</u>
1113023A	12 Strand Single Mode Fiber Optic Cable - Aerial	L.F.
1113037A	12 Strand Single Mode Fiber Optic Cable in Conduit	L.F.

ITEM #1118007A – ADJUST EXISTING SIGNAL INSTALLATION

Description:

This item shall consist of relocating and adjusting signal heads, relocating span attachments, and removing signal sections of existing signals. This work also includes the necessary wiring changes overhead, in handholes, pole bases, pedestal bases, and the possible removal and reinstallation of existing cables in conduit to facilitate the installation of new cables. All of these changes shall be as shown on the contract plans or as directed by the Engineer to insure that the operation of the signal meets the new sequence prints. Controller revisions shall be completed under Item #1108163A - Modify Existing Controller.

Materials:

The materials for this work shall conform to the pertinent articles of the standard specifications.

Construction Methods:

Adjustments to the existing signal installation shall be completed in such a manner as to safe guard all parts from damage or loss. The Contractor shall replace, at his own expense all material which becomes damaged due to his operations. Where signal heads are to be relocated or modified, splices will not be allowed. All wiring shall be direct, back to the cable closure or controller cabinet.

Method of Measurement:

This item will be measured for payment as an "Each" item.

Basis of Payment:

This item will be paid for at the Each contract price for "Adjust Existing Signal Installation" which price shall include necessary mounting hardware, tools, equipment, and labor required to adjust and change the signal installation as called for on the plans. Additional cable, span wire and signal sections required shall be paid for at the contract unit price.

ITEM #1118012A REMOVAL AND/OR RELOCATION OF TRAFFIC SIGNAL EQUIPMENT

Section 11.18: Replace the entire section with the following:

11.18.01 – Description:

Remove all abandon traffic signal equipment. Restore the affected area. Where indicated on the plans remove and reinstall existing traffic signal equipment to the location(s) shown.

11.18.02 – Materials:

The related sections of the following specifications apply to all incidental and additional material required for the proper relocation of existing equipment and the restoration of any area affected by this work.

- Division III, “Materials Section” of the Standard Specifications.
- Current Supplemental Specifications to the Standard Specifications.
- Applicable Special Provisions to the Standard Specifications.
- Current Department of Transportation, Functional Specifications for Traffic Control Equipment.

Article 11.18.03 - Construction Methods:

Schedule/coordinate the removal and/or relocation of existing traffic signal equipment with the installation of new equipment to maintain uninterrupted traffic signal control. This includes but is not limited to vehicle signals and detectors, pedestrian signals and pushbuttons, co-ordination, and pre-emption.

Abandoned Equipment

The contract traffic signal plan usually does not show existing equipment that will be abandoned. Consult the existing traffic signal plan for the location of abandoned material especially messenger strand, conduit risers, and handholes that are a distance from the intersection. A copy of the existing plan is usually in the existing controller cabinet. If not, a plan is available from the Division of Traffic Engineering upon request.

Unless shown on the plans it is not necessary to remove abandoned conduit in-trench and conduit under-roadway

When a traffic signal support strand, rigid metal conduit, down guy, or other traffic signal equipment is attached to a utility pole, secure from the pole custodian permission to work on the pole. All applicable Public Utility Regulatory Authority (PURA) regulations and utility company requirements govern. Keep utility company apprised of the schedule and the nature of the work.

Remove all abandoned hardware, conduit risers, and down guys, Remove anchor rods, to 6” (150mm) below grade.

When underground material is removed, backfill the excavation with clean fill material. Compact the fill to eliminate settling. Remove entirely the following material: pedestal foundation; controller foundation; handhole; pressure sensitive vehicle detector complete with concrete base. Unless otherwise shown on the plan, remove steel pole and mast arm foundation to a depth of 2 feet (600mm) below grade. Restore the excavated area to a grade and condition compatible with the surrounding area.

- If in an unpaved area apply topsoil and establish turf in accordance with Section 9.44 and Section 9.50 of the Standard Specifications.
- If in pavement or sidewalk, restore the excavated area in compliance with the applicable Sections of Division II, “Construction Details” of the Standard Specifications.

Relocated Equipment

In the presence of the Engineer, verify the condition of all material that will be relocated and reused at the site. Carefully remove all material, fittings, and attachments in a manner to safeguard parts from damage or loss. Replace at no additional cost, all material which becomes damaged or lost during removal, storage, or reinstallation.

Salvage Equipment

Salvage Material	Stock No.	Value
Controller Cabinet, Complete including but not limited to the following: Conflict Monitor Coordination Equipment Vehicle Detection Equipment	330-03-7010	\$ 500.00
Controller Unit	330-03-7005	\$ 500.00
Aluminum Pedestal 8 foot (2.4 m)	330-16-7108	\$ 100.00
4 foot, 4 inch (1.3 m)	330-16-7112	\$ 100.00
Steel Span Pole, 30’ (9.0 m)	330-16-7050	\$ 250.00
Steel Span Pole, all other lengths	330-16-7016	\$ 250.00

All material not listed as salvage becomes the property of the Contractor. Properly handle, transport, then dispose in a suitable dump or recycle this material. Comply with all Federal and State hazardous waste laws and regulations.

In the presence of the Engineer, verify the condition and quantity of salvage material prior to removal. After removal transport and store the material protected from moisture, dirt, and other damage. Coil and secure copper cable separate from other cable such as galvanized support strand.

Within 4 working days of removal, return the State owned salvage material to the Department of Transportation Stores warehouse listed below. Supply all necessary manpower and

equipment to load, transport, and unload the material. The condition and quantity of the material after unloading will be verified by the Engineer.

The spread spectrum wireless equipment at intersection 034-207 and 034-299 are to be returned to the DOT Traffic Signal laboratory.

DOT Salvage Store #134
660 Brook Street
Rocky Hill, CT

Contact Materials Management Salvage Coordinator, at (860) 258-1980, at least 24 hours prior to delivery.

Municipal Owned Traffic Signal Equipment

Return all municipal owned material such as pre-emption equipment to the Town.

Article 11.18.04 – Method of Measurement:

This work will be measured as a Lump Sum.

Article 11.18.05 – Basis of Payment:

This work will be paid for at the contract lump sum price for “Removal and/or Relocation of Traffic Signal Equipment” which price shall include relocating signal equipment and associated hardware, all equipment, material, tools and labor incidental thereto. This price shall also include removing, loading, transporting, and unloading of signal equipment/materials designated for salvage and all equipment, material, tools and labor incidental thereto. This price shall also include removing and disposing of traffic signal equipment not to be salvaged and all equipment, material, tools and labor incidental thereto.

Payment is at the contract lump sum price for “Removal and/or Relocation of Traffic Signal Equipment” inclusive of all labor, vehicle usage, storage, and incidental material necessary for the complete removal of abandoned equipment/material and/or relocation of existing traffic signal equipment/material. Payment will also include the necessary labor, equipment, and material for the complete restoration of all affected areas.

A credit will be calculated and deducted from monies due the Contractor equal to the listed value of salvage material not returned or that has been damaged and deemed unsalvageable due to the Contractor’s operations.

Pay Item	Pay Unit
Removal and/or Relocation of Traffic Signal Equipment	L.S. (L.S.)

ITEM NO. 1118051A – TEMPORARY SIGNALIZATION (SITE NO. 1)

ITEM NO. 1118052A – TEMPORARY SIGNALIZATION (SITE NO. 2)

ITEM NO. 1118053A – TEMPORARY SIGNALIZATION (SITE NO. 3)

Description:

Provide Temporary Signalization (TS) at the intersections shown on the plans or as directed by the Engineer.

1. Existing Signalized Intersection: Keep each traffic signal completely operational at all times during construction through the use of existing signal equipment, temporary signal equipment, new signal equipment, or any combination thereof once TS has started as noted in the section labeled Duration.

2. Unsignalized Intersection: Provide TS during construction activities and convert the temporary condition to a permanent traffic signal upon project completion. Furnish, install, maintain, and relocate equipment to provide a complete temporary traffic signal, including but not limited to the necessary support structures, electrical energy, vehicle and pedestrian indications, vehicle and pedestrian detection, pavement markings, and signing.

Materials:

- Pertinent articles of the Standard Specifications
- Supplemental Specifications and Special Provisions contained in this contract

Construction Methods:

Preliminary Inspection

In the presence of the Engineer and a representative from the DOT Electrical Maintenance Office (Town representative for a Town owned signal), inspect and document the existing traffic signal's physical and operational condition prior to Temporary Signalization. Include but do not limit the inspection to the following:

- Controller Assembly (CA)
 - Controller Unit (CU)
 - Detection Equipment
 - Pre-emption Equipment
 - Coordination Equipment
- Vehicle and Pedestrian Signals
- Vehicle and Pedestrian Detectors
- Emergency Vehicle Pre-emption System (EVPS) *
- Interconnect Cable and Splice Enclosures
- Support Structures
- Handholes, Conduit and Cable

It may be necessary to repair or replace equipment that is missing, damaged, or malfunctioning. Develop a checklist of items for replacement or repair after the inspection. If authorized by the Engineer, this work will be considered "Extra Work" under Article 1.09.04.

* At a State owned signal the EVPS equipment is usually owned by the municipality. It is recommended to apprise the municipality of the inspection schedule and results.

TS Plan

At least 30 days prior to implementation of each stage, submit a 1:40 scale TS plan for each location to the Engineer for review and comment. Include but do not limit the plan to the following:

- Survey Ties
- Dimensions of Lanes, Shoulders, and Islands
- Slope Limits
- Clearing and Grubbing Limits
- Signal Phasing and Timing
- Location of Signal Appurtenances such as Supports, Signal Heads, Pedestrian Push buttons, Pedestrian Signals
- Location of Signing and Pavement Markings (stop bars, lane lines, etc.)
- Location, method, and mode of Temporary Detection

Review of the TS plan does not relieve the Contractor of ensuring the TS meets the requirements of the MUTCD. A copy of the existing traffic signal plan for State-owned traffic signals is available from the Division of Traffic Engineering upon request. Request existing traffic signal plans for Town-owned traffic signals from the Town. Do not implement the TS plan until all review comments have been addressed.

Earthwork

Perform the necessary clearing and grubbing and the grading of slopes required for the installation, maintenance, and removal of the TS equipment. After TS terminates restore the affected area to the prior condition and to the satisfaction of the Engineer.

Maintenance and Protection of Traffic

Furnish, install, maintain, relocate, and remove signal-related signing (lane-use, signal ahead, NTOR, etc.) and pavement markings as needed. Install, relocate, and/or remove equipment in a manner to cause no hazard to pedestrians, traffic or property. Maintain traffic as specified in the Special Provisions "Prosecution and Progress" and "Maintenance and Protection of Traffic."

Electrical Service and Telephone Service at Existing Signalized Intersections

If the electrical service or the telephone service source must be changed or relocated make all arrangements with the utility company and assume all charges. The party previously responsible for the monthly payment of service shall continue to be responsible during TS.

Electrical Service at Unsignalized Intersections

Assume all charges and make all arrangements with the power company, including service requests, scheduling, and monthly bills in accordance with Section 10.00.12 and Section 34-313

10.00.13 of the Standard Specifications,. A metered service is recommended where TS equipment will be removed when no longer needed.

Temporary Signalization

Furnish, install, maintain, relocate, and remove existing, temporary, and proposed traffic signal equipment and all necessary hardware; modify or furnish a new CA; reprogram the CU phasing and timing; as many times as necessary for each stage/phase of construction to maintain and protect traffic and pedestrian movements as shown on the plans or as directed by the Engineer.

Inspection

When requested by the Engineer, the TS will be subject to a field review by a representative of the Division of Traffic Engineering and/or the Town, which may generate additional comments requiring revisions to the temporary signal.

Emergency Vehicle Pre-emption System (EVPS)

Furnish, install, maintain, relocate, and remove the equipment necessary to keep the existing EVPS operational as shown on the plan. Do not disconnect or alter the EVPS without the knowledge and concurrence of the Engineer and the EVPS owner. Schedule all EVPS relocations so that the system is out of service only when the Contractor is actively working. Ensure EVPS is returned to service and is completely operational at the end of the work day. Keep the EVPS owner apprised of all changes to the EVPS.

Coordination

Furnish, install, maintain, relocate, and remove the equipment necessary to keep the intersection coordinated to adjacent signals as shown on the plan. Do not disconnect the interconnect without the approval of the Engineer.

- Closed Loop System: If it is necessary to disconnect the communication cable, notify the Engineer and the Bridgeport Operation Center (BOC) or the Newington Operation Center (NOC) prior to disconnect and also after it is reconnected.
- Time Base System: Program and synchronize all Time Clock/Time Base Coordination (TC/TBC) units as necessary.

Maintenance

Once TS is in effect, assume maintenance responsibilities of the entire installation in accordance with Section 1.07.12 of the Standard Specifications. Notify the Engineer for the project records the date that Temporary Signalization begins. Notify the following parties that maintenance responsibility has been transferred to the Contractor:

Signal Owner
CT DOT Electrical Maintenance Office or
Town Representative
Local Police Department

Provide the Engineer a list of telephone numbers of personnel who will be on-call during TS. Respond to traffic signal malfunctions by having a representative at the site within three

hours from the initial contact. Within twenty-four (24) hours have the traffic signal operating according to plan.

If the Engineer determines that the nature of a malfunction requires immediate attention and/or the Contractor does not respond within three (3) hours, then an alternate maintenance service will be called to repair the signal. Expenses incurred by the alternate maintenance service for each call will be deducted from monies due to the Contractor with a minimum deduction of \$1,000. The alternate maintenance service may be the owner of the signal or another qualified electrical contractor.

Duration

Temporary Signalization shall commence when any existing signal equipment is disturbed, relocated, or altered based on the inspection checklist in any way for the TS.

For intersections with a State furnished controller, TS terminates when the inspection of the permanent signal is complete and operational and is accepted by the Engineer. For intersections with a Contractor furnished controller, Temporary Signalization terminates at the beginning of the 30 day test period for the permanent signal.

Ownership

Existing equipment, designated as salvage, remains the property of the owner. Salvable equipment will be removed and delivered to the owner upon completion of use. Temporary equipment supplied by the Contractor remains the Contractor's property unless noted otherwise.

Method of Measurement:

Temporary Signalization shall be paid only once per site on a percentage of the contract Lump Sum price. Fifty percent (50%) shall be paid when TS is operational as shown on the plan or to the satisfaction of the Engineer. Fifty percent (50%) shall be paid when TS terminates.

Basis of Payment:

This work shall be paid at the contract Lump Sum price for "Temporary Signalization (Site No.);" for each site. This price includes the preliminary inspection, TS plan for each stage/phase, furnishing, installing, maintaining, relocating and revising traffic signal equipment, controller assembly modifications, controller unit program changes such as phasing and timing, removing existing, temporary, and proposed traffic signal equipment, arrangements with utility companies, towns or cities including the fees necessary for electric and telephone service, clearing and grubbing, grading, area restoration and all necessary hardware, materials, labor, and work incidental thereto.

All material and work for signing and pavement markings is paid for under the appropriate Contract items.

All Contractor supplied items that will remain the Contractor's property shall be included in the contract Lump Sum price for "Temporary Signalization."

Any items installed as part of the permanent installation are not paid for under this item but are paid for under the bid item for that work.

<u>Pay Item</u>	<u>Pay Unit</u>
Temporary Signalization (Site No.)	L.S.

ITEM #1118301A - RELOCATE PRE-EMPTION SYSTEM (SITE NO. 1)

ITEM #1118302A - RELOCATE PRE-EMPTION SYSTEM (SITE NO. 2)

ITEM #1118303A - RELOCATE PRE-EMPTION SYSTEM (SITE NO. 3)

Description:

Relocate existing town owned emergency vehicle pre-emption system (EVPS) (either optical or siren) as shown on the plan or as directed by the Engineer. The EVPS equipment includes but is not limited to the following material:

- Optical Detectors
- Siren Detectors
- Phase Selectors
- System Chassis
- Auxiliary Equipment Cabinets (AEC)
- Confirmation Light
- Detector Cable (where practical)

Install new cable from the controller to the pre-emption detectors where the existing cable cannot be practically relocated.

Material:

All material is existing except for miscellaneous hardware necessary for reinstallation (e.g. changing detector attachment from span wire to mast arm) and the Detector Cable.

Miscellaneous Hardware:

1. Mounting hardware designed and manufactured specifically for use with the existing EVPS.
2. Corrosion and rust resistant.

Detector Cable (Optical):

1. 3-Conductor cable with shield and ground wire.
2. AWG #20 (7x28) stranded.
3. Individually tinned copper strands.
4. Conductor insulation: 600 volt, 167^o F (75 deg. C).
5. 1 Conductor-yellow; 1 Conductor-blue; 1 Conductor-orange.
6. Aluminized mylar shield tape or equivalent.
7. AWG #20 (7x28) stranded uninsulated drain wire
8. DC resistance not to exceed 11.0 ohms per 1000 feet (305M).
9. Capacitance from one conductor to other two conductors and shield not to exceed 157pf/M (48 pf./ft.).
10. Jacket: 600 volts, 176^o F (80 deg. C), minimum average wall thickness - 0.045" (1.14mm).
11. Finished O.D.: 0.3" (7.62mm) max.

Detector Cable (Audio):

1. 2-Conductor cable with shield and ground wire.
2. AWG #14.
3. IMSA Spec 50-2 Detector Lead-In.

Construction Methods:

Conduct an initial evaluation test before removal and a final test after reinstallation. Thirty days prior to disconnection and removal of the existing pre-emption equipment, test and verify that the system is operational as shown on the plan. The thirty days is intended to provide the EVPS owner an opportunity to correct and resolve any deficiencies identified during the test. If during the thirty days the owner repairs, replaces, or corrects any malfunctioning, disconnected, or missing components, re-test that feature prior to removal. The contractor is not responsible to correct any part of the EVPS that is found to be malfunctioning, disconnected, or missing during the initial test. If the contractor is to assume maintenance responsibility of the traffic signal during Temporary Signalization, the EVPS equipment will not be included. Maintenance responsibility remains with the owner.

EVPS Test Procedure

1. Notify the system owner/user, such as the municipal fire chief or public works director, of the scheduled inspection.
2. Request a fire department representative and an emergency vehicle, which has an activation device to conduct the test. If not available, the contractor shall provide an activation device.
3. In the presence of the Engineer and the municipal representative, test each pre-empted approach with the emergency vehicle. Test the following items of the system:
 - * Confirm that the emitter or siren activates the phase selector and the phase selector activates the correct pre-emption input to the controller.
 - * Confirm adequate range. The traffic signal must be pre-empted to green sufficiently in advance of the emergency vehicle arrival. The vehicle emitter or siren shall initiate pre-emption at a minimum distance of 548.6M (1800 feet).
Exception: An obstructed line-of-sight may reduce the minimum distance. Town concurrence is required.
 - * Confirm there are no false calls. Keep the emitter or siren active as the emergency vehicle passes through the intersection. No other detectors shall activate.
4. Document the test. Provide the Engineer and the municipality copies of the test results. Attached is a sample test procedure form.

Keep the appropriate fire department official apprised of when (day and time) the system is disconnected and taken out of operation.

Store all pre-emption equipment intended for re-installation in a suitable location to prevent damage from elements and construction activities. Return all pre-emption equipment not intended for re-installation to the Town.

Mount the AEC on the left side of the controller cabinet, when facing the door. Confirm that the inside of the cabinet wall is clear, so that the installation of the AEC will not damage any equipment inside the controller cabinet. Drill a 25mm (1") hole through the side of the controller cabinet. Install a close nipple through the 25mm (1") hole. Apply clear silicon caulk to both ends of the close nipple. Tighten lock-nuts and fiber bushings. Apply additional caulk if necessary to prevent moisture from entering the controller cabinet and the AEC.

Re-install and wire the pre-emption equipment in a neat and orderly manner, as shown on the plan or as directed by the Engineer. Pre-emption detector locations shown on the plan are for illustration purposes only. Field locate the detectors for the best possible line-of-sight. Install the detector cables continuous with no splices between the optical detector and the AEC. Make all connections from the phase selector to the "D" harness and to the cabinet wiring at the pre-emption termination panel.

Conduct a final test, identical to the initial test, to verify that the EVPS is as operational as before removal. If the initial test was not conducted, it is assumed the EVPS was fully operational as shown on the plan. The Contractor is then responsible for all damaged; faulty; missing; and replacement material necessary to restore the EVPS to fully operational.

If a malfunction is found other than identified during the initial test, or the system needs adjustment (such as range, emitter intensity, or detector location), schedule a follow-up test. Repeat the test procedure for all approaches that did not pass.

Notify the appropriate fire department official that the EVPS has been re-installed and is operational.

If not present in an existing traffic controller cabinet install a pre-emption disconnect switch. When switched off, the traffic controller shall not be affected by EVPS calls.

EVPS TEST PROCEDURE

Confirm that the emitter or siren activates the phase selector and the phase selector activates the correct pre-emption input to the controller.	
Confirm adequate range.	
Confirm there are no false calls.	

Method of Measurement:

Work under this item is measured as Lump-Sum per site. Detector Cable shall be measured by the number of linear feet (meters) supplied and installed.

Basis of Payment:

This work shall be paid at the contract Lump Sum price for “Relocate Pre-Emption System (Site No.)” for each site. This item shall include all prior testing, removal, storage, re-installation, final testing, any corrective adjustments, replacement components if necessary, documentation, disconnect switch if necessary, and all necessary hardware, materials, labor and work incidental thereto.

Pay Item
Relocate Pre-emption System (Site No._)

Pay Unit
L.S.

ITEM #1131002A - REMOTE CONTROLLED CHANGEABLE MESSAGE SIGN

Description: Work under this item shall include furnishing and maintaining a trailer-mounted, “Changeable Message Sign”, “Remote Controlled Changeable Message Sign”, “Changeable Message Sign with Radar”, or “Remote Controlled Changeable Message Sign with Radar” whichever is applicable, at the locations indicated on the plans or as directed by the Engineer.

Materials: The full matrix, internally illuminated variable message sign shall consist of a LED, fiber optic, lamp matrix, or hybrid magnetically operated matrix – LED message board; and a computer operated interface, all mounted on a towable, heavy duty trailer.

The sign shall have a minimum horizontal dimension of 115 inches and rotate a complete 360 degrees atop the lift mechanism.

In the raised position, the bottom of the sign shall be at least 7 feet above the roadway. The messages displayed shall be visible from a distance of 1/2 mile and be clearly legible from a distance of 900 feet during both the day and night.

The lighting system shall be controlled both manually and by a photocell for automatic sign dimming during nighttime use.

The sign shall be capable of storing a minimum of 100 preprogrammed messages and be able to display any one of those messages upon call from the trailer mounted terminal and/or through the cellular telephone hookup for the remote controlled sign.

The sign shall be a full matrix sign that is able to display messages composed of any combination of alphanumeric text, punctuation symbols, and graphic images (notwithstanding NTCIP limitations). The display shall be capable of producing arrow functions. Full- matrix displays shall allow the use of graphics, traffic safety symbols and various character heights.

Standard messages shall be displayed in a three-line message format with 8 characters per line. The letter height shall not be less than 18 inches.

The sign shall utilize yellow green for the display with a black background. Each matrix shall have a minimum size of 6 x 9 pixels. Each pixel shall utilize a minimum of four high output yellow green LEDs or equivalent light source. The LEDs or light source shall have a minimum 1.4 candela luminance intensity, 22 degrees viewing angle, and wavelength of 590 (+/- 3) nanometers.

For hybrid magnetically operated matrix – LED matrix, each pixel shall have one single shutter faced with yellow green retro-reflective sheeting with a minimum of four high output yellow green LEDs or equivalent light source. The hybrid magnetically operated matrix – LED matrix sign shall be capable of operating in three display modes; shutter only, LED only, and both LED

and shutter. These modes shall be automatically controlled by a photocell for day and night conditions and also capable of being manually controlled through the software.

The sign shall be controlled by an on-board computer. The sign shall automatically change to a preselected default message upon failure. That default message shall remain on display until the problem is corrected.

The sign shall include all necessary controls, including, but not limited to, personal computer, keyboard or alphanumeric hand-held keyboard, and software. The sign shall interface with PCs, cellular phones, and radar speed detection devices as required.

Controls shall be furnished for raising and lowering the message board, aligning the message board and, for solar powered units, a read-out of the battery bank charge.

Power shall be provided by a self-contained solar maintained power source or a diesel engine driven generator. Hardware for connection to a 110-volt power source shall also be provided.

Solar powered signs shall display programmed messages with the solar panel disconnected, in full night conditions, for a minimum of 30 consecutive days.

Remote Controlled Changeable Message Signs shall include one (1) industrial-grade cellular telephone and be equipped with a modem to control the sign and a security system to prevent unauthorized access. The security system shall allow access only through use of a code or password unique to that sign. If the proper code or password is not entered within 60 seconds of initial telephone contact, the call will be terminated. Remote control for the Remote Controlled Changeable Message Sign shall be by cellular telephone and touch tone modem decoder.

The radar equipped signs shall include a high-speed electronic control module (ECM-X), Radar SI transceiver, signal processing board and radar logging software.

The radar software will operate the sign in four modes:

- 1) The sign will display words "YOUR SPEED" followed by the speed (2 digits). The display will repeat the message as long as vehicles are detected. The sign will blank when no vehicles are present.
- 2) The sign will display a series of up to six messages (programmed by the user) when a preset speed (programmed by the user) is exceeded. The sign will blank when no vehicles are present.
- 3) Will perform like mode #2 with the addition of displaying the actual speed with it.
- 4) The sign will work as a standard Changeable Message Sign or Remote Controlled Changeable Message Sign with no radar.

Construction Methods: The Contractor shall furnish, place, operate, maintain and relocate the sign as required. When the sign is no longer required, it shall be removed and become the property of the Contractor. The cellular telephone required for the Remote Controlled

Changeable Message Sign shall be provided to the Engineer for his use, and subsequently returned to the Contractor.

When the sign is not in use, it shall either be turned off with a blank display or turned from view.

Any signs that are missing, damaged, defaced or improperly functioning so that they are not effective, as determined by the Engineer and in accordance with the ATSSA guidelines contained in "Quality Standards for Work Zone Traffic Control Devices," shall be replaced by the Contractor at no cost to the State.

Method of Measurement: This work will be measured for payment for each "Changeable Message Sign", "Remote Controlled Changeable Message Sign", "Changeable Message Sign with Radar", or "Remote Controlled Changeable Message Sign with Radar", whichever applies, furnished and installed, for the number of calendar days that the sign is in place and in operation, measured to the nearest day. When a sign is in operation for less than a day, such a period of time shall be considered to be a full day regardless of actual time in operation.

Basis of Payment: This work will be paid for at the Contract unit price per day for each "Changeable Message Sign", "Remote Controlled Changeable Message Sign", "Changeable Message Sign with Radar", or "Remote Controlled Changeable Message Sign with Radar" which price shall include placing, maintaining, relocating and removing the sign and its appurtenances and all material, labor, tools and equipment incidental thereto. Additionally, for the "Remote Controlled Changeable Message Sign", or "Remote Controlled Changeable Message Sign with Radar", the cellular telephone service and telephone charges shall be included.

<u>Pay Item</u>	<u>Pay Unit</u>
Changeable Message Sign	Day
Remote Controlled Changeable Message Sign	Day
Changeable Message Sign with Radar	Day
Remote Controlled Changeable Message Sign with Radar	Day

ITEM NO. 1132001A - RELOCATE INCIDENT MANAGEMENT SYSTEM

Description:

This item includes the requirements for the removal and re-installation, and testing of the IMS service cabinet and foundation that supplies power and communication to an existing combination portable variable message sign (PVMS) and camera.

Materials:

All miscellaneous hardware required for the installation and operation of the Service Cabinet.

Bare copper grounding conductor shall be No. 8 and shall conform to the requirements of article M.15.13.

The foundation shall conform to Section 10.02 and as identified on the IMS Plan Sheet.

Insulators shall be compatible with the existing neutral bus bar.

The Contractor shall be responsible for the repair of damage to the cabinet and internal equipment caused by the Contractor in performing the work specified herein. All repairs or replacements due to damage or loss by the Contractor shall be made by the Contractor at the Contractor's expense, as directed by the Engineer.

Construction Methods:

The existing service cabinet with all internal equipment shall be removed and relocated onto a new foundation at the location shown on the plan.

The Contractor shall maintain the operation of the co-located Portable VMS (PVMS) 214 and Camera 148 at all times.

The contractor will need to coordinate with utilities in order to relocate SNET Pole 9417 and SNET Pole 94X7 that supplies power, telephone, and T1 service to the PVMS 214/Camera 148 Service Cabinet. The cost for relocation of power service and installation of utility poles will be paid for under item #1017034A Install service.

The contractor will be responsible for coordinating with AT&T to relocate the telephone and T1 communication cable. Any costs for relocating and installing new communication cables to the relocated service cabinet will be covered under this item.

The contractor is alerted that no unplanned service interruption of the Incident Management

System, resulting from the Contractors operations will be allowed. The contractor must insure that power and communications is maintained throughout construction.

The Contractor shall contact Robert Kennedy, ConnDOT Highway Operations at least 48 hours prior to the removal and relocation of the existing PVMS 214/Camera 148 service cabinet.

Stage 2 Construction IMS Service Cabinet Relocation

In order to minimize the downtime of the PVMS 214 and Camera 148, the Contractor shall complete the installation of all work that will not interfere with the existing PVMS/Camera operation including the following:

- The SNET Pole 9417 and SNET Pole 94X7 that provide electrical and telephone services to the PVMS 214 Service Cabinet need to be relocated by the Utility Company.
- Install pedestal mount concrete foundation
- Install 3” RMC (for CL&P Electric Service) between the pedestal mount concrete foundation and base of SNET Pole No. 9417 as shown on the IMS Plan
- Install 2” RMC (for AT&T telephone and T1 Service) between the pedestal mount concrete foundation and SNET Pole No. 9417 as shown on the IMS Plan. Continue installation of 2” RMC surface mounted to pole with entrance fitting (weatherhead).
- Install two (2) -2” RMC between the pedestal mount concrete foundation to be terminated at two (2) Type II Handholes as shown on the IMS Plan.

IMS Service Cabinet Relocation

The Contractor shall contact Robert Kennedy, ConnDOT Highway Operations at least 48 hours prior to the removal and relocation of the existing PVMS 214/Camera 148 service cabinet.

The Contractor shall be permitted to remove the electrical service and telephone service for a period of not more than one (1) work day – eight (8) hours while the existing IMS service cabinet is removed and relocated.

The removal and relocation of the relocation of the PVMS 214/Camera 148 Service Cabinet shall include the following:

- Removal of existing electric service and telecommunications cables between the existing service cabinet and PVMS 214/Camera 148
- Connect existing two (2) – 2” RMC conduits to Type II handholes shown on the IMS Plan
- The Contractor shall note any damage to the cabinet prior to removal.
- The Contractor shall remove the existing Service Cabinet and relocate it to the new foundation.
- Coordinate with CL&P and AT&T to install electric service and telecommunications services respectively.

- Install electrical service cables and communication cables between the relocated service cabinet and the PVMS 214/Camera 148.
- Re-connect the telephone and service cable on the appropriate wiring panel assembly such as equipment transformers, surge suppression, cabling with spade lugs and/or connectors, etc. at the PVMS 214/Camera 148 and the relocated Service Cabinet.
- Re-connect the wiring inside the service cabinet. All wiring shall be neat and firm and in conformance with the current National Electrical Code. Any work performed by the Contractor for the utility installation shall be in accordance with P.U.R.A and State of Connecticut Department of Transportation Form 816. The Contractor shall obtain the necessary utility specifications prior to any service work.
- All power cables and communication cables connected within the service cabinet shall be neat and secure.

Service Cabinet Test:

1. Pre-Installation Testing:

- 1.1. Visual Inspection: The Contractor shall perform detailed visual inspection to confirm that the following aspects of the cabinet are in compliance with the requirements of this specification:
- 1.2. General appearance: cabinet dimensions, finish, locks and door handles, door frames, latching mechanism, door hinges, bolts, louvered vents and filters, and gaskets.
- 1.3. Electrical components: power distribution assembly, conductors, color coding, terminal blocks.

2. Proof-of-Performance Testing:

- 2.1. The Contractor shall energize the service cabinet and confirm proper operation of the portable variable message sign by contacting highway operations Rich Launder at (860) 594-3456. The contractor must ensure the power, voice grade telephone, and T1 communication is properly wired and that communication to the existing portable variable message sign is working properly.

Method of Measurement:

This item shall be measured for payment at the contract lump sum price for “Relocate Incident Management System”, installed, tested and accepted in place.

Basis of Payment:

This work shall be paid for at the contract lump sum price for “Relocate Incident Management System”, which price shall include all materials, concrete foundation, relocating and installing new communication cables and all equipment, tools, labor, testing and work incidental thereto. The price shall also include all brackets, cables, connectors and incidental items required to complete the item work.

ITEM #1201804A – 4 CHORD TRUSS CANTILEVER SIGN STRUCTURE

Description: Work under this item shall consist of designing, fabricating and installing a sign support structure to carry extruded aluminum traffic signs, on a prepared foundation, in accordance with the details shown on the plans, in accordance with these specifications and as ordered by the Engineer. For the purposes of this specification, the sign support structure shall be composed of a cantilevered 4 chord truss supported by a single linear tubular pole member.

Materials: The poles shall be tubular members with either a round or multisided cross-section. The round tubular members shall be fabricated from steel pipe with a tabulated yield stress no less than 35,000 psi. The multisided tubular members shall be fabricated from steel plate conforming to the requirements of ASTM A709, Grade 50T2.

The truss chord members shall be tubular members with a round cross-section fabricated from steel pipe with a tabulated yield stress no less than 35,000 psi. Truss chord members fabricated from tubular members with a multisided cross-section are not permitted.

The truss bracing members shall be tubular members with a round cross-section fabricated from steel pipe with a tabulated yield stress no less than 35,000 psi.

The structural plate components, such as the baseplates, connection/flange/splice plates, gusset plates, and plates in the truss to pole connection shall be made of steel that conforms to the requirements of ASTM A709, Grade 50T2.

The handholes shall be fabricated from either steel plate or rectangular tubular steel members. The steel plate shall conform to the requirements of ASTM A709, Grade 50T2. The rectangular tubular steel members shall conform to ASTM A500, Grade B.

Anchorage plates shall conform to the requirements of ASTM A709, Grade 50T2.

The non-structural components, such as hand hole covers, cap plates and sign panel support members, shall conform to the requirements of ASTM A709, Grade 50T2.

The use of steel plate or rolled shapes with a tabulated yield stress less than 50 ksi is not permitted.

The steel for pole, truss chord members, structural plate components, such as the baseplates, connection/flange/splice plates, gusset plates, and plates in the truss to pole connection; and handholes shall meet the following Charpy V-notch impact testing requirements:

Yield Strength	Thickness in.	Minimum Test Value Energy ft.-lbs.	Minimum Average Energy, ft.-lbs.
$F_y \leq 50$ ksi	≤ 2	20	25 at 40°F
$50 \text{ ksi} < F_y \leq 70$ ksi	≤ 4	28	35 at -10°F

Charpy V-notch sampling and testing shall be in accordance with ASTM A673, "P" piece frequency.

The weld filler metal shall have a matching strength relationship with the base metal.

All high strength bolts shall conform to ASTM A325, Type 1. Nuts shall conform to ASTM A563, Grade DH. Circular, flat, hardened steel washers shall conform to ASTM F436. The bolts, nuts and washers shall be galvanized in accordance with ASTM A153 or ASTM B695, Class 50. The nuts shall be overtapped to the minimum amount required for the bolt assembly and all surfaces of the nuts shall be lubricated with a lubricant containing a visible dye of any color that contrasts with the color of the galvanizing. The high strength bolts shall conform to the requirements of Subarticle M.06.02-3.

Compressible-washer-type direct tension indicators shall conform to ASTM F959, Type 325, and shall be galvanized in accordance with ASTM B695, Class 50.

U-bolts and threaded rods shall conform to ASTM A449. The nuts shall conform to ASTM A563, Grade DH. The washers shall conform to ASTM F436. The bolts, nuts and washers shall be galvanized in accordance with ASTM A153 or ASTM B695, Class 50. The nuts shall be overtapped to the minimum amount required for the fastener assembly and all surfaces of the nuts shall be lubricated with a lubricant containing a visible dye of any color that contrasts with the color of the galvanizing. The threaded ends of all U-bolts and threaded rods shall be supplied with 1 washer and 2 nuts, unless otherwise noted.

The anchor bolts shall conform to ASTM F1554, Grade 105. The nuts shall conform to ASTM A563, Grade DH. The washers shall conform to ASTM F436. The bolts, nuts and washers shall be galvanized in accordance with ASTM A153. The nuts shall be overtapped to the minimum amount required for the bolt assembly and all surfaces of the nuts shall be lubricated with a lubricant containing a visible dye of any color that contrasts with the color of the galvanizing.

All steel components, including anchor bolts, shall be completely hot-dip galvanized, after fabrication, in accordance with ASTM A123 or ASTM A153, as applicable. Repairs to damaged areas of the hot-dip galvanized coatings shall conform to the requirements of ASTM A780 amended as follows:

Paints containing zinc dust, if used for repairs, shall contain either between 65% to 69% metallic zinc by weight or greater than 92% metallic zinc by weight in dry film.

The silicone sealant shall be a 1-component, 100% silicone sealant recommended for use with galvanized steel.

Neoprene gasket material for the access openings shall conform to ASTM D1056, Grade 2A2 or 2A3.

Bare copper grounding conductor shall be #8 AWG stranded bare copper wire conforming to M.15.13. The grounding bolt shall be galvanized steel with a hex head.

All materials used in the finished structure shall be new. The use of materials that have been previously used in a structure or salvaged from a structure is not permitted.

The Contractor shall submit Certified Test Reports and Materials Certificates in conformance with Article 1.06.07 for the steel used in the support members and components, high-strength bolts (including nuts and washers), anchor bolts (including nuts and washers), U-bolts (including nuts and washers) and threaded rods (including nuts and washers). In addition, the following shall be submitted:

- a. Mill test reports that indicate the place where the material was melted and manufactured.
- b. High-strength bolt test results for proof load tests, wedge tests, and rotational-capacity tests that indicate where the tests were performed, date of tests, location of where the components were manufactured and lot numbers.
- c. Galvanized material test results that indicate the thickness of the galvanizing.

Prior to incorporation into the work, the Contractor shall submit samples in conformance with Article 1.06.02 for the steel used in the support members and components, high-strength bolts (including nuts and washers), anchor bolts (including nuts and washers), U-bolts (including nuts and washers) and threaded rods (including nuts and washers).

Construction Methods: The design and fabrication of the sign support structure, including its anchorage (into the foundation) and the hardware and structural members required to support the traffic appurtenances, shall conform to the requirements of the latest edition of the AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaries and Traffic Signals, including the latest interim specifications, amended as follows:

- The dead load of the sign panels, sign panel support members and hardware shall be no less than the 8 psf.
- The design wind speed shall be 120 mph. The computation of wind pressures in accordance with Appendix C is not permitted.
- The minimum design life for the structures shall be 50 years.

- The wind importance factor, I_r , for wind pressure shall be 1.00.
- The wind drag coefficient, C_d , for traffic signs shall be 1.3.
- The height and exposure factor, K_z , shall be determined based on the highest elevation of the structure or the supported sign panels. The factor shall be considered constant in all pressure calculations required for the design of the structure. The height and exposure factor shall be no less than 1.05.
- The sign structure shall be designed for fatigue category I. The sign structure shall be designed for the wind load effects due to natural wind gusts and truck-induced gusts. The design pressure for the truck-induced gust shall be based on a truck speed of 65 mph. The sign structure shall be designed assuming that vibration mitigation devices will not be installed.
- The vertical deflection of the free end of the truss due to the wind load effects of truck-induced gusts shall not exceed 8”.
- The fixity of the structure connections shall be as follows:

Welded gusset plate, bracing member to chord connections shall be considered rigid in the plane of the gusset plate and pinned perpendicular to the plane of the gusset plate.

Flange plate chord to chord connections shall be considered rigid with respect to both axes.

Baseplate to anchor bolt connection shall be considered rigid with respect to both axes.

- The minimum effective length factor, K , shall be as follows:

For the pole, $k = 2.1$

For truss chord and bracing, $k \geq 1.0$

- The fatigue stress categories at the gusset plate to chord fillet welded connection shall be conform to AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaries and Traffic Signals, Table 11-2, Note a .
- The maximum stress ratio (the ratio of the computed stress to the allowable stress) or combined stress ratio in any sign structure component due to each group load shall not exceed 0.90.

- The truss shall be cambered to compensate for the dead load deflections. The truss shall have a permanent camber no less than $L/1000$ and no greater than $L/500$. L is the span length of the cantilever truss measured from centerline of the pole to the end of the truss. The permanent camber is in addition to the dead load camber. The total camber shall be obtained with the use of through chord connection plates installed at an angle.
- The maximum span length of the truss shall be 45'-0", measured from the centerline of the pole to the end of the truss.
- The truss chord members shall be tubular members with a round cross-section. Truss chord members fabricated from tubular members with a multisided cross-section are not permitted. All truss chords shall have the same cross-sectional properties and material designations. The minimum wall thickness of the truss chord members shall be $5/16$ ".
- The truss bracing members shall be tubular members with a round cross-section. All truss bracing shall have the same cross-sectional properties and material designations. The steel pipe bracing shall have a minimum nominal diameter of 2½". The steel pipe bracing shall have a minimum thickness of 0.203". The steel pipe bracing shall be connected to tower post and truss chord gusset plates with slotted tube connections. The bracing slot shall have a coped hole at the end of the slot. A minimum of 10% of the bracing gusset plate to truss chord connections, 100% of the fillet welds on each side of the connection, shall be non-destructively tested in accordance with the magnetic particle method.
- One pair of crossing diagonal bracing members shall be provided at each end of the truss to provide stability of the structure. Also if the span of the arm is longer than 25'-0", a pair of crossing diagonal bracing members shall be placed at a panel point at midspan of the truss.
- The minimum diameter of the pole shall be 2'-0". The maximum diameter of the pole shall be 2'-6". The minimum wall thickness of the pole member shall be $5/16$ ".
- The pole shall be a tubular member with either a round or multisided cross-section. Multisided tubular members with other than 16 sides are not permitted. Multisided tubular member with fluted sides are not permitted.
- The pole shall be fabricated from a single piece of material. Splicing 2 or more pieces together to form one member is not permitted.
- The tubular members may be fabricated with no more than 1 longitudinal seam weld.

- The longitudinal seam welds within 6" of the member ends shall be complete joint penetration groove welds. The seam welds shall be ground smooth and flush with the adjacent base metal.
- Partial joint penetration longitudinal seam welds shall be non-destructively tested in accordance with the magnetic particle method. Complete joint penetration longitudinal seam welds shall be non-destructively tested in accordance with the ultrasonic method.
- Slip-type field splices are not permitted in any member. The wall thickness of the component members shall be uniform throughout their lengths. The use of multiple plies (laminations) to obtain the required member thickness is not permitted. The use of shop-fabricated stepped members is not permitted.
- All tubular member to transverse plate connections shall be made with a complete joint penetration groove weld with a backing ring attached to the plate with a continuous fillet weld. 100% of the complete joint penetration groove welds shall be non-destructively tested by the ultrasonic method. After galvanizing, the joint between the backing ring and tubular member shall be sealed with silicone sealant.
- The use of stiffeners at tubular member to transverse plate connections is not permitted.
- The strength of a connection made with a complete joint penetration groove weld shall be no greater than the strength of the base metal. In connections joining base metal with different yield strengths, the base metal with the lower yield strength shall govern the design.
- The minimum base plate and splice plate thickness shall be 2". The determination of the plate thickness in the tubular member to transverse plate connections shall consider the potential for the plate to warp due to the heat from welding. Consideration should be given to the use of thicker plates to allow for subsequent machining of warped plates to a flat surface so that removal of material will not compromise the required strength of the plate.
- All high-strength bolted connections shall be designed as slip critical connections with standard holes, unless otherwise noted. The high-strength bolts shall conform to the maximum spacing requirements for sealing and stitch fasteners. The high-strength bolts shall conform to the edge distance requirement for fasteners. Consideration should be given to the use of smaller diameter bolts since they require lower specified minimum bolt tensions.
- The minimum number of high-strength bolts in flange splices shall be 6.

- The minimum thickness of the truss to pole connection plates shall be $\frac{3}{4}$ ". The minimum thickness of the truss bracing gusset plates and the stiffener plates shall be $\frac{1}{2}$ ".
- The minimum size fillet weld shall be $\frac{1}{4}$ ", unless noted otherwise. The use of seal and tack welds is not permitted. No welding shall be performed after galvanizing.
- The anchor bolt to base plate connection shall be designed as a double-nut connection with shear holes. The anchor bolts shall use an embedded anchorage plate, $\frac{3}{4}$ " minimum thickness, to transmit loads from the pole base to the concrete foundation. The use of hooked anchor bolts is not permitted. The minimum number of anchor bolts shall be 12. The minimum anchor bolt diameter shall be 2". The minimum anchor bolt embedment, the distance from the top of the foundation to the top of the embedded anchorage plate, shall be 3'-6" or the tension development length of the vertical foundation reinforcement plus the end concrete cover, whichever is greater. Each anchor bolt shall be supplied with 5 nuts and 4 washers. Washers shall be placed on the top and bottom surfaces of the pole base plate and anchorage plate. Welding to the anchor bolts is not permitted.

The approximate dimensions of the truss and the pole heights are shown in plan and elevation on the traffic sheets. The actual sign support dimensions shall be determined by the Contractor based on the horizontal and vertical clearances shown on the plans, a field survey of the finished grade at the site, the elevation of the top of the finished foundation, the locations of overhead and subsurface utilities, the location of the drainage facilities and noise barrier wall locations.

The minimum vertical clearance from the top of the finished road to the bottom of the sign panels and the centerline of the truss shall be as shown on the sign support drawings as amended by the sign support elevation on the traffic sheets.

Sign panels shall be installed symmetrically about the centerline of the truss. The bottom of all signs shall be level. Sign panels shall be installed at an angle of 5° from the vertical, with the top edge tilting toward oncoming traffic.

The sign panels and crown panels, if applicable, shall be connected to sign panel support members. The support members shall extend full height of the sign and crown panels. The number and spacing of support members shall be determined by the Contractor based on the width of the sign and crown panels and the support member spacing parameters shown on the plans. Sign panels shall be supported by no less than 3 support members. Crown panels shall be supported by no less than 2 support members. The faying surface between the sign panel support member and the rear face of the sign panel shall be a flange so that panel clips may be placed on both sides of the flange to connect the panel. The outside support members for each sign panel shall include a sign stop at the bottom of the member and a sign hook at the top of the member to support and carry the sign panels.

The sign panel support members shall be designed to be vertically adjustable to compensate for the truss camber. The supports members shall be designed to be installed at any location along the truss. The use of U-bolts and threaded rods is permitted. No less than 2 U-bolts or 4 threaded rods shall be used at each chord connection. The threaded ends of these fasteners shall have double nuts.

The minimum thickness of the sign panel support members and the plate and rolled shape components used in the connection to the sign support shall be ¼”.

The sign support shall be designed for the load effects due to the actual sign panels that it will carry unless otherwise shown on the plans. The sign supports shall also be designed for the load effects of sign panels during all stages of construction which may exist during the project under which the supports are installed. The load effects on the sign support from the sign and crown panels shall include forces and moments due to the eccentricity of the sign and crown panels and the unbalanced lateral loads on the crown panel. The sign support and its component parts shall also be designed for the load effects resulting from the transportation and erection of the support.

The sign support shall be designed so that the pole extends into the truss and is connected at each chord. Connection plates, through each chord, shall be fastened with high-strength bolts to stiffened connection plates fillet welded to the pole. 100% of the fillet welds used in the truss to pole connection shall be non-destructively tested in accordance with the magnetic particle method. All bolts, nuts and washers used in the connection shall be visible. The use of tapped holes in the plates of the connection is not permitted.

Vent and drain holes shall be provided for galvanizing. The number, size and location of vent and drain holes should be coordinated with the galvanizer prior to the submission of the sign support design. The area of vent and drain holes at each end of a member shall be at least 30% of the inside area of the member for members 3” in diameter and greater and 45% of the inside area of the member for members smaller than 3” in diameter. The vent and drain holes shall be strategically located for reducing stress and for proper galvanizing. The holes shall be made by drilling. Flame cut holes are not permitted. The edges of all holes shall be rounded by grinding. After galvanizing, exposed holes placed in the sign support components for galvanizing shall be sealed with neoprene plugs.

The pole shall have a handhole centered 2'-9" from the top of the base plate. The pole handhole shall be located away from traffic.

Handholes shall be reinforced with a frame having a minimum 4" wide by minimum 6" high clear opening. The minimum thickness of the handhole frame shall be no less than the thickness of the tubular member. The handhole frame shall be connected to the tubular member with a partial joint penetration groove weld reinforced with a fillet weld. The weld shall be non-destructively tested in accordance with the magnetic particle method. Each handhole shall have a cover connected to the handhole frame with no less than 4 stainless steel screws. The cover shall be installed with a neoprene gasket. A stainless steel chain shall be bolted to the cover

inside face of the cover with a stainless steel bolt with a lock nut and bolted to the inside side face of the handhole frame with a stainless steel bolt. On pole hand hole frames, the opposite side face of the handhole shall have a hole with a nut welded to outside face for a stainless steel grounding bolt.

Handhole frames fabricated from steel plate and bent to form a closed shape shall be joined with a complete joint penetration groove weld. All surfaces of the groove weld shall be ground smooth and flush with the adjacent base metal.

The ends of each chord member shall be sealed with a removable end cap plate attached to the member with a threaded fastener. The joint between the member and plate shall be sealed with a neoprene gasket.

The design of the sign support and the anchorage shall be coordinated with the design of the foundation to ensure that the foundation is adequate for the support reactions and to avoid conflicts between the embedded anchorage and the foundation reinforcement.

Prior to performing a field survey for each sign support, the Contractor shall coordinate with the Engineer to locate and stake each support foundation. The foundations shall be located to avoid conflicts with both subsurface and overhead utilities and subsurface drainage structures. In accordance with Article 1.05.15, the Contractor shall contact "Call Before You Dig" to identify the subsurface utilities that are located in the vicinity of each foundation. Once the location of each foundation has been found acceptable to the Engineer, the Contractor shall perform a field survey to obtain the information necessary to prepare a roadway cross-section with details of each sign support and supporting foundation(s).

The Contractor shall prepare and submit one copy of a cross-section (elevation) drawing based on a field survey for each sign support to the Engineer for review and approval. Each cross-section drawing shall be submitted in paper form and shall be printed on an ANSI B (11" x 17"; Ledger/Tabloid) sheet. Each drawing shall have a border and title block. Located in the lower right hand corner of the drawing adjacent to the title block, each drawing shall have a rectangular box, 2 1/4" wide x 1 3/4" high, for the reviewers stamp. On the ANSI B sheets, the minimum text height and width shall be 1/16". All letter characters shall be uppercase. Only one sign support cross-section shall be shown on each drawing.

The cross-sections shall include, but not be limited to the following:

- Project number, town, location (route number, direction, mileage), station, structure number, sign location number, and site number
- Location and dimensions of travel lanes and shoulders
- Location and elevation of the high point of the road
- Top and bottom of slope elevations. Slope of finished grade at foundations

- Locations of utilities (both overhead and subsurface)
- Locations of drainage facilities
- Locations of noise barriers, including elevation of top of wall
- Type of protection (metal beam rail/barrier), and the dimension from the front face of metal beam rail /barrier to the edge of the foundation and centerline of the foundation
- Elevation of the top of the foundation(s). The top of the foundation(s) shall project 6” to 12” above the level ground or 6” to 12” above the finished grade at the high side of a sloping grade.
- Dimension from top foundation to finish grade (existing or proposed as applicable).
- Span, dimension from centerline to centerline of foundations
- Dimensions of sign panel(s)
- Location of sign panel(s) relative to the centerline of the foundations/poles
- Location of sign panel(s) relative to the roadway travel lanes
- Dimension from top of foundation to centerline of truss
- Minimum dimensions from high point of the road to the centerline of the truss and the bottom of the sign panel(s)
- Elevation of centerline of truss

The Contractor shall submit the cross-section drawings to the project’s “Engineer of Record” for review and approval. The project’s “Engineer of Record” is identified in the signature block on the sign support traffic cross-section contract plans. A copy of the transmittal shall be sent to the District Construction office administering the project.

The reviewed and stamped cross-section drawings shall be sent by the reviewer, along with a recommendation regarding acceptance, to the District Construction office for review, comment and distribution. The approval of cross-section drawings does not relieve the Contractor from verifying that all dimensions are correct. If there are any changes to the proposed location of the sign support and foundations prior to the construction of the foundations, the cross-section shall be re-submitted for review and approval.

Prior to fabrication, the Contractor shall submit working drawings and design computations for each sign support, based on the approved cross-section, to the engineer for review in accordance with Article 1.05.02. An individual, independently packaged set of working drawings and computations, with all details and documents necessary for fabrication and erection of the structure and its components, including a copy of the certificate of insurance, shall be prepared and submitted for **each** support. **A single set of drawings with tabulated data for multiple sign support locations is not permitted.** The alpha-numeric support identifier shall be included on these documents. The working drawings and computations shall be prepared in Customary U.S. units.

The packaged set of working drawings and computations for each support shall be submitted either in paper (hard copy) form or in an electronic portable document format (.pdf) with appropriate bookmarks. The packaged set submitted in paper form shall be bound with a staple. The packaged set submitted in an electronic portable document format (.pdf) shall be in an individual file and the file shall be enabled for commenting. The packaged set shall include the following:

- title sheet
- table of contents
- contact information for designer, fabricator and galvanizer – contact information should include name and address of each firm and the name of contact person with phone number and email address
- copy of the certificate of insurance
- copy of fabricator's AISC certification
- copy of the **approved** cross-section
- sign support working drawings
- sign support design computations
- welding procedures
- sign support installation procedure, including the method to plumb the poles

Combining of a non-approved cross-section with the sign support working drawings and calculations into one packaged set for review is not permitted.

The working drawings and design computations shall be **signed, dated and sealed** by a Professional Engineer licensed in the State of Connecticut, who shall also be available for consultation in interpreting his computations and drawings, and in the resolution of any problems which may occur during the performance of the work. Each working drawing shall be signed, dated and sealed. The cover/first sheet for the computations shall be signed, dated and sealed.

Working drawings submitted in paper form shall be printed on ANSI B (11" x 17"; Ledger/Tabloid) sheets. Each drawing shall have a border and title block. Located in the lower right hand corner of the drawing adjacent to the title block, each drawing shall have a rectangular box, 2 ¼" wide x 1 ¾" high, for the reviewers stamp. On the ANSI B sheets, the minimum text

height and width shall be $\frac{1}{16}$ ". All letter characters shall be uppercase. Design computations, procedures and other supporting data shall be submitted on ANSI A (8 ½" x 11"; Letter) sheets.

Working drawings submitted in an electronic portable document format (.pdf) shall be created on ANSI D (22" x 34") full scale (1" electronic file = 1" paper) sheets. (The purpose of creating the drawings on ANSI D sheets is so that the sheets may be printed/plotted at that size or smaller without loss of legibility.) Each drawing shall have a border and title block. Located in the lower right hand corner of the drawing adjacent to the title block, each drawing shall have a rectangular box, 2 ¼" wide x 1 ¾" high, for the reviewers stamp. On the ANSI D full scale sheets, the minimum text height and width shall be $\frac{1}{8}$ ". All letter characters shall be uppercase. The electronic files for the design computations, procedures and other supporting data shall be created on ANSI A (8 ½" x 11"; Letter) sheets.

The working drawings shall include complete details of all sign support components. The drawings shall include, but not be limited to the following:

- the project number, town and support identification number
- reference to the design specifications, including interim specifications
- reference to the design specifications design criteria, such as design wind speed, minimum design life, etc.
- material specifications/designations for all components
- non-destructive weld testing requirements
- details of the location of the longitudinal seam weld in the pole
- vent and drain holes for galvanizing
- dead load and permanent camber
- a plan view of the anchor bolt layout relative to the orientation of the span
- anchor bolt dimensions, including embedment and projection
- support installation procedure, including the method to plumb the pole

The design computations shall include, but not be limited to the following:

- the project number, town and support identification number

- references to design specifications, including interim specifications, and the applicable code section and articles
- description/documentation for all computer programs used in the design
- drawings/models of the structure, components and connections, with dimensions, loads and references to the local and global coordinate systems used (as applicable), to facilitate review of the results
- Tabulation of the section properties of the tubular members at each analyzed section. The tabulated values should include the diameter, D (if round member); effective width, b (if multisided member, AASHTO 5.5.2); equivalent diameter (if multisided member, AASHTO 5.6), wall thickness, t ; inside bend radius, r_b (if multisided member, AASHTO 5.5.2), cross-sectional area, A ; moment of inertia, I ; section modulus, S ; radius of gyration, r . AASHTO Table B-1 may be used to determine the section properties. If Table B-1 is used, the radius measured to the mid-thickness of the wall shall also be provided.
- coefficients and factors used in the design
- results of all group loads and load combinations
- stress ratios and combined stress ratios for all group loads and load combinations
- maximum vertical deflection due to dead loads
- maximum vertical deflection due to ice loads
- vertical deflection of the free end of the truss due to the wind load effects of truck-induced gusts
- total camber and permanent camber

The Contractor shall submit the packaged set of working drawings and calculations to the project's "Engineer of Record". The project's "Engineer of Record" is identified in the signature block on the sign support structural contract plans. A copy of the transmittal shall be sent to the District Construction office administering the project.

The reviewed and stamped working drawings and calculations shall be sent by the reviewer, along with a recommendation regarding acceptance, to the District Construction office for review, comment and distribution. After the District Construction office has reviewed the working drawings and calculations, ensured all comments have been addressed and have found

the submittal to be acceptable, in addition to distributing copies of the working drawings and calculations to the Contractor and District offices, a copy of each packaged set of working drawings and calculations shall be sent to the following Department offices:

Bridge Safety and Evaluation
Research and Materials
Traffic Engineering
Engineer of Record

If the as-built condition of the foundation(s), such as the location or elevation, will impact the design, final erection or assembly of the sign support for conformance with the requirements herein, the cross-section shall be re-submitted for review and approval. Subsequently, the working drawings and calculations shall be resubmitted to conform to the revised cross-section and the requirements herein.

The support shall be fabricated in accordance with the latest edition of the AASHTO LRFD Bridge Construction Specifications, including the latest interim specifications, amended herein.

The steel fabricator shall be AISC certified for the fabrication of Simple Steel Bridges (SBR).

Fabrication of the support may begin only after the working drawings and design computations have been reviewed and the Engineer has authorized fabrication to begin. The Contractor shall submit to the Engineer, no less than 2 weeks prior to the start of fabrication, the name and location of the fabrication shop where the work will be done so that arrangements can be made for an audit of the facility and the assignment of the Department Quality Assurance (QA) inspector. No fabrication will be accepted unless the QA inspector is present during fabrication. No changes may be made during fabrication without prior written approval by the Department.

The Contractor shall furnish facilities for the inspection of material and workmanship in the shop by the Engineer. The Engineer and his representative shall be allowed free access to the necessary parts of the premises.

The Engineer will provide QA inspection at the fabrication shop to assure that all applicable Quality Control plans and inspections are adequately adhered to and maintained by the Contractor during all phases of the fabrication. A thorough inspection of a random selection of elements at the fabrication shop may serve as the basis of this assurance.

Prior to shipment to the project, each individual piece of steel shall be marked in a clear and permanent fashion by a representative of the fabricators' Quality Control (QC) Department to indicate complete final inspection by the fabricator and conformance to the project specifications for that piece. The mark must be dated. A Materials Certificate in accordance with Article 1.06.07 may be used in lieu of individual stamps or markings, for all material in a single shipment. The Materials Certificate must list each piece within the shipment and accompany the shipment to the project site.

Following the final inspection by the fabricator's QC personnel, the Engineer may select pieces of steel for re-inspection by the Department's QA inspector. Should non-conforming pieces be identified, all similar pieces must be re-inspected by the fabricator and repair procedure(s) submitted to the Engineer for approval. Repairs will be made at the Contractor's expense.

The pieces selected for re-inspection and found to be in conformance, or adequately repaired pieces, may be marked by the QA inspector. Such markings indicate the Engineer takes no exception to the pieces being sent to the project site. Such marking does not indicate acceptance or approval of the material by the Engineer.

Fabrication of the supports shall conform to the requirements of Articles 6.03.04, 6.03.05, 6.03.06 and 6.03.10, 6.03.11, 6.03.12 and 6.03.13.

All welding details, procedures and nondestructive testing shall conform to the requirements of AWS D1.1 Structural Welding Code - Steel.

Personnel performing the nondestructive testing shall be certified as a NDT Level II technician in accordance with the American Society for Non Destructive Testing (ASNT), Recommended Practice SNT-TC-1A and approved by the Engineer.

All nondestructive testing shall be witnessed by Engineer. Certified reports of all tests shall be submitted to the Engineer for examination. Each certified report shall identify the structure, member, and location of weld or welds tested. Each report shall also list the length and location of any defective welds and include information on the corrective action taken and results of all retests of repaired welds.

The Department reserves the right to perform additional testing as determined by the Engineer. Should the Engineer require nondestructive testing on welds not designated in the contract, the cost of such inspection shall be borne by the Contractor if the testing indicates that any weld(s) are defective. If the testing indicates the weld(s) to be satisfactory, the actual cost of such inspection will be paid by the Department.

All members and components shall be hot-dip galvanized in a single dip. Double-dipping of members and components is not permitted. All exterior and interior surfaces of the sign support members and components shall be completely galvanized.

Galvanized members and components shall be free from uncoated areas, blisters, flux deposits, and gross inclusions. Lumps, projections, globules, or heavy deposits of zinc which will interfere with the intended use of the material will not be permitted.

All damaged areas of the hot-dip galvanized surfaces shall be repaired in accordance with the requirements of ASTM A780. If paint containing zinc dust is used for repairs, the dry coating thickness shall be at least 50% greater than the thickness of the adjacent hot-dip galvanized coating, but no greater than 4.0 mils. The paint shall be brush applied. The use of aerosol spray

cans shall not be permitted. The color of the finished repair area shall match the color of the adjacent hot-dip galvanized surface at the time of the repair to the satisfaction of the Engineer.

Prior to shipping, all galvanized surfaces of the members and components shall be inspected, in the presence of the Engineer, to determine the acceptability of the galvanized coating. Galvanized coatings may be found acceptable by the Engineer if all surfaces of the members and components meet the galvanizing requirements herein. Only sign support members and components with acceptable galvanized coatings shall be shipped. If the galvanized coating on any member or component is found not acceptable, the Contractor shall submit a repair procedure to the Engineer for review.

The sign support structure number shall be stenciled in black paint on the pole centered approximately 5' off the ground and visible from the roadway. The numeric characters shall be 3" to 4" high and placed vertically so that they may be read from top to bottom.

After fabrication, the sign support components shall be assembled in the fabricator's shop, in the presence of the Engineer, to determine the acceptability of the bolted connections and to confirm the permanent camber. The faying surfaces of the connections shall be free of dirt, loose scale, burrs, other foreign material and other defects that would prevent solid seating of the parts. Prior to assembly, the galvanized faying surfaces shall be scored by wire brushing. The faying surfaces of the connection plates shall be checked with a straight edge to ensure that the surfaces are not distorted and the entire faying surface of each plate will be in contact when assembled. The high-strength bolts, including nuts and washes, shall be installed and tensioned in accordance with Subarticle 6.03.03-4(f). A connection may be found acceptable by the Engineer if the faying surfaces of the connection plates are in firm, continuous contact after properly tensioning the bolts. Only sign supports with acceptable connections shall be shipped. If a bolted connection is found not acceptable, the Contractor shall submit a procedure to repair the connection to the Engineer for review. Galvanized surfaces damaged by the repair procedure shall be hot dip galvanized. Repair of the damaged galvanized surfaces in accordance with the requirements of ASTM A780 or with a galvanizing repair stick is not permitted. Bolts, nuts and washers used for the trial shop fit-up shall not be reused in the final field assembly. The permanent camber shall be measured at the end of the truss and the structure shall be rejected if the camber does not meet the following:

$$L/1000 \leq \text{Permanent Camber} \leq L/500$$

where L is the span length of the overhead member measured from centerline to the end of the truss.

The finished members and components shall be protected with sufficient dunnage and padding to protect them from damage and distortion during transportation. Damage to any material during transportation, improper storage, faulty erection, or undocumented fabrication errors may be cause for rejection of said material at the project site. All costs associated with any corrective action will be borne by the Contractor.

Following delivery to the project site, the Engineer will perform a visual inspection of all material to verify shipping documents, fabricator markings, and that there was no damage to the material or coatings during transportation and handling.

The Engineer is not responsible for approving or accepting any fabricated materials prior to final erection and assembly at the project site.

High-strength bolts, nuts and washers shall be stored in accordance with Subarticle 6.03.03-4(f).

The support shall be erected, assembled and installed in accordance with these specifications and the procedures and methods submitted with the working drawings. The Contractor and the support designer are responsible to ensure that the erection and assembly procedures and methods in this specification are acceptable for use with the support. Changes to these methods and procedures shall be submitted with the working drawings and computations.

Prior to installation of the support, the threads of the embedded anchor bolts shall be cleaned of accumulated dirt and concrete. The anchor bolt nuts shall be re-lubricated with a lubricant containing a visible dye of any color that contrasts with the color of the galvanizing. On each anchor bolt, all the nuts shall be run down by hand on the anchor bolt threads.

The space between the bottom of the baseplate and the top of the foundation shall not be sealed with closed cell elastomer or filled with grout, unless otherwise noted.

During the erection of the pole, the leveling nuts and washers shall be inspected, and if necessary adjusted, so that they are in full contact with the bottom surface of the baseplate. Subsequently, the top nuts and washers shall be inspected, and if necessary adjusted, so that they are snug tight (in full contact with the baseplate). Snug tight is defined as the condition where the nuts and washers are in full contact with the baseplate and the snug tight condition was the result of the full effort of a person using a 12" wrench.

With the top nuts snug tight, the top nuts shall be tightened one-sixth of a turn beyond snug tight. After the top nuts are tightened, the leveling nuts should be retightened to assure the full contact has been maintained. After tightening, lock nuts shall be installed over the top anchor nuts. The top nuts shall have full thread engagement. The distance from the bottom of the leveling nuts to the top of the foundation shall not exceed 1".

High-strength bolts, including nuts and washes, shall be installed and tensioned in accordance with Subarticle 6.03.03-4(f). The truss shall be temporarily and fully supported while all the high-strength bolts are installed and tensioned. The temporary support of the truss shall not be removed until the Engineer has confirmed that the faying surfaces of the connection/flange plates are in firm, continuous contact and the high-strength bolts were properly installed and tensioned. All high-strength bolts in the bolted connections shall be inspected (in accordance with Subarticle 6.03.03-4(f)) to confirm the high-strength bolts were properly tensioned.

After erecting the support, the support shall be electrically grounded by attaching the bare copper grounding conductor to the inside of the handhole frame with a galvanized steel bolt and to the ground rod with a ground clamp. The rigid metal conduit shall be electrically grounded by attaching the bare copper grounding conductor to the insulated bonding bushing and to the ground rod with a ground clamp.

After erection of the support and before the installation of the sign panels, if the structure exhibits excessive vibration, oscillations or deflections as determined by the Engineer, the Contractor shall immediately stabilize the structure to the satisfaction of the Engineer. Stabilizing the structure may require the removal of a portion of the structure or the entire structure.

The sign panels shall be located and mounted on the truss as shown in the working drawings.

After installation of the sign panels, the anchor bolts nuts (leveling and top anchor nut) and washers shall be in full contact with the top and bottom surfaces of the pole baseplate and the centerline of the pole shall be plumb.

After erection of the support and after the installation of the sign panels, if the structure exhibits excessive vibration, oscillations or deflections as determined by the Engineer, the Contractor shall design and construct devices to mitigate the movements. The Contractor is responsible for immediately stabilizing the structure to the satisfaction of the Engineer. Stabilizing the structure may require the removal of the sign panels or the entire structure. Prior to installation of any mitigation device, the Contractor shall submit drawings, design computations other documentation to the Engineer for review in accordance with Article 1.05.02.

Method of Measurement: This work will be measured for payment by the number of cantilever sign structures, completed and accepted in place.

Basis of Payment: This work will be paid for at the contract unit price each for "4 Chord Truss Cantilever Sign Structure", complete in place, which price shall include field survey, equipment, materials, tools and labor incidental to the design, fabrication and installation, including anchorage materials, sign panel support members and mitigation devices, if required, of the supports at the locations specified on the plans.

**ITEM #1202999A – DRILLED SHAFT TRAFFIC STRUCTURE
FOUNDATION**

Description: Work under this item shall consist of the subsurface investigation, design and construction of drilled shaft foundations for traffic structures, in accordance with the details shown on the plans, in accordance with these specifications and as ordered by the Engineer. For the purposes of this specification, a traffic structure support may be an overhead cantilever or bridge type sign support structure.

Materials: The reinforcing steel shall be uncoated, ASTM A615, Grade 60 reinforcement conforming to the requirements of Article M.06.01.

The concrete for the drilled shaft shall be a Contractor designed Portland cement concrete with a 3/8" (No. 8) maximum coarse aggregate size and minimum 28 day compressive strength of 4,000 psi. The Contractor shall design concrete mixes for both dry and wet drilled shaft construction. The concrete mixes shall be designed so that the concrete remains in a workable plastic state throughout the 2 hour placement limit. For dry construction, the initial concrete slump shall be from 6" to 8". For wet construction, the initial concrete slump shall be from 7" to 8". The concrete shall maintain a slump of 4" or greater for the duration of the concrete placement. The mix concrete designs, including admixtures, shall be submitted to the Engineer for approval.

The concrete for the formed pedestal shall be Class "F" Concrete, with a minimum 28 day compressive strength of 4,000 psi, conforming to Article M.03.01.

The slurry shall be Contractor designed mineral slurry that meets the range of values listed herein. The slurry mix design, including admixtures, shall be submitted to the Engineer for approval.

Rigid metal conduit, ground rod sleeves and related hardware, and end caps shall be galvanized steel conduit, and shall conform to Article M.15.09.

Ground rods shall be 5/8" in diameter by 12'-0" long copper clad steel. The copper cladding shall be a minimum thickness of 0.128". The ground clamp shall be a square-head bolt type, approved for direct burial.

Bare copper wire shall conform to Article M.15.13.

Topsoil shall conform to Article M.13.01.

Fertilizer shall conform to Article M.13.03.

Seed mixture shall conform to Article M.13.04.

Mulch shall conform to Article M.13.05.

Erosion control matting shall conform to Article M.13.09.

Construction Methods:

Subsurface Conditions for Bidding: For the purpose of bidding this item, the Contractor shall assume that the subsurface conditions for each foundation location consists of cohesionless medium dense granular soil (AASHTO A-1 or A-2) with cobbles present and a high groundwater table which requires the use of wet construction/concreting methods.

Subsurface Conditions for Foundation Design: As early as possible and prior to preparation of the foundation design, the Contractor **shall** perform a subsurface investigation for **each** sign foundation location. The subsurface data obtained in the exploration program at each site shall be used in the design of the foundation at that site. Use of the assumed subsurface condition (that was provided for the purpose of bidding), an assumed conservative subsurface condition or any other assumed subsurface condition shall not be allowed for use in the foundation design nor shall any assumed subsurface condition relieve the Contractor from their responsibility of obtaining a test boring at each foundation site. The subsurface investigation program should be prepared and executed in accordance with the most recent editions of the AASHTO Manual on Subsurface Investigations and ConnDOT Geotechnical Engineering Manual. The Contractor shall provide a full-time inspector to oversee the subsurface exploration program. The subsurface investigations and all related cost will not be measured for payment and shall be included in the cost of the foundation.

The Contractor shall review results of their subsurface investigation to determine if subsurface conditions for sign foundation locations differ materially from those assumed at the time of bid. Should the subsurface investigation(s) encounter conditions that differ materially, the Contractor shall notify the Engineer in writing prior to the submission of the working drawings and calculations. All matters regarding increased cost relating to agreed upon change in subsurface conditions will be handled per Section 1.04.04 – Differing Site Conditions.

Foundation Design: The design of drilled shaft traffic structure foundations shall conform to the requirements of AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaries and Traffic Signals – latest edition, including the latest interim specifications, amended as follows:

- The foundation shall be designed for the soils and rock properties and parameters based on the subsurface conditions (character of the soil and rock, presence of ground water, etc.) in the location of, adjacent to and below the drilled shaft foundation excavation determined by the subsurface investigation.
- The concrete for the foundation shall have a compressive strength, f'_c , of 4,000 psi at 28 days. The concrete cover for reinforcing in a drilled shaft shall conform to the following:

Shaft Diameter	Minimum Cover
Less than or equal to 3'-0"	3"
Greater than 3'-0" and less than 5'-0"	4"
Greater than or equal to 5'-0"	6"

- The reinforcement shall be uncoated and conform to ASTM A615, Grade 60.
- The foundation shall be designed for the traffic structure support reactions for all group loads and load combinations. The reactions shall include axial, shear, flexural and torsional load effects. No reduction of the reactions or increase in the allowable stresses of the materials is permitted.
- For sign support foundations, the minimum drilled shaft diameter shall be 3'-0".
- The design of the drilled shaft foundation shall include embedment of the foundation in soil, the embedment of the foundation in rock or the embedment of the foundation partially in soil and partially in rock, as applicable.
- The design of the drilled shaft foundation embedment depth shall account for the slope of the finished grade.
- The minimum embedment for a drilled shaft foundation, excavated entirely in soil, shall be no less than 15'-0" below the finished grade at the low side of a sloping grade. The minimum embedment for a drilled shaft foundation, excavated entirely in rock shall be no less than 10'-0" below the finished grade at the low side of a sloping grade.
- For sign support foundations, the top of the drilled shaft pedestal shall project 6" to 12" above the level ground or 6" to 12" above the finished grade at the high side of a sloping grade.
- The embedment depth for a drilled shaft foundation, determined by the Brom's design method, shall have a minimum factor of safety of 3.25 applied to the shear and moment load effects. The factor of safety applied to the torsional load effect shall be no less than 1.3.
- The load factor method shall be used for the structural design of the drilled shaft foundation. The load factor applied to all loads, dead, wind and ice, and their effects, axial, shear, flexure and torsion, shall be no less than 1.6. The drilled shaft may be designed in accordance with the load factor method presented in the latest edition of the Building Code Requirements for Reinforced Concrete", ACI 318.

- The drilled shaft foundation shall be reinforced with longitudinal and transverse reinforcement. The area of longitudinal reinforcement should be no less than the sum of the reinforcement required for flexure and the longitudinal reinforcement required for torsion. The area of transverse reinforcement should be no less than the sum of the reinforcement required for shear and the transverse reinforcement required for torsion.
- In drilled shaft foundations for cantilever sign structures, the area of transverse reinforcement provided shall prevent the concrete breakout at the edge of the foundation due to the torsional load on the anchor bolt group. The area of transverse reinforcement provided shall be considered adequate to prevent this condition if the nominal torsional strength of the foundation is greater than the concrete breakout strength. The concrete breakout strength shall be determined in accordance with the latest edition of the Building Code Requirements for Reinforced Concrete”, ACI 318, Appendix D.
- The minimum number of longitudinal reinforcing bars shall be 16. The minimum size of longitudinal reinforcing bars shall be #8. The minimum area of longitudinal reinforcing bars shall be no less than 1% of the gross cross-sectional area of the shaft. The reinforcement shall extend full length of the drilled shaft foundation, including the pedestal. Splicing of the longitudinal reinforcement is not permitted.
- The drilled shaft foundation shall be transversely reinforced with spirals or circular, one piece, enclosed ties. The minimum size of the transverse reinforcement shall be #4. The maximum spacing/pitch of the transverse reinforcement shall be no more than 6”, except in the top 2’-0” of the foundation where the maximum spacing/pitch of the transverse reinforcement shall be no more than 4”. The spiral reinforcement shall be terminated at the top and the bottom with 1 ½ turns of the reinforcing and a 135° standard hook. Spirals may be spliced with lap splices or mechanical connectors. For spirals, the minimum lap splice length shall be 1.7 times the tension development length (including modification factors) of the bar or 48 bar diameters, whichever is greater. For spirals, the mechanical connectors shall develop both in tension and compression 125% of the specified yield strength of the bar and conform to the latest edition of the AASHTO LRFD Bridge Design Specifications, including the latest interim specifications. For ties, the minimum lap splice length shall be no less than 1.7 times the tension development length (including modification factors) of the bar. Tie lap splices shall be alternated. The ends of the bars in lap splices shall be anchored with a 135° standard hook around longitudinal reinforcement.
- For sign support foundations, the top of the drilled shaft shall be designed with a square pedestal to facilitate the installation of the anchor bolts and rigid metal conduits. The plan dimensions of the pedestal shall equal the diameter of the drilled shaft. The top and sides of the pedestal shall be reinforced with a grillage

of reinforcement. The minimum size reinforcement shall be #5. The minimum concrete cover shall be 3”

- The design of the foundation shall be coordinated with the traffic structure support to avoid conflicts between the embedded support anchorage and the foundation reinforcement.

The Contractor’s foundation designer shall obtain a Professional Liability Insurance Policy in accordance with the requirements of Article 1.05.02-2a. A Contractor shall submit a copy of the certificate of insurance to the Engineer in accordance with the requirements of Article 1.05.02-2a.

Prior to excavating for the foundation, the Contractor shall submit working drawings and design computations for the foundation(s) at each sign support, based on the approved cross-section, to the Engineer for review in accordance with Article 1.05.02. An individual, independently packaged set of working drawings and computations, with all details and documents necessary for fabrication and construction, including a copy of the certificate of insurance, shall be prepared and submitted for the foundation(s) at **each** support. **A single set of drawings with tabulated data for multiple foundation locations is not permitted.** The alpha-numeric support identifier shall be included on these documents. The working drawings and computations shall be prepared in Customary U.S. units.

The packaged set of working drawings and computations for the foundation(s) at each support shall be submitted either in paper (hard copy) form or in an electronic portable document format (.pdf) with appropriate bookmarks. The packaged set submitted in paper form shall be bound with a staple. The packaged set submitted in an electronic portable document format (.pdf) shall be in an individual file and the file shall be enabled for commenting. The packaged set shall include the following:

- title sheet
- table of contents
- contact information for designer – contact information should include name and address of design firm, name of contact person with phone number and email address
- copy of the certificate of insurance
- copy of the **approved** cross-section
- results of subsurface investigation, including boring logs and geotechnical design recommendations
- foundation working drawings
- foundation design computations

Combining the foundation working drawings and calculations with sign support working drawings and calculations into one packaged set for review is not permitted.

The working drawings and design computations shall be **signed, dated and sealed** by a Professional Engineer licensed in the State of Connecticut, who shall also be available for consultation in interpreting his computations and drawings, and in the resolution of any problems which may occur during the performance of the work. Each working drawing shall be signed, dated and sealed. The cover/first sheet for the computations shall be signed, dated and sealed.

Working drawings submitted in paper form shall be printed on ANSI B (11" x 17"; Ledger/Tabloid) sheets. Each drawing shall have a border and title block. Located in the lower right hand corner of the drawing adjacent to the title block, each drawing shall have a rectangular box, 2 1/4" wide x 1 3/4" high, for the reviewers stamp. On the ANSI B sheets, the minimum text height and width shall be 1/16". All letter characters shall be uppercase. Design computations, procedures and other supporting data shall be submitted on 8 1/2" x 11" (Letter) sheets.

Working drawings submitted in an electronic portable document format (.pdf) shall be created on ANSI D (22" x 34") full scale (1" electronic file = 1" paper) sheets. (The purpose of creating the drawings on ANSI D sheets is so that the sheets may be printed/plotted at that size or smaller without loss of legibility.) Each drawing shall have a border and title block. Located in the lower right hand corner of the drawing adjacent to the title block, each drawing shall have a rectangular box, 2 1/4" wide x 1 3/4" high, for the reviewers stamp. On the ANSI D full scale sheets, the minimum text height and width shall be 1/8". All letter characters shall be uppercase. The electronic files for the design computations, procedures and other supporting data shall be created on ANSI A (8 1/2" x 11") letter sheets.

The working drawings shall include complete details of all foundation components. The drawings shall include, but not be limited to the following:

- the project number, town and support identification number
- reference to the design specifications, including interim specifications
- material specifications for all components
- embedment depths for foundation in soil, rock and a combination of soil and rock
- anchor bolt details, including dimensions, embedment and projection

The design computations shall include, but not be limited to the following:

- the project number, town and support identification number
- references to design specifications, including interim specifications, and the applicable code section and articles
- description/documentation for all computer programs used in the design

- drawings/models of the foundation with dimensions, loads and references to the local and global coordinate systems used (as applicable), to facilitate review of the results
- sign support reactions of all group loads and load combinations
- soil and rock design parameters
- computations demonstrating the geotechnical and structural capacity of the drilled shaft for all applicable axial and lateral load combinations

The Contractor shall submit the packaged set of working drawings and calculations to the project's "Engineer of Record". The project's "Engineer of Record" is identified in the signature block on the sign support structural contract plans. A copy of the transmittal shall be sent to the District Construction office administering the project.

The reviewed and stamped working drawings and calculations shall be sent by the reviewer, along with a recommendation regarding acceptance, to the District Construction office for review, comment and distribution. After the District Construction office has reviewed the working drawings and calculations, ensured all comments have been addressed and have found the submittal to be acceptable, in addition to distributing copies of the working drawings and calculations to the Contractor and District offices, a copy of each packaged set of working drawings and calculations shall be sent to the project's "Engineer of Record".

Foundation Construction: The Contractor performing the work described in this specification shall have installed drilled shafts of both diameter and length similar to those required for the traffic structures for a minimum of 3 years prior to the bid date for this project. The Contractor shall submit a list containing at least 3 projects completed in the last 3 years on which the Contractor has installed drilled shafts of a diameter and length similar to those shown on the plans. The list of projects shall contain names and phone numbers of owner's representatives who can verify the Contractors' participation on those projects. The Contractor shall provide a list identifying the on-site supervisor(s) and drill operator(s) for approval by the Engineer. The on-site supervisor(s) shall have a minimum 2 years experience in supervising the construction of drilled shafts of a diameter and length similar to those shown on the plans. The drill operator(s) shall have a minimum 1 year experience in drilling for the construction of drilled shafts of a diameter and length similar to those shown on the plans. The list shall contain a summary of each individual's experience. Should the Contractor elect to change personnel during construction of the shaft, the same approval process will need to be completed for the new personnel prior to them starting work on the project. The Contractor shall not be compensated for any delays resulting from their changing of personnel.

Prior to excavating for the foundation, the Contractor shall submit the following:

Reinforcing Steel Shop Drawings: Based on the accepted foundation design, the Contractor shall prepare reinforcing steel shop drawings for each foundation

in accordance with Subarticle 1.05.02-3. The drawings shall be reviewed and stamped approved (or approved as noted) by the foundation designer. Four copies of each reviewed and stamped drawing shall be submitted to the Engineer at the District Construction office. One copy of each reviewed and stamped drawing shall be submitted to the project's "Engineer of Record".

Concrete and Slurry Mix Designs: The Contractor shall submit to the Engineer at the District Construction office the concrete mix designs and the slurry mix design, including admixtures, for review.

Foundation Construction Procedure: The Contractor shall submit to the Engineer at the District Construction office a written foundation construction procedure outlining the equipment; drilling procedure for soil and rock, including how spoils will be handled; temporary casing placement and removal; slurry placement; reinforcement, anchor bolt and conduit placement; and concrete placement required for the drilled shaft foundation construction for review. The procedure should include contingencies for the various soil, rock and subsurface water conditions that may be encountered during the foundation construction. Also required in this submission are the following;

- list of proposed equipment to be used, including cranes, drills, augers, bailing buckets, final cleaning equipment, desanding equipment, slurry pumps, core sampling equipment, tremies or concrete pumps, casing, etc.
- details of overall construction operation sequence and the sequence of shaft construction in bents or groups
- details of shaft excavation methods
- when the use of slurry is anticipated, details of the mix design and its suitability for the subsurface conditions at the construction site, mixing and storage methods, maintenance methods, and disposal procedures
- details of methods to clean the shaft excavation
- details of reinforcement placement, including support and centralization methods
- details of concrete mix design and test results of both a trial mix and a slump loss test. The tests shall be conducted by an approved testing laboratory using approved methods to demonstrate that the concrete meets slump loss requirements

- details of concrete placement, including proposed operational procedures for free fall, tremie or pumping methods, proposed concreting log form and computations for time duration of shaft pour estimates
- details of casing installation and removal methods
- details of methods for removal of obstructions. Obstructions the Contractor shall provide details of methods for removal include, but are not necessarily be limited to, boulders, concrete, riprap, steel, timber, etc.

The Engineer will evaluate the foundation construction procedure for conformance with the plans, specifications and special provisions and will then notify the Contractor of any additional information required and/or changes necessary to meet the contract requirements. All procedural approvals given by the Engineer shall be subject to trial in the field and shall not relieve the Contractor of the responsibility to satisfactorily complete the work as detailed in the plans and specifications. The Contractor shall not commence construction of the drilled shafts until the Engineer has accepted the foundation construction procedure.

Excavations required for shafts shall be performed through whatever materials are encountered, to the dimensions and elevations in the working drawings or as ordered by the Engineer. The methods and equipment used shall be suitable for the intended purpose and materials encountered. Shaft excavation may be performed by combinations of augering, rotary drilling, down-the-hole hammer, reverse circulation drilling, claming, scraping, or other means approved by the Engineer. Generally, either the dry method, wet method, or temporary casing method may be used, as necessary, to produce sound, durable concrete foundation shafts free of defects. The Contractor shall select and use the method that is needed to properly accomplish the work, as determined by site conditions and subject to the approval of the Engineer. The Contractor is responsible for maintaining the stability of the shaft excavation during all phases of construction.

The dry method consists of drilling the shaft excavation, removing accumulated water and loose material from the excavation, and placing the shaft concrete in a relatively dry excavation. The dry construction method shall be used only at sites where the groundwater table and site conditions are suitable to permit construction of the shaft in a relatively dry excavation, and where the sides and bottom of the shaft are stable and may be visually inspected prior to placing the concrete. The use of the dry construction method is permitted if less than one foot of water accumulates in the bottom of a hole without pumping over a one hour period, the excavation remains stable and any loose material and water can be removed prior to placement of concrete.

The wet construction method shall be used at sites where a dry excavation cannot be maintained for placement of the shaft concrete. Wet construction methods consist of using a mineral slurry to maintain stability of the hole perimeter while advancing the excavation to final depth, placing the reinforcing cage and shaft concrete. This procedure may require desanding and cleaning the slurry; final cleaning of the excavation by means of a bailing bucket, air lift, submersible pump

or other devices; and placing the shaft concrete with a tremie. Unless it is demonstrated to the satisfaction of the Engineer that the surface casing is not required, temporary surface casings shall be provided to aid shaft alignment and position, and to prevent sloughing of the top of the shaft excavation. Surface casing is defined as the amount of casing required from the ground surface to a point in the shaft excavation where sloughing of the surrounding soil does not occur.

The temporary casing construction method shall be used at all sites where the dry or wet construction methods are inappropriate. Temporary casing construction method consists of advancing the excavation through caving material by the wet method. Temporary casing may be installed by driving or vibratory procedures in advance of excavation to the lower limits of the caving material. When a nearly impervious formation is reached, a casing is placed in the hole and sealed in the nearly impervious formation. After the drilling fluid is removed from the casing, drilling may proceed as with the dry method except that the casing is withdrawn when the shaft concrete is placed. If seepage conditions prevent use of the dry method, excavation is completed using the wet method. Temporary casing may be installed by driving or vibratory procedures in advance of excavation to the lower limits of the caving material. Slurry may be omitted if the casing can be installed with only minor caving of the hole.

If the Engineer determines that the foundation material encountered during excavation is unsuitable or differs from that anticipated in the design of the shaft, or if rock is encountered at an unanticipated elevation, the Contractor's foundation designer shall determine if the foundation embedment should be revised from that shown on the working drawings. If rock is encountered, the Engineer shall be notified to inspect and determine the elevation of the top of competent rock. Any revisions to the foundation embedment during construction shall be reviewed by the Engineer.

Excavated materials which are removed from the shaft excavation and any drilled fluids used shall be disposed of by the Contractor as directed by the Engineer and in accordance with Section 1.10.

Casings shall be metal, smooth, clean, watertight, and of ample strength to withstand both handling and driving stresses and the pressure of both concrete and the surrounding earth materials. The outside diameter of casing shall not be less than the specified size of the shaft. Temporary casings shall be removed while the concrete remains workable (i.e., a slump of 4" or greater). Before the casing is withdrawn and while the casing is being withdrawn, a 5'-0" minimum head of fresh concrete in the casing shall be maintained so that all the fluid trapped behind the casing is displaced upward without contaminating the shaft concrete. The required minimum concrete head may have to be increased to counteract groundwater head outside the casing. Separation of the concrete by hammering or otherwise vibrating the casing, during withdrawal operations, shall be avoided. Casing extraction shall be at a slow, uniform rate with the pull in line with the shaft axis.

Slurry used in the drilling process shall be a mineral slurry. The slurry shall have both a mineral grain size that will remain in suspension and sufficient viscosity and gel characteristics to transport excavated material to a suitable screening system. The percentage and specific gravity

of the material used to make the suspension shall be sufficient to maintain the stability of the excavation and to allow proper concrete placement. The level of the slurry shall be maintained at a height sufficient to prevent caving of the hole.

The mineral slurry shall be premixed thoroughly with clean fresh water at a temperature above 41° F and adequate time allotted for hydration prior to introduction into the shaft excavation. The elevation of the slurry within the shaft foundation shall be maintained within 24” of the top casing and at least 48” above the existing water level during drilling and until the concrete placement is essentially complete. The slurry properties shall be maintained at all times, including non-working periods and stoppages. The slurry shall be circulated and agitated, continuously if necessary, to maintain the slurry properties and to prevent it from setting up in the shaft.

The Contractor, in the presence of the Engineer, shall perform control tests on the slurry to ensure that the density, viscosity, and pH fall within the acceptable limits tabulated below. The Contractor shall provide all equipment required to perform the tests. If desanding is required, sand content shall not exceed 4% (by volume) at any point in the shaft excavation as determined by the American Petroleum Institute sand content test.

Range of Values (at 68°F)

Property (Units)	Time of Slurry Introduction	Time of Concreting (in Hole)	Test Method
Density (pcf)	64.3 to 69.1	64.3 to 75.0	Density Balance
Viscosity (seconds per quart)	28 to 45	28 to 45	Marsh Cone
pH	8 to 11	8 to 11	pH paper or meter

The control tests to determine unit weight (density), viscosity, and pH values of the slurry shall be done during the shaft excavation to establish a consistent working pattern.

Prior to placing shaft concrete, slurry samples shall be taken from the bottom and at intervals not exceeding 10’-0” for the full height of slurry. Any heavily contaminated slurry that has accumulated at the bottom of the shaft shall be eliminated. The mineral slurry shall be within specification requirements immediately before shaft concrete placement.

The hole shall be covered when left unattended.

After completing the shaft excavation, all loose material existing at the bottom of the hole shall be removed.

Prior to placing the reinforcement into the shaft, the Contractor, in the presence of the Engineer, shall determine the shaft dimensions, depth and alignment of the shaft. The concrete shaft shall

not be out of plumb by more than $\frac{1}{4}$ inch per foot of depth. The Contractor shall provide all equipment necessary for checking the shaft excavation. The Engineer shall inspect the shaft and verify that it has been properly cleaned.

The reinforcing steel shall be fabricated and assembled in accordance with Article 6.02.03. All reinforcement shall be assembled with wire ties. Welding to assemble the reinforcement is not permitted.

Immediately after the shaft excavation has been inspected and approved by the Engineer and prior to placement of the concrete, the assembled reinforcing steel cage, including cage stiffener bars, spacers, centralizers, and other necessary appurtenances, shall be carefully placed into the shaft excavation as a unit. Dropping or forcing cages into the shaft will not be allowed. The reinforcing steel in the shaft shall be tied and supported so that the reinforcing steel will remain within allowable tolerances of its intended position until the concrete will support the reinforcing steel. When concrete is placed by tremie methods, temporary hold-down devices shall be used to prevent uplifting of the reinforcing steel cage during concrete placement. Concrete spacers or other approved noncorrosive spacing devices shall be used at sufficient intervals not exceeding 5'-0" along the shaft to insure concentric location of the cage within the shaft excavation. When the size of the longitudinal reinforcing steel is larger than a #8 bar, such spacing shall not exceed 10'-0". After placement of the reinforcing cage, the Engineer shall inspect the shaft to ensure that it has remained clean. If the inspection indicates that loose material has accumulated at the bottom of shaft excavation, the Contractor shall remove the reinforcing cage and reclean the shaft.

Concrete shall be placed in the shaft excavation as soon as possible, but no more than 4 hours after completion of excavation and cleaning of the bottom of the excavation, and no more than 2 hours after placement of the reinforcing steel cage. Concrete shall be placed in a continuous operation to the top of the shaft. The concrete level shall be horizontal during the pouring operations. Concrete placement shall continue after the shaft is full until good quality concrete is evident at the top of the shaft. The elapsed time from the beginning of concrete placement in the shaft to the completion of placement shall not exceed 2 hours.

In dry construction, concrete shall be placed in a single continuous operation with the flow of concrete down the center of the shaft excavation so as to consolidate the concrete on impact. During placement operations, the concrete is not permitted to hit the reinforcing steel. A dropchute, consisting of a hopper and flexible hose, may be used to direct the concrete down the center of the foundation and prevent the concrete from hitting the reinforcing steel. Accumulated water shall be removed before placing the concrete. At the time of concrete placement, no more than 2" of water may exist at the bottom of the excavation and loose sediment no more than $\frac{1}{2}$ " over one-half the base is acceptable.

In wet (slurry) construction, concrete to be placed by the tremie method, where the concrete displaces the slurry from bottom of the excavation to the top. The concrete shall be placed through a top metal hopper and into a rigid leak-proof elephant trunk tremie tube, sufficiently large enough to permit free flow of concrete. The tremie tube shall be positioned so that it can

be removed without disturbing the reinforcing. Initially, the discharge end of the tremie tube shall be sealed closed (plugged) to prevent slurry from entering the tube after it is placed in the excavation and before the tube is filled with concrete. After concrete placement has started, the tremie tube shall be kept full of concrete to the bottom of the hopper to maintain a positive concrete head. The flow of concrete shall be induced by slightly raising the discharge end of the tube, always keeping the tube end in the deposited concrete. No horizontal movement of the tremie tube will be permitted.

The shaft concrete shall be vibrated or rodded to a depth of 5'-0" below the ground surface except where soft uncased soil or slurry remaining in the excavation will possibly mix with the concrete.

Exposed concrete shall be cured and finished in accordance with Subarticle 6.01.03-21.

Anchor bolt assemblies shall be embedded in the concrete as shown on the working drawings. A template plate shall be used to hold the anchor bolt assemblies, conduits and ground rod sleeve in the correct position. The anchor bolts shall be installed plumb.

All conduit ends terminating below grade shall be capped with a malleable iron caps. All above-grade conduit ends shall be terminated with an insulated bonding bushing with tinned insert.

Ground rod and ground wire shall be installed as shown on the plans.

No construction operations that would cause soil movement adjacent to the shaft, other than mild vibration, shall be conducted for at least 48 hours after shaft concrete has been placed.

The top of the foundations shall be backfilled and the adjacent disturbed ground surfaces restored to match the surrounding area after the concrete has cured and the forms are removed. Placement of topsoil shall conform to Articles 9.44.01 and 9.44.03. Turf establishment shall conform to Article 9.50.03.

After the foundation has cured, the Contractor shall obtain the as-built top of foundation elevations based on a field survey.

The traffic structures shall not be erected on the foundation until the concrete in the shaft and pedestal has reached a compressive strength of 4000 psi.

Method of Measurement: This work will be measured for payment by the number of foundation units, each completely installed and accepted. One foundation unit is required to support each cantilever sign support. Two foundation units are required to support each bridge sign support.

Basis of Payment: The work will be paid for at the contract unit price each for "Drilled Shaft Traffic Structure Foundation," completed and accepted in place, which price shall include all

equipment, materials, tools and labor incidental to the design, fabrication, construction and disposal of drilling spoils, of the foundations at the locations specified on the plans.

No additional payment will be made for the Contractor to test the slurry when it is used to construct a drilled shaft foundation. No additional payment will be made for subsurface investigations performed by the Contractor.

The removal of existing roadside barrier systems, installation and removal of temporary roadside barrier systems and resetting existing roadside barrier systems will not be paid for separately, but will be included as part of the work.

The temporary support, protection and restoration of utilities (if necessary), including existing underground wiring, conduits, drainage structures, pipes and underdrain systems within the excavation limits will not be paid for separately, but will be included as part of the work.

Backfilling and restoration of adjacent ground surfaces (pavement, slope protection, topsoil & seed, etc.) in all areas disturbed by the work will not be paid for separately, but will be included as part of the work. The Engineer will determine the type, thickness and horizontal limits of the surface treatments to be restored.

The installation of new or upgraded permanent roadside barrier systems, if required, will not be paid for as part of this work, but will be paid for under separate items.

ITEM #1203902A - STRUCTURE MOUNTED SIGN SUPPORT

Description: Work under this item shall consist of drilling holes through the steel beam web, drilling holes and grouting threaded rods in the concrete parapet, fabricating, galvanizing, transporting and erecting a structural steel sign support at the location indicated, as shown on the plans and in accordance with these specifications.

For the purposes of this specification, a dowel may be a reinforcing bar, anchor bolt or threaded rod.

Materials: Structural steel shapes and plates shall conform to the requirements of ASTM A709, Grade 50. Structural tubing shall conform to the requirements of ASTM A500 Grade B. The complete assembly including angles and the vibration bracket shall be galvanized after fabrication in accordance with the requirements of ASTM A123.

High strength bolts, heavy hex nuts, and washers shall conform to requirements of ASTM A325, Type 1. U-bolts shall conform to the requirements of ASTM A36 with regular thickness washers and prevailing torque hex lock nuts. Threaded rods shall conform to the requirements of ASTM F1554 Grade 36 with regular thickness washers and prevailing torque hex lock nuts. High strength bolts, u-bolts, threaded rods, nuts, and washers shall be galvanized in accordance with the requirements of ASTM B695 Class 50.

High strength bolts, including suitable nuts and hardened washers, shall also conform to the special provision "Section M.06-Metals."

Galvanizing compound for field touch up shall conform to the requirements of Federal Specification TT-P-641.

The adhesive bonding material shall be a resin compound specially formulated to anchor rods or bolts in holes drilled into concrete for the purpose of resisting tension pull-out. The adhesive bonding materials shall be selected from the Connecticut Department of Transportation Approved Product List.

The chemical anchoring material shall conform to Subarticle M.03.01-15.

Construction Methods: Prior to the start of fabrication, the Contractor shall field verify all dimensions and locations of existing structural components, junction boxes, cross frames, fencing, parapet joints, and longitudinal grades for the structure.

Before fabricating any materials, the Contractor shall submit manufacturer's specifications and installation for the chemical anchoring material to the Engineer for review in accordance with Article 1.05.02.

Shop Drawings: Before fabrication and erection, the Contractor shall submit shop drawings to the Engineer for approval in accordance with Article 1.05.02. These drawings shall include but not be

limited to the following information: the locations and sizes of all welds and details and dimensions of all components and hardware for the sign support. Material lists and designations shall also be included.

Shop fabrication of the sign support shall conform to the requirements of Article 6.03.03-4, 5 and 6. The sign support shall be located, positioned, and attached to the existing structures as shown on the plans or as directed by the Engineer.

Holes for the dowels shall be located as shown on the plans. The holes shall clear the existing reinforcement and provide the minimum cover as shown on the plans. A pachometer shall be used to locate existing reinforcing steel. If existing reinforcing is encountered during the drilling operation, the holes shall be relocated and the uncompleted holes shall be filled with the chemical anchoring material and finished smooth and flush with the adjacent surface.

The depth and diameter of each hole shall be as shown on the plans. If the diameter of a hole is not shown, the diameter of the hole shall conform to the manufacturer's recommendations for the diameter of the dowel being anchored. If the depth and diameter of a hole are not shown, the hole shall conform to the manufacturer's recommendations for the diameter of the dowel being anchored such that the grouted dowel will be able to develop in tension 100 percent of its specified yield strength.

Hole drilling methods shall not cause spalling, cracking, or other damage to the existing concrete. The weight of the drill shall not exceed 9 kg. Those areas damaged by the Contractor shall be repaired by him in a manner suitable to the Engineer and at no expense to the State.

Prior to placing the chemical anchoring material in the holes, the holes shall be cleaned of all dirt, moisture, concrete dust and other foreign material. The dowels and the chemical anchoring material shall be installed in the holes in accordance with the chemical anchoring material manufacturer's recommendations.

The Contractor, as directed by the Engineer, shall take adequate precautions to prevent any materials from dropping to the area below, which may result in damage to any existing construction or to adjoining property. Should any damage occur to the structure as a result of the Contractor's operations, the Contractor shall make repairs at his own expense. The repair work shall be approved in advance and shall be of a quality acceptable to the Engineer.

At the locations on the plans, or as directed by the Engineer, holes shall be drilled through the web of the steel girder for the installation of the bolts.

All bolted connections shall conform to the requirements of the special provision "Section 6.03-Structural Steel" and "Section M.06-Metals". The installation of the load indicator washers shall be in accordance with the manufacturer's specifications.

All work shall proceed in accordance with the special provisions "Maintenance and Protection of Traffic" and "Prosecution and Progress".

Method of Measurement: The work will be measured for payment by each sign support erected and accepted.

Basis of Payment: The complete sign support erected on the structure at the location specified will be paid for at the contract unit price each for "Structure Mounted Sign Support". This unit price shall include furnishing, fabrication, galvanizing, transporting and erecting of the sign support, and all materials, equipment, tools, and labor incidental thereto.

ITEM NO. 1204247A - REVISION OF LEGEND

12.04.01–Description:

This item shall consist of revising sign legends, which shall include furnishing and installing sign face sheet aluminum sign panels as required to modify the legends of the signs as shown on the following sign details.

12.04.02–Materials:

Materials for “Sheet Aluminum” sign panels shall conform to the requirements of Article 12.08.02.

12.04.03–Construction Methods:

The following sign locations shall be revised as shown on the following sign details:

<u>Sign Location</u>	<u>Material Type for Overlay Panel or New Panel</u>
084-034-380-A	Sheet Aluminum

Construction methods for “Sheet Aluminum” sign panels shall conform to the requirements of Article 12.08.03 and as supplemented as follows.

The Contractor shall revise the signs as shown on the following sign details and as directed by the Engineer.

The sheet aluminum sign panel shall be fastened to the existing sign with aluminum rivets. The aluminum rivets shall be of the pull through type and of the size and number designated by the sign panel manufacturer and shall be approved by the Engineer. The sign panel shall be installed at the location shown on the attached sign detail.

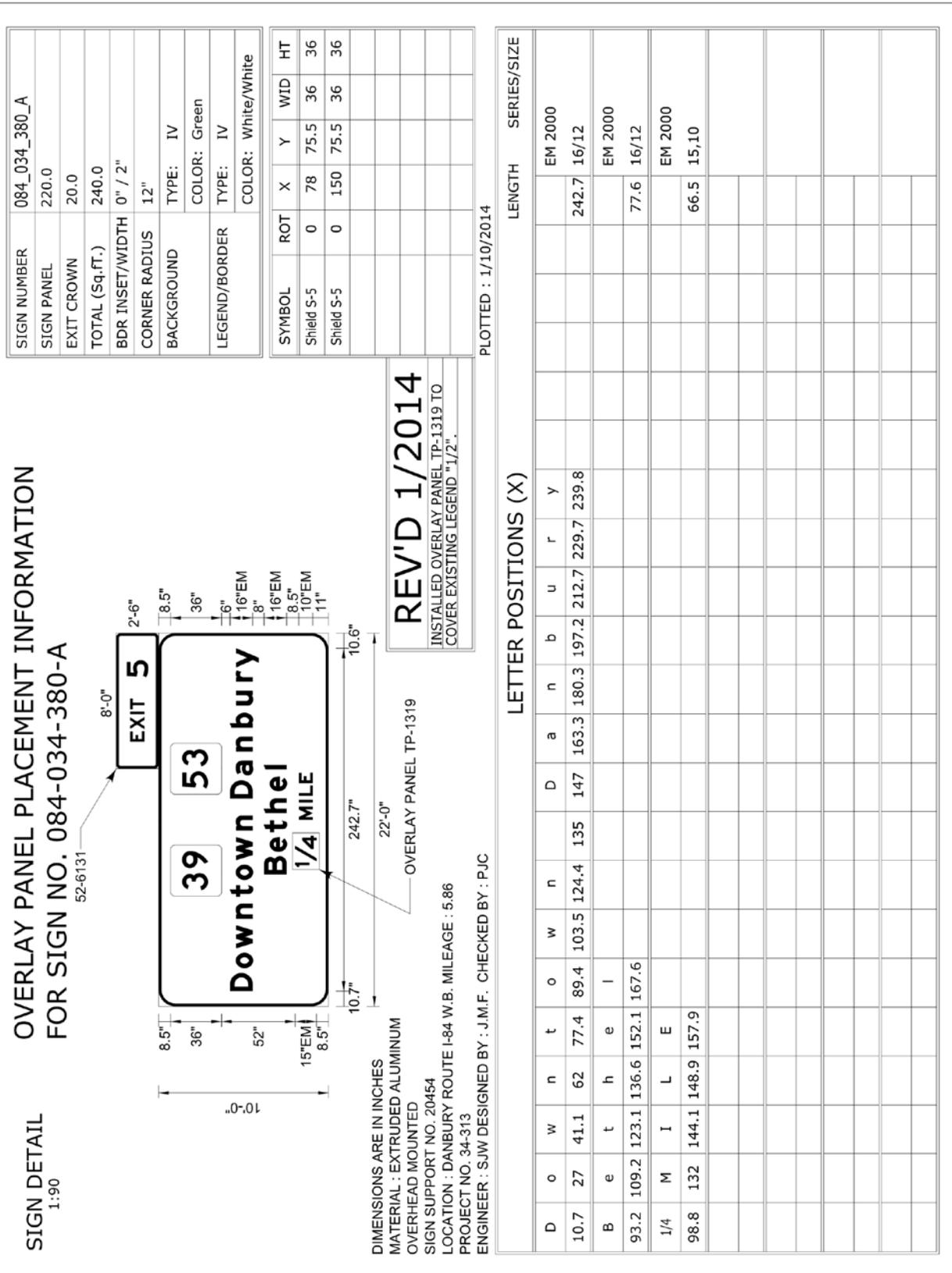
12.04.04–Method of Measurement:

This work will be measured for payment by the number of signs that are revised and accepted.

12.04.05–Basis of Payment:

This item will be paid for at the contract unit price for “Revision of Legend” complete, in place, which price shall include new hardware, removing and disposing of unnecessary materials, and all equipment, material, tools and labor incidental thereto. This price shall also include removing, loading, transporting, and unloading of signs and all equipment, material, tools and labor incidental thereto.

<u>Pay Item</u>	<u>Pay Unit</u>
Revision of Legend	ea.



ITEM NO. 1206023A - REMOVAL AND RELOCATION OF EXISTING SIGNS

Section 12.06 is supplemented as follows:

Article 12.06.01 – Description is supplemented with the following:

Work under this item shall consist of the removal and/or relocation of designated side-mounted extruded aluminum and sheet aluminum signs, sign posts, sign supports, and foundations where indicated on the plans or as directed by the Engineer. Work under this item shall also include furnishing and installing new sign posts and associated hardware for signs designated for relocation.

Article 12.06.03 – Construction Methods is supplemented with the following:

The Contractor shall take care during the removal and relocation of existing signs, sign posts, and sign supports that are to be relocated so that they are not damaged. Any material that is damaged shall be replaced by the Contractor at no cost to the State.

Foundations and other materials designated for removal shall be removed and disposed of by the Contractor as directed by the Engineer and in accordance with existing standards for Removal of Existing Signing.

Sheet aluminum signs designated for relocation are to be re-installed on new sign posts.

Article 12.06.04 – Method of Measurement is supplemented with the following:

Payment under Removal and Relocation of Existing Signs shall be at the contract lump sum price which shall include all extruded aluminum and sheet aluminum signs, sign posts, and sign supports designated for relocation, all new sign posts and associated hardware for signs designated for relocation, all extruded aluminum signs, sheet aluminum signs, sign posts and sign supports designated for scrap, and foundations and other materials designated for removal and disposal, and all work and equipment required.

Article 12.06.05 – Basis of Payment is supplemented with the following:

This work will be paid for at the contract lump sum price for “Removal and Relocation of Existing Signs” which price shall include relocating designated extruded aluminum and sheet aluminum signs, sign posts, and sign supports, providing new posts and associated hardware for relocated signs, removing and disposing of foundations and other materials, and all equipment, material, tools and labor incidental thereto. This price shall also include removing, loading, transporting, and unloading of extruded aluminum signs, sheet aluminum signs, sign posts, and sign supports designated for scrap and all equipment, material, tools and labor incidental thereto.

<u>Pay Item</u>	<u>Pay Unit</u>
Removal and Relocation of Existing Signs	L.S.

ITEM NO. 1206025A - REMOVAL AND RELOCATION OF EXISTING OVERHEAD SIGNS

Section 12.06 is supplemented as follows:

12.06.01 – Description is supplemented with the following:

Work under this item shall consist of the removal and/or relocation of designated existing overhead signs, sign supports and foundations, where indicated on the plans or as directed by the Engineer.

12.06.03 - Construction Methods is supplemented with the following:

Overhead sign supports, foundations, and other materials designated for removal shall be removed and disposed of by the Contractor as directed by the Engineer and in accordance with existing standards for Removal of Existing Overhead Signing.

For overhead signs designated for reinstallation and/or relocation, the Contractor shall accomplish the work in a manner so as not to cause twisting, bending or deforming of sign panels, or scratching of the sign face. Any sign panel damaged shall be repaired or replaced at the Contractor’s expense. The signs shall be level, correctly aligned as indicated on the plans and shall be properly fastened to the structure or supports with the necessary hardware as indicated on the plans.

12.06.04 - Method of Measurement is supplemented with the following:

This work will be paid for at the contract lump sum price for “Removal and Relocation of Existing Overhead Signs” which price shall include overhead signs designated for relocation, overhead extruded aluminum signs, overhead sign supports, foundations, and other materials designated for removal, and all equipment, material, tools and labor incidental thereto.

12.06.05 - Basis of Payment is supplemented with the following:

This work will be paid for at the contract lump sum price for “Removal and Relocation of Existing Overhead Signs”. This price shall include the removal, relocation, and permanent installation of overhead signs. Also, the price shall include all necessary hardware required for the reinstallation of the existing sign panels onto existing or new sign supports, unless such hardware is paid for under separate pay items. The price shall include all equipment, material, labor and tools necessary to complete this work. This price shall also include removing, loading, transporting, and unloading of overhead extruded aluminum signs designated for removal and all equipment, material, tools and labor incidental thereto. This price shall also include removing and disposing of sign supports, foundations, and other materials, and all equipment, material, tools and labor incidental thereto.

Pay Item

Removal and Relocation of Existing Overhead Signs

Pay Unit

L.S.

ITEM #1207034A – SIGN FACE - EXTRUDED ALUMINUM (TYPE IV RETROREFLECTIVE SHEETING)

Article 12.07.01 – Description is revised as follows: This item shall consist of furnishing and installing sign face extruded aluminum with Type IV retroreflective sheeting at locations indicated on the plans or as ordered and in conformance with the plans and these specifications.

Sign Face – Extruded Aluminum is supplemented with the sign details that follow.

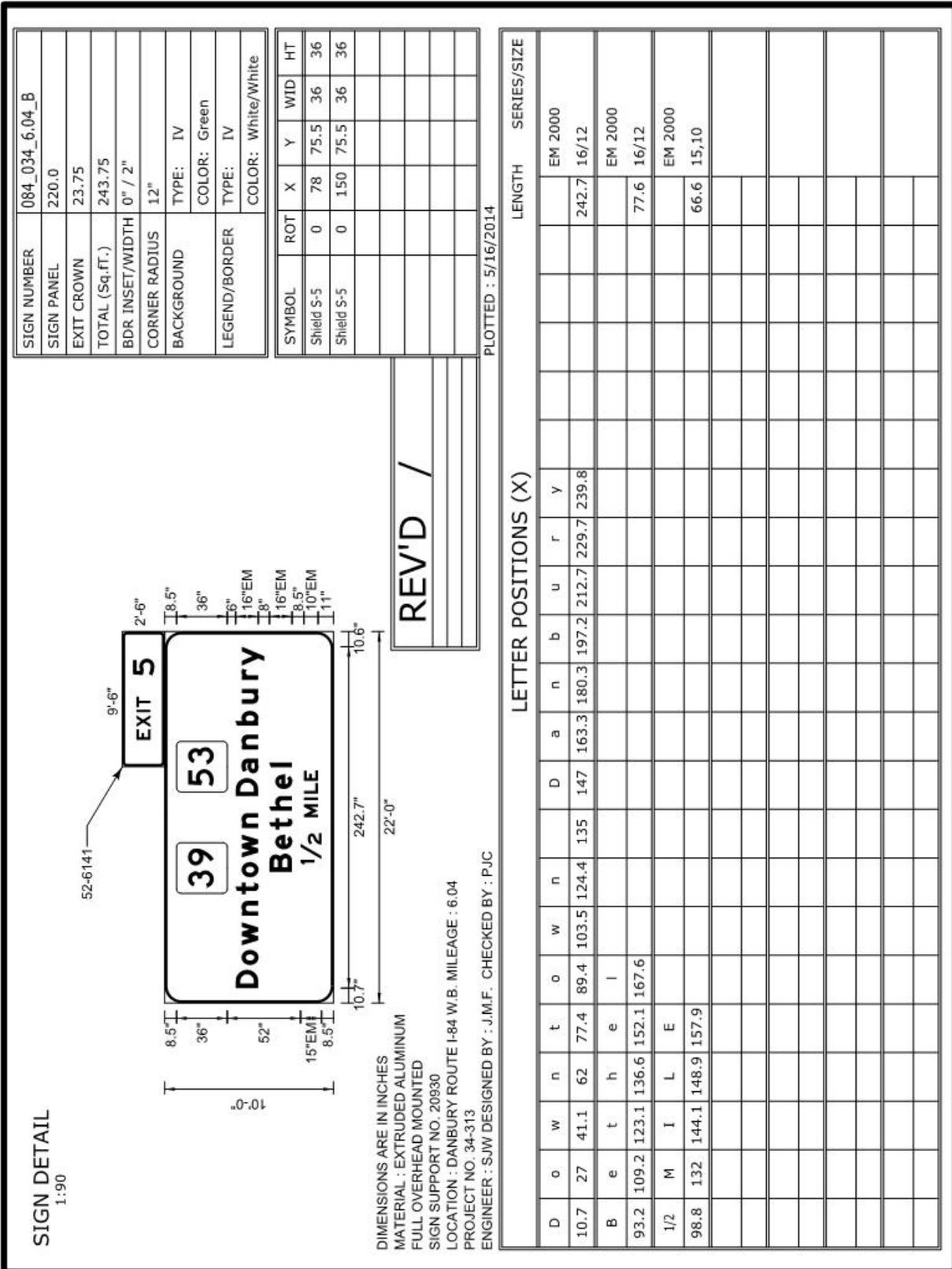
Article 12.07.02 – Materials is supplemented as follows: For Article M.18.10.02, the heading “2. Type III Reflective Sheeting” shall be replaced with “2. Type IV Retroreflective Sheeting”.

Article 12.07.03 – Construction Methods is supplemented as follows: All overhead sign foundations shall be field staked and the locations approved by an engineer from the Division of Traffic Engineering a minimum of seven days prior to installation.

For all side mounted signs, the edge of the sign closest to the roadway and the sign foundations shall be field staked and approved by an engineer from the Division of Traffic Engineering a minimum of seven days prior to installation.

For side-mounted signs, the offset to the near edge of sign face shall exceed the maximum deflection of the guide rail unless otherwise shown on the plans or otherwise directed by the Engineer.

Pay Item	Pay Unit
Sign Face - Extruded Aluminum (Type IV Retroreflective Sheeting)	S.F. (S.M.)



ITEM #1210101A – 4’ WHITE EPOXY RESIN PAVEMENT MARKINGS

ITEM #1210102A – 4’ YELLOW EPOXY RESIN PAVEMENT MARKINGS

ITEM #1210103A – 6’ WHITE EPOXY RESIN PAVEMENT MARKINGS

ITEM #1210104A – 8’ WHITE EPOXY RESIN PAVEMENT MARKINGS

ITEM #1210105A – EPOXY RESIN PAVEMENT MARKINGS, SYMBOLS AND LEGENDS

SECTION 12.10 – EPOXY RESIN PAVEMENT MARKINGS, SYMBOLS AND LEGENDS is amended as follows:

Delete “SYMBOLS AND LEGENDS” from the title of the section.

SECTION 12.10.03 – Construction Methods is amended as follows:

Delete the entire sections titled “3. Performance and Warranty:” and “WARRANTY:” and replace them with the following:

3. Initial Performance: The retroreflectivity of the markings applied must be measured by the Contractor three (3) to fourteen (14) days after installation. A Certified Test Report (CTR), in accordance with Section 1.06.07, must be submitted to the Engineer no later than ten (10) days after the measurements are taken using the procedures and equipment detailed below:

Test Lots - The following test lots shall be randomly selected by the Engineer to represent the line markings applied:

Table 3.1: Line Test Lots

Length of line	Number of Lots	Length of Test Lot
< 1.0 mi. (1.5 km)	1	1000 ft. (300 m)
≥ 1.0 mi. (1.5 km)	1 per 1.0 mi. (1.5 km)	1000 ft. (300 m)

Measurement Equipment and Procedure

ITEM #1210101A
 ITEM #1210102A
 ITEM #1210103A
 ITEM #1210104A
 ITEM #1210105A

Portable Retroreflectometer

1. Skip line measurements shall be obtained for every other stripe, taking no more than two readings per stripe with readings no closer than 20 in. (0.5 m) from either end of the marking.
2. Solid line test lots shall be divided into ten sub-lots of 100 ft. (30 m) length and measurements obtained at one randomly select location within each subplot.
3. For symbols and legends, 10 percent of each type shall be measured by obtaining five (5) measurements at random locations on the symbol or legend.
4. The Apparatus and Measurements shall be made in accordance with ASTM E1710 (Standard Test Method for Measurement of Retroreflective Pavement Marking Materials with CEN-Prescribed Geometry Using a Portable Retroreflectometer) and evaluated in accordance with ASTM D7585/D7585M (Standard Practice for Evaluating Retroreflective Pavement Markings Using Portable Hand-Operated Instruments).

Mobile Retroreflectometer

1. Calibration of the instruments shall be in accordance with the manufacturer's instructions.
2. Retroreflectivity shall be measured in a manner proposed by the Contractor and approved by the Engineer. The basis of approval of the test method will be conformance to a recognized standard test method or provisional standard test method.

The measurements shall be obtained when the pavement surface is clean and dry and shall be reported in millicandellas per square foot per foot candle - $\text{mcd}/\text{ft}^2/\text{fc}$ (millicandelas per square meter per lux ($\text{mcd}/\text{m}^2/\text{lux}$)). Measurements shall be obtained sequentially in the direction of traffic flow.

Additional Contents of Certified Test Report

The CTR shall also list:

- Project and Route number
- Geographical location of the test site(s), including distance from the nearest reference point.
- Manufacturer and model of retroreflectometer used.
- Most recent calibration date for equipment used.
- Grand Average and standard deviation of the retroreflectivity readings for each line, symbol or legend.

Initial Performance:

In order to be accepted, all epoxy resin pavement markings must meet the following minimum retroreflectivity reading requirement:

White Epoxy: minimum retroreflectivity reading of 400 mcd/ft²/fc (mcd/m²/lux)

Yellow Epoxy: minimum retroreflectivity reading of 325 mcd/ft²/fc (mcd/m²/lux)

At the discretion of the Engineer, the Contractor shall replace, at its expense, such amount of lines, symbols and legends that the grand average reading falls below the minimum value for retro-reflectivity. The Engineer will determine the areas and lines to be replaced. The cost of replacement shall include all materials, equipment, labor and work incidental thereto.

ITEM #1220013A – CONSTRUCTION SIGNS - BRIGHT FLUORESCENT SHEETING

Article 12.20.01 – Description: The Contractor shall furnish construction signs with bright fluorescent sheeting and their required portable supports or metal sign posts that conform to the requirements of NCHRP Report 350 (TL-3). The construction signs and their required portable supports or metal sign posts shall conform to the signing requirements stated in Article 9.71 "Maintenance and Protection of Traffic", as shown on the plans and/or as directed by the Engineer.

Article 12.20.02 – Materials: Prior to using the construction signs and their portable supports, the Contractor shall submit to the Engineer a copy of the Letter of Acceptance issued by the FHWA to the manufacturer documenting that the devices (both sign and portable support tested together) conform to NCHRP Report 350 (TL-3).

Portable sign supports shall be designed and fabricated so as to prevent signs from being blown over or displaced by the wind from passing vehicles. Portable sign supports shall be approved by the Engineer before they are used. Mounting height of signs on portable sign supports shall be a minimum of 1 foot and a maximum of 2 feet, measured from the pavement to the bottom of the sign.

All sign faces shall be rigid and reflectorized. Sheet aluminum sign blanks shall conform to the requirements of Article M.18.13. Metal sign posts shall conform to the requirements of Article M.18.14. Application of reflective sheeting, legends, symbols, and borders shall conform to the requirements specified by the reflective sheeting manufacturer. Attachments shall be provided so that the signs can be firmly attached to the portable sign supports or metal posts without causing damage to the signs. A Materials Certificate and Certified Test Report conforming to Article 1.06.07 shall be required for the reflective sheeting.

The following types of construction signs shall not be used: mesh, non-rigid, roll-up, corrugated or waffle board types substrates, foam core and composite aluminum sign substrates.

Reflective sheeting shall conform to the following:

The fluorescent orange prismatic retroreflective sheeting shall consist of prismatic lenses formed in a transparent fluorescent orange synthetic resin, sealed, and backed with an aggressive pressure sensitive adhesive protected by a removable liner. The sheeting shall have a smooth surface.

Physical Properties:

A. Photometric - Coefficient of Retroreflection R_A

When the sheeting applied on test panels is measured in accordance with ASTM E 810, it shall have minimum coefficient of retroreflection values as shown in Table I. The rotation angle shall be as designated by the manufacturer for test purposes, the observation angles shall be 0.2 degrees and 0.5 degrees, the entrance angles (component B_1) shall be -4 degrees and +30 degrees.

TABLE I
Minimum Coefficient of Retroreflection R_A
Candelas per footcandle per square foot

Observation Angle (deg.)	Entrance Angle (deg.)	R_A Orange
0.2	- 4	200
0.2	+ 30	90
0.5	- 4	80
0.5	+ 30	50

The rotation shall be as designated by the manufacturer.

B. Daytime Color

Color shall conform to the requirements of Table II. Daytime color and maximum spectral radiance factor (peak reflectance) of sheeting mounted on test panels shall be determined instrumentally in accordance with ASTM E 991. The values shall be determined on a Hunter Lab Labscan 6000 0/45 Spectrocolorimeter with option CMR 559 (or approved equal 0/45 instrument with circumferential viewing illumination). Computations shall be done in accordance with ASTM E 308 for the 2 degree observer.

TABLE II
Color Specification Limits** (Daytime)

Color	1		2		3		4		Reflectance Limit Y (%)	
	X	Y	X	Y	X	Y	X	Y	MIN	MAX
Orange (new)	.583	.416	.523	.397	.560	.360	.631	.369	28	-
Orange (weathered)	.583	.416	.523	.397	.560	.360	.631	.369	20	45

Maximum Spectral Radiance Factor, new: 110%, min.
weathered: 60%, min.

** The four pairs of chromaticity coordinates determine the acceptable color in terms of the CIE 1931 standard colorimetric system measured with standard illuminant D65.

C. Nighttime Color

Nighttime color of the sheeting applied to test panels shall be determined instrumentally in accordance with ASTM E 811 and calculated in the u' , v' coordinate system in accordance with ASTM E 308. Sheeting shall be measured at 0.33 degrees observation and -4 degree entrance at rotation as determined by the manufacturer for test purposes. Color shall conform to the requirements of Table III.

TABLE III
Color Specification Limits ** (Nighttime)

Color	1		2		3		4	
	u'	v'	u'	v'	u'	v'	u'	v'
Orange (new and weathered)	.400	.540	.475	.529	.448	.522	.372	.534

D. Resistance to Accelerated Weathering

The retroreflective surface of the sheeting shall be weather resistant and show no appreciable cracking, blistering, crazing, or dimensional change after one year's unprotected outdoor exposure in south Florida, south-facing and inclined 45 degrees from the vertical, or after 1500 hours exposure in a xenon arc weatherometer in accordance with ASTM G26, Type B, Method A. Following exposure, panels shall be washed in a 5% HCL solution for 45 seconds, rinsed thoroughly with clean water, blotted with a soft clean cloth and brought to equilibrium at standard conditions. After cleaning, the coefficient of retroreflection shall be not less than 100 when measured as in D.2, below, and the color is expected to conform to the requirements of Tables II and III for weathered sheeting. The sample shall:

1. Show no appreciable evidence of cracking, scaling, pitting, blistering, edge lifting or curling or more than 0.031 inch shrinkage or expansion.
2. Be measured only at angles of 0.2 degrees observation, -4 degrees entrance, and rotation as determined by the manufacturer for test purposes. Where more than one panel of color is measured, the coefficient of retroreflection shall be the average of all determinations.

E. Impact Resistance

The retroreflective sheeting applied according to the manufacturer's recommendations to a test panel of alloy 6061-T6, 0.040 inch by 3 inches by 5 inches and conditioned for 24 hours, shall show no cracking outside the impact area when the face of the panel is subjected to an impact of 100 inch-pounds, using a weight with a 0.625 inch diameter rounded tip dropped from a height necessary to generate an impact of 100 inch-pounds, at test temperatures of both 32° F and 72° F.

F. Resistance to Heat

The retroreflective sheeting, applied to a test panel as in E., above, and conditioned for 24 hours, shall be measured in accordance with Paragraph A. at 0.2 degree observation and -4 degree entrance angles at rotation as determined by the manufacturer for test purposes and exposed to 170° ± 5° F for 24 hours in an air circulating oven. After heat exposure the sheeting shall retain a minimum of 70% of the original coefficient of retroreflection.

G. Field Performance:

Retroreflective sheeting processed and applied to sign blank materials in accordance with the sheeting manufacturer's recommendations, shall perform effectively for a minimum of 3 years. The retroreflective sheeting will be considered unsatisfactory if it has deteriorated due to natural causes to the extent that: (1) the sign is ineffective for its intended purpose when viewed from a moving vehicle under normal day and night driving conditions; or (2) the coefficient of retroreflection is less than 100 when measured at 0.2 degrees observation and -4 degree entrance. All measurements shall be made after sign cleaning according to the sheeting manufacturer's recommendations.

Article 12.20.03 – Construction Methods: Ineffective signs, as determined by the Engineer and in accordance with the ATSSA guidelines contained in "Quality Standards for Work Zone Traffic Control Devices", shall be replaced by the Contractor at no cost to the State.

Signs and their portable sign supports or metal posts that are no longer required shall be removed from the project and shall remain the property of the Contractor.

Article 12.20.04 – Method of Measurement: Construction Signs - Bright Fluorescent Sheeting will be measured for payment by the number of square feet of sign face. Sign supports will not be measured for payment.

Article 12.20.05 – Basis of Payment: "Construction Signs - Bright Fluorescent Sheeting" required and used on the project will be paid for at the Contact unit price per square foot. This price shall include the furnishing and maintenance of the signs, portable sign supports, metal sign posts and all hardware. Each sign and support or posts will be paid for once, regardless of the number of times it is used.

Pay Item

Construction Signs – Bright Fluorescent Sheeting

Pay Unit

S.F.

ITEM # 130002A – RELOCATION OF WATER MAINS

Description:

Work under Item #130002A-RELOCATION OF WATER MAINS shall consist of furnishing all labor, materials, tools and equipment necessary to lower or relocate portions of the existing 8-inch water main as required for the installation of new storm drains, complete as specified herein. The work of this Item shall conform to the requirements of the Danbury Water Department. Included under Item #130002A is the following water main relocation:

- At approximate Sta. 20+60 on Walnut Street lower existing 8-inch water main as required for installation of new storm drain.

Materials:

The Contractor shall submit 10 copies of shop drawings to Roald Haestad, Inc. Consulting Engineers, 37 Brookside Road, Waterbury, Connecticut 06708 for all materials to be furnished under this item, including but not limited to pipe and fittings.

Ductile Iron Pipe and Fittings: Pipe shall be Class 52 ductile iron pipe as manufactured by Atlantic States Pipe Co., U.S. Pipe Co., Griffin Pipe Company or an approved equal. Pipe joints may be either mechanical joint or push-on joint. Fittings shall be ductile iron with mechanical joints.

Ductile iron pipe shall conform in all respects, except for ends, to ANSI A21.51 (AWWA C151), latest editions. Pipe ends shall conform to ANSI A21.11 (AWWA C111), latest editions.

Fittings shall be ductile iron and shall conform to ANSI A21.10 (AWWA C110) and ANSI A21.11 (AWWA C111), latest edition, or to ANSI A21.53 (AWWA C153) for compact fittings.

The manufacturer's certifications specified in Sections 5.1.1.2 and 5.4 of Specification ANSI A21.51 (AWWA C151) shall be furnished for ductile iron pipe. A statement shall also be furnished stating that the coating and lining have been installed in accordance with ANSI A21.4 (AWWA C104).

All pipe and fittings shall be furnished with a bituminous sealcoat, double thickness, cement mortar lining in accordance with ANSI A21.4 (AWWA C104), latest revision, and an exterior bituminous coating. Coating that is damaged during shipment or placement shall be touched up in the field with two (2) coats of an asphaltic coating fully resistant to water and chemicals. Materials used for interior surfaces shall be acceptable for use in a potable drinking water supply and shall not impart any odors to the pipe and water.

Materials (continued):

All bolts, nuts, glands, gaskets, and other jointing materials are included under this Item.

Before any pipe is shipped to the job site, the manufacturer shall furnish the Engineer with details of his proposed joint, giving manufacturer's tolerances. Each shipment of pipe shall be accompanied by a certification from the manufacturer that the pipe and the joints meet the Specifications and, in particular, the joint tolerances.

Each piece of pipe and each fitting shall be plainly marked at the foundry with class number and weight.

Restrained Joints: Restrained joints shall be used where shown on the Contract Drawings. Joints shall be restrained using mechanical joint pipe and fittings with EBAA Iron, Inc. MEGALUG multiple wedging action thrust restraint glands, or using push-on joint pipe with EBAA Iron, Inc. Series 1700 restraint harness. Restraint glands shall be installed in strict accordance with the manufacturer's instructions.

Bedding Material: Bedding material shall consist of bankrun gravel, screened gravel, or crushed stone fill. Bankrun gravel, as defined herein, shall be gravel of such size that 100% passes a sieve having 2" square openings and shall be reasonably uniform, graded down to the 100 mesh sieve size. It shall not contain vegetation or masses of roots and shall be substantially free from loam and other organic matter, clay, and other fine or harmful substances. Screened gravel shall be well graded in size, from 1/2" to the 100 mesh sieve size or such other sizes as may be approved. It shall consist of clean, hard, and durable particles or fragments, free from dirt, vegetation, or other objectionable matter, and free from any excess of soft, thin, elongated, laminated, or disintegrated pieces. Crushed rock of suitable size and grading may be used for bedding material instead of bankrun or screened gravel.

Construction Methods:

Lowering and Relocating Existing Water Mains: Where existing water mains must be temporarily shut down to either lower or relocate the water main, the Contractor shall schedule the connection with the Danbury Water Department and notify customers of any disruption in service that may be required. The Contractor shall limit individual shutdowns to no more than 4 to 6 hours. Prior to main shutdown the Contractor shall verify that all pipe, fittings and materials for lowering or relocating the water main are at the site. To limit the length of the shutdowns, the Contractor shall preassemble pipe and fittings prior to installation.

After a shutdown has been verified, the existing water main shall be cut as required to complete the lowering or relocation as shown on the Contract Drawings. Connections to existing water main shall be made using mechanical joint solid sleeves. The minimum length of restrained joints beyond the 45 degree mechanical joint elbows shall either be obtained by replacing the existing pipe with new pipe with restraint harnesses or furnishing and installing restraint harnesses on the existing pipe.

Construction Methods (continued):

As the lowered or relocated water mains will not be disinfected, the interior of all piping shall be swabbed or sprayed with a 1% hypochlorite solution in accordance with Section 4.7 of AWWA C651 prior to installation. After the connections are made at each end of the lowered or relocated water main, the piping shall be subject to the normal working pressure and all joints checked for leaks prior to backfilling.

Operation of Valves: Unless otherwise permitted, existing water valves shall not be operated by the Contractor. Whenever the operation of a valve is necessary, the Contractor shall make arrangements, at least 24 hours in advance of the need to have Danbury Water Department forces perform the required operations.

The Danbury Water Department does not guarantee that all existing water valves will close tight or are operable. Some leakage through existing valves can be expected. If leakage through a closed valve is sufficient to interfere with the work, Danbury Water Department will make the necessary repairs or replacement.

Laying Ductile Iron Pipe: All pipe installation shall conform to AWWA Standard C600, latest revision, unless otherwise modified by these Specifications.

Ductile iron pipe shall be laid to provide a vertical clearance of at least eighteen inches (18") between the relocated water main and the proposed storm drain. The pipe between bell holes shall bear continuously on clean fill. If the Contractor excavates below the required limit, the trench bottom shall be brought to the required grade with an approved backfill of gravel, sand or crushed stone at the Contractor's expense. In laying pipe, the deflections shall not exceed 75% of the deflections given in AWWA Standard C600 latest revision.

All pipe and fittings shall be lowered carefully into the trench by means of mechanical equipment in such a manner as to prevent them from being damaged. The insides of all bells and outsides of spigots shall be wiped clean and dry and shall be free from oil or grease. During the laying of the pipe, extra care shall be taken to see that no dirt, debris, tools, clothing, or other illicit materials are allowed to be left in the pipeline.

After the pipe is laid in the trench, the spigot end shall be centered in the bell and forced home. Under no circumstances shall pipe be laid where there is water in the trench. The Contractor shall install and joint the pipe in accordance with the manufacturer's instructions.

When necessary to cut pipe in the field, the cutting shall be done such that neither the pipe nor the lining shall be damaged and such that a smooth, right angle to axis cut is made. A machine designed for this purpose shall be used for the cutting.

Unclassified Excavation: The excavation defined herein shall be deemed to include earth excavation and rock excavation.

Construction Methods (continued):

Excavation shall be made in such a manner and to such widths as will give ample room for properly installing and inspecting the pipe or structures that they are to contain and for such sheeting and bracing, pumping and draining as may be necessary. The Contractor shall not use excavating equipment that requires the trench to be excavated to an excessive width. The width of the trench for pipe shall be sufficient to allow thorough compacting of earth or gravel refill adjacent to the bottom half of the pipe. Enlargements of the trench shall be made to give ample space for required operations at the pipe joints. Hand excavation shall be employed whenever, in the opinion of the Engineer, it is necessary to protect existing structures.

The Contractor's attention is directed to the fact that pipe must have bearing on a four inch (4") minimum layer of bankrun gravel, screened gravel, or crushed stone bedding thoroughly compacted for its entire length. Special care shall be taken to excavate accurately to grade. If the trench is over-excavated, it shall be brought to grade, at the Contractor's expense, by refilling with suitable material in compacted layers, each layer not to exceed six inches (6") in thickness.

Sheeting and Bracing or Trench Box: All excavations into which workers may be caused to enter shall be protected according to OSHA 29 CFR Part 1926, Subpart P-Excavations.

Where necessary, the sides of the trenches and excavations shall be supported by adequate sheeting and bracing or trench boxes. The Contractor shall be held accountable and responsible for the sufficiency of all sheeting and bracing or trench boxes used and for all damages to persons or property resulting from the improper quality, strength, placing, maintaining, or removing of the same. When sheeting is removed, care shall be taken not to disturb the new work or existing utilities and structures. No sheeting is to be left in place unless expressly permitted by the Engineer.

Dewatering: The Contractor shall provide all necessary pumps, drains, well point systems, and other means for removing water from the trenches and other parts of the work. Before pipes are laid or structures built, the trenches and excavations shall be free from water and, if necessary, suitable drainage facilities shall be provided and maintained. Any drainage system used by the Contractor shall be subject to the approval of the Engineer. Subgrade damaged by failure to properly dewater shall be repaired at the Contractor's expense. Water from the trenches and excavations shall be disposed of in such a manner as will neither cause injury to public health nor to public or private property, nor to the work completed or in progress.

Backfilling: Unless otherwise specified or directed, all trenches and excavations shall be backfilled immediately after installation and inspection of the pipe. Selected material from excavation shall be used for backfilling trenches along and over the pipe to a level twelve inches (12") above the top of the pipe and shall be earth, sand, or well-graded gravel with a maximum size of four inches (4"). The Contractor shall use suitable material from excess excavation from other portions of the work or from approved gravel pits. It shall be carefully deposited in uniform

Construction Methods (continued):

layers not exceeding twelve inches (12") in depth, and unless otherwise permitted, each layer shall be carefully and solidly tamped with appropriate tools in such a manner as to avoid disturbing the completed work.

Backfilling for the remainder of trenches and excavations shall be approved material free from organic matter. No large stones shall be used in the trench until there is at least two feet (2') of fill over the top of the pipe or around the structure and, in depositing stone, care must be taken not to injure the pipe or structure. Stones which are used in backfilling shall be so distributed through the mass that all interstices are filled with fine material. Backfill shall be deposited in layers and solidly compacted.

Rock and miscellaneous materials from trenches and excavations may be used in the fill, provided individual pieces are not larger than one-half cubic foot in volume and that they are placed so that voids are filled with sand, gravel and earth.

Backfilling within two feet (2') of structures shall be uniformly deposited on all sides and, unless otherwise permitted, solidly compacted in such manner as to avoid injuring the structure or producing unequal pressures thereon.

When sheeting is drawn or trench boxes removed, all cavities remaining in or adjoining the trench shall be solidly filled.

Handling and Distribution of Pipe and Fittings: The pipe and fittings shall be handled and protected during loading, transporting, and unloading operations in such manner as to avoid damage. Pipe and fittings shall be unloaded by lifting with hoists or skidding so as to avoid shock or damage. Under no circumstances shall they be dropped nor shall they be permitted to roll against pipe already on the ground. Insofar as practicable, each piece of pipe shall be delivered and unloaded near the place where it is to be installed and where it will not interfere with excavation operations, traffic, or adjacent property owners and may be readily inspected by the Engineer. All damaged pipe and fittings will be rejected and such rejected pipe and fittings shall be removed from the site. In the event of slight damage to the coating or lining, the Engineer may permit the damage to be repaired at the site. Such repairs shall be made at the Contractor's expense.

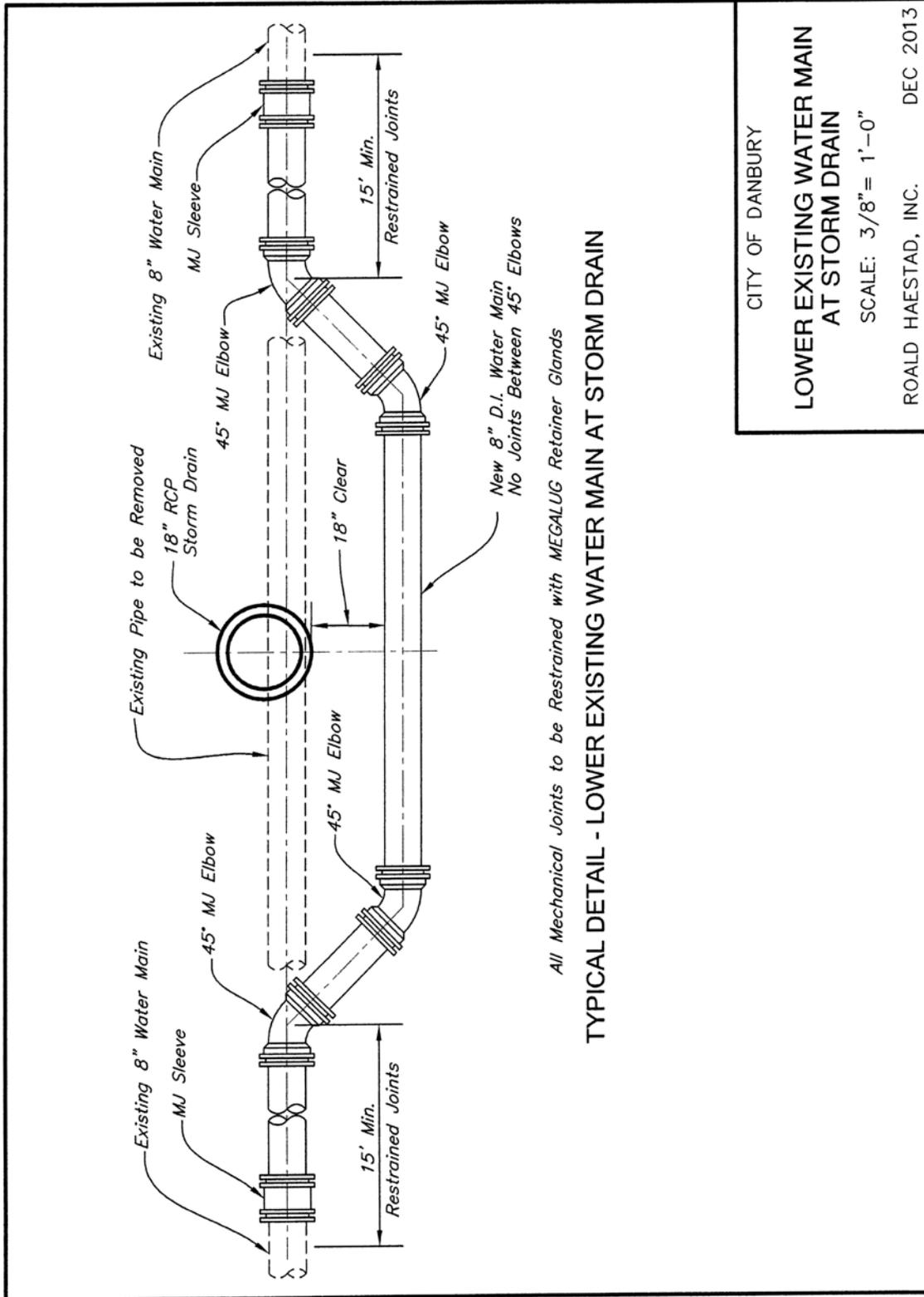
Cleaning and Inspection of Pipe and Fittings: The insides of pipes and fittings shall be thoroughly cleaned before laying and shall be kept clean until accepted in the completed work. Whenever the work is interrupted, all open ends of pipe shall be temporarily closed by water tight plugs. No trench water shall be permitted to enter the pipe. All pipe and special castings shall be carefully examined for defects and no pipe or special casting shall be laid which is known to be defective. If any such pipe or casting is discovered to be defective after placement, it shall be removed and replaced with a sound pipe or casting by the Contractor at his expense.

Method of Measurement:

The quantity to be paid for under Item #1300002A-RELOCATION OF WATER MAINS shall be the actual number of existing 8-inch water mains that are lowered or relocated as required for the installation of new storm drains. Included in each lowering or relocation shall be four 45 degree mechanical joint elbows, 8-inch ductile iron pipe, two mechanical joint solid sleeves and associated joint restraints.

Basis of Payment:

Item #1300002A-RELOCATION OF WATER MAINS will be paid for at the Contract unit price per each, which price shall include payment in full for all labor, materials, tools and equipment necessary to lower or relocate portions of the existing 8-inch water mains as required for the installation of new storm drains, complete as specified herein.



CITY OF DANBURY

**LOWER EXISTING WATER MAIN
AT STORM DRAIN**

SCALE: 3/8" = 1'-0"

ROALD HAESTAD, INC. DEC 2013

ITEM #1302053A-RESET WATERGATE

Description:

Work under Item #1302053A-RESET WATERGATE shall consist of furnishing all labor, materials (except Owner furnished materials), tools and equipment necessary to reset all valve boxes on all water valves in areas where the frames need to be reset to meet finished grade. The work of this Item shall conform to the requirements of the City of Danbury Department of Public Utilities (riser rings will not be allowed).

Materials:

None required.

Construction Methods:

Notification of City of Danbury: Forty-eight (48) hours prior to resetting valve boxes, the Contractor shall notify the City of Danbury, Department of Public Utilities, Timothy P. Nolan at (203) 797-4367 to schedule inspections of the existing valve boxes that are to be reset. If during the inspection it is determined that the existing valve boxes are broken or if they will not extend, the City will furnish new valve boxes and covers for installation by the Contractor.

Excavation and Backfilling: These items shall be as specified under # 1303196A but included for payment under this Item #1302053A-RESET WATERGATE.

Resetting of Existing Valve Boxes: In areas where existing water valve boxes need to be reset to comply with the finished grade of the final pavement surface, the Contractor shall excavate around the top section of the valve box as required to adjust it to the proper grade. Care shall be taken during excavation and resetting so as not to damage the valve box and cover.

Prior to resetting the top section of the valve box, the ground that the flange will be set on shall be thoroughly compacted to support the top section of the valve box at the proper grade. Valve boxes shall be set carefully, truly vertical, and accurately centered over the operating nut. After the top section is reset, the area around the valve box shall be thoroughly compacted.

The City will perform a final inspection to ensure all work has been completed to their satisfaction. This inspection will take place following final pavement restoration.

Method of Measurement:

The quantity to be paid for under Item #1302053A-RESET WATERGATE shall be the actual number of water valve boxes that need to be reset to meet the finished grade of the final pavement surface.

Basis of Payment:

Item #1302053A-RESET WATERGATE will be paid for at the Contract Unit price per each, which price shall include all labor, materials (except Owner furnished materials), tools and equipment necessary for excavation and backfill; resetting existing water valve boxes or Owner furnished replacement valve boxes and all other work shown or specified.

ITEM #1303196A-RELOCATE FIRE HYDRANT

Description:

Work under Item #1303196A-RELOCATE FIRE HYDRANT shall consist of furnishing, all labor, materials, tools and equipment necessary to relocate existing fire hydrants complete as shown on the Contract Drawings and specified herein. The work of this Item shall conform to the requirements of the Danbury Water Department. Relocation of the following fire hydrants are included under Item #1303196A:

- At Sta.'s 306+25, 315+15 and 317+50.

Materials:

The Contractor shall submit 10 copies of shop drawings to Roald Haestad, Inc. Consulting Engineers, 37 Brookside Road, Waterbury, Connecticut 06708 for all materials to be furnished under this item including, but not limited to pipe and hydrants.

6-Inch Ductile Iron Piping: The 6-inch piping shall be cement lined ductile iron pipe, Class 52 with mechanical joint or push-on joint ends, minimum wall thickness of 0.31 inches, and conforming to AWWA C151 latest revision.

Hydrants: Hydrants shall be 5-1/4-inch hydrants with two (2) 2-1/2-inch hose nozzles and one (1) 4-inch pumper nozzle. Hydrants shall be painted yellow and shall open left. Operating cap nuts shall be pentagonal 1-1/2-inch point to flat. Threading of the pumper nozzle shall be "National Standard". Threading for the hose nozzles shall be 8 threads to the inch. Hydrants are to be furnished with a fully bronzed waterway (bronze to bronze closing) including a bronze seat and a bronze seat ring. Connection between fire hydrant service and elbow at base of hydrant shall be six-inch (6") mechanical joint.

The Kennedy K-81D Fire Hydrant with Danbury threads and drain holes tapped for standard plugs and the Mueller Centurion Model #A423 Fire Hydrant are the City of Danbury's standards, and no substitutions will be allowed. Hydrants shall conform to AWWA C502 latest revision and all requirements of the City of Danbury requirements.

Offset Fittings: Offset fittings will only be allowed to be used to adjust the fire hydrant to finished grade when specifically approved on a case by case basis by the Danbury Engineering Department during installation of a fire hydrant assembly.

Offset fittings shall be "Gradelok" or approved equal and shall be manufactured of 350 Ductile Iron, shall be cement lined inside and tar coated outside for corrosion protection, and shall conform to AWWA C153/ANSI A21.53/AWWA C104/ANSI A21.4.

Materials (continued):

Restrained Joints: Joints shall be restrained using mechanical joint pipe and fittings with EBAA Iron, Inc. MEGALUG multiple wedging action thrust restraint glands, or using push-on joint pipe with EBAA Iron, Inc. Series 1700 restraint harnesses.

Concrete for Thrust Blocks: Concrete for thrust blocks shall contain at least 4.7 bags of cement per cubic yard. The amount of water used shall not be more than 7.0 gallons per bag of cement and less shall be used if required, depending upon the character of the aggregates, the proportion of coarse to fine materials in the aggregates, and the consistency desired for various parts of the work. Proper allowance shall be made for the moisture content in the aggregates. Portland cement shall conform to ASTM C 150, latest revision, for Type I cement. Aggregate for concrete shall conform to ASTM C 33, latest revision. Coarse aggregate shall be size No. 67. The exact proportion of water, cement, sand, and coarse aggregates shall be varied as ordered to give the best results for the aggregate used. The minimum 28-day compressive strength shall be 2,500 lbs. per square inch.

Construction Methods:

Notification of City of Danbury: Forty-eight (48) hours prior to relocation of fire hydrants, the Contractor shall notify the City of Danbury, Department of Public Utilities, Timothy P. Nolan at (203) 797-4367.

Excavation: Excavations shall be made in such a manner and to such widths as will give ample room for properly installing and inspecting the pipe or structures that they are to contain and for such sheeting and bracing, pumping and draining as may be necessary. The Contractor shall not use excavating equipment that requires the trench to be excavated to an excessive width. The width of the trench for pipe shall be sufficient to allow thorough compacting of earth or gravel refill adjacent to the bottom half of the pipe. Enlargements of the trench shall be made to give ample space for required operations at the pipe joints. Hand excavation shall be employed whenever, in the opinion of the Engineer, it is necessary to protect existing structures.

The Contractor's attention is directed to the fact that pipe must have bearing on a four inch (4") minimum layer of bankrun gravel, screened gravel, or crushed stone bedding thoroughly compacted for its entire length. Special care shall be taken to excavate accurately to grade. If the trench is over-excavated, it shall be brought to grade, at the Contractor's expense, by refilling with suitable material in compacted layers, each layer not to exceed six inches (6") in thickness.

Sheeting and Bracing or Trench Box: All excavations into which workers may be caused to enter shall be protected according to OSHA 29 CFR Part 1926, Subpart P-Excavations. Where necessary, the sides of the trenches and excavations shall be supported by adequate sheeting and bracing or trench boxes. The Contractor shall be held accountable and responsible for the

Construction Methods (continued):

sufficiency of all sheeting and bracing or trench boxes used and for all damages to persons or property resulting from the improper quality, strength, placing, maintaining, or removing of the same. When sheeting is removed, care shall be taken not to disturb the new work or existing utilities and structures. No sheeting is to be left in place unless expressly permitted by the Engineer.

Dewatering: The Contractor shall provide all necessary pumps, drains and other means for removing water from the trenches and other parts of the work. Before pipes are laid or structures built, the trenches and excavations shall be free from water and, if necessary, suitable drainage facilities shall be provided and maintained. Subgrade damaged by failure to properly dewater shall be repaired at the Contractor's expense. Water from the trenches and excavations shall be disposed of in such a manner as will neither cause injury to public health nor to public or private property, nor to the work completed or in progress.

Relocate Fire Hydrants: Where Contract Drawings call for existing hydrants to be relocated, work shall include, but not be limited to: trench excavation and backfill; removal of existing hydrants; furnishing and installing new fire hydrants, additional 6-inch ductile iron pipe, fittings and joint restraints; concrete masonry units, thrust blocks and drainage stone as required.

Hydrant installations shall conform to the Detail included with this Special Provision. Hydrants shall have their nozzles parallel with, or at right angles to the curb, with the pumper nozzle facing the curb. Hydrants must be installed with 2'-6" diameter minimum clearance to operate the hydrant valve, and 5'-0" minimum clearance both sides and front to connect fire hose. Hydrants shall rest on a flat stone or concrete masonry unit not less than four inches (4") thick and eighteen inches (18") square and shall be surrounded by 1/2 cubic yard of screened gravel. The screened gravel shall be covered with an approved filter fabric, felt paper, burlap, or canvas and the excavation carefully backfilled. A concrete masonry unit shall also be provided beneath the hydrant bottom and a concrete thrust block with a minimum bearing surface of 4 square feet shall be poured behind the hydrant. The blocks shall rest against undisturbed earth and shall not obstruct the hydrant drain. Hydrants shall be set exactly plumb at the required elevation so that the standpipe breaking ring is 3 inches above the ground surface without the use of extension sections. Offset fittings shall be used to adjust the fire hydrants to finished grade as approved by the Danbury Engineering Department.

All mechanical joints in hydrant leads shall have ductile iron restraint glands and all push-on joints in hydrant leads shall have push-on joint restraint harnesses. Restraint glands and restraint harnesses shall be installed in strict accordance with the manufacturer's instructions.

Existing protective bollards shall be replaced in kind.

Construction Methods (continued):

Disinfection and Testing: As the hydrant relocations will not be disinfected, the interior of all piping shall be swabbed or sprayed with a 1% hypochlorite solution in accordance with Section 4.7 of AWWA C651 prior to installation. After the connections are made, the connecting piping shall be subject to the normal working pressure and all joints checked for leaks prior to backfilling.

Backfilling: Unless otherwise specified or directed, all trenches and excavations shall be backfilled immediately after installation and inspection of the pipe. Selected material from excavation shall be used for backfilling trenches along and over the pipe to a level twelve inches (12") above the top of the pipe and shall be earth, sand, or well-graded gravel with a maximum size of four inches (4"). The Contractor shall use suitable material from excess excavation from other portions of the work or from approved gravel pits. It shall be carefully deposited in uniform layers not exceeding twelve inches (12") in depth, and unless otherwise permitted, each layer shall be carefully and solidly tamped with appropriate tools in such a manner as to avoid disturbing the completed work.

Backfilling for the remainder of trenches and excavations shall be approved material free from organic matter. No large stones shall be used in the trench until there is at least two feet (2') of fill over the top of the pipe or around the structure and, in depositing stone, care must be taken not to injure the pipe or structure. Stones which are used in backfilling shall be so distributed through the mass that all interstices are filled with fine material. Backfill shall be deposited in layers and solidly compacted.

Rock and miscellaneous materials from trenches and excavations may be used in the fill, provided individual pieces are not larger than one-half cubic foot in volume and that they are placed so that voids are filled with sand, gravel, and earth.

Operation of Valves: Existing water valves shall not be operated by the Contractor. Whenever the operation of a valve is necessary, the Contractor shall make arrangements, at least 48 hours in advance of the need, to have the Danbury Water Department forces perform the required operations.

The Danbury Water Department does not guarantee that all existing water valves will close tight or are operable. Some leakage through existing valves can be expected. If leakage through a closed valve is sufficient to interfere with the work, the Danbury Water Department will make the necessary repairs or replacement.

Method of Measurement:

Item #1303196A-RELOCATE FIRE HYDRANT will be measured for payment as the actual number of fire hydrants that are relocated as shown on the Contract Drawings and specified herein, or as directed by the Engineer.

Basis of Payment:

Item #1303196A-RELOCATE FIRE HYDRANT will be paid for at the Contract Unit Price each complete and accepted, which price shall include all materials, equipment, tools, labor and incidentals necessary to complete the work including: trench excavation; backfill; removing existing hydrant; furnishing and installing new hydrant, additional 6-inch ductile iron pipe, offset if required, mechanical joint restraint glands, push-on pipe joint restraint harnesses, connecting sleeves, drainage stone, and thrust block; disinfection and testing.

ITEM #1304025A-RESET MANHOLE (WATER)

Description:

Work under Item #1304025A-RESET MANHOLE (WATER) shall consist of furnishing all labor, materials (except Owner furnished materials), tools and equipment necessary to reset the frame and cover on existing water valve manholes in areas where the frames need to be reset to meet finished grade. The work of this Item shall conform to the requirements of the City of Danbury Department of Public Utilities (riser rings will not be allowed).

Materials:

Brick: Brick shall be hard burned sewer brick or concrete brick conforming to the requirements of the standard Specification for Clay Sewer Brick of the ASTM Serial Designation C32, latest revision, Grade SS; or standard specification for Concrete Building Brick of the ASTM Serial Designation C55, latest revision, Grade N.

Cement Mortar: All cement mortar used in the work, unless otherwise specified, shall be of one volume of cement and two volumes of sand. Lime shall not be used in the mortar.

Manhole Steps: Steps shall be made of copolymer polypropylene plastic molded around a #4 grade 60 reinforcing bar. Polypropylene plastic molded steps shall be "Safety Green" phosphorescent Model No. PS2-PF-SL as manufactured by M. A. Industries, Inc., 14" copolymer polypropylene step-part # P-14850 with built-in reflectors as manufactured by Lane International Corporation, or approved equal.

Construction Methods:

Notification of City of Danbury: Forty-eight (48) hours prior to resetting manhole frames and covers, the Contractor shall notify the City of Danbury, Department of Public Utilities, Timothy P. Nolan at (203) 797-4367 to schedule inspections of the existing manhole frames and covers that are to be reset. If during the inspection it is determined that the existing frames and covers are broken or worn to the point that they should be replaced, the City will furnish new frames and covers for installation by the Contractor.

Excavation and Backfilling: These items shall be as specified under # 1303196A but included for payment under this Item #1304025A-RESET MANHOLE (WATER).

Removal and Resetting of Existing Frames and Covers: The existing frames and covers shall be removed in areas where the water valve manhole frames need to be reset to comply with the finished grade of the final pavement surface. Care shall be taken so as not to damage the frames or covers during removal and resetting.

Construction Methods: (continued)

Manhole frames, in general, are supported on concrete brick masonry stacks or concrete grading rings not over 12" nor less than 4" in height, constructed on cone sections or slab tops. The Contractor shall adjust the height of the stack as is necessary to bring the manhole frame to the proper grade. Manhole steps shall be set into masonry stacks as required to maintain 12" vertical spacing. See details on pages 3 and 4 of Item #1403501A.

Cement mortar shall be mixed in a suitable box or mortar pan. The cement and sand shall be thoroughly mixed dry until the mixture has a uniform color. Water shall then be added and the mass worked until a mortar which is uniform and of the required consistency is produced. Mortar shall be mixed in no greater quantity than is required for the work in progress, and any that sets sufficiently to require retempering shall not be used.

Brick shall be laid in a neat and workmanlike manner. The manhole frame shall be firmly set and bonded to the masonry as required to conform with the finished grade.

The City will perform a final inspection to ensure all work has been completed to their satisfaction. This inspection will take place following final pavement restoration.

Method of Measurement:

The quantity to be paid for under Item #1304025A-RESET MANHOLE (WATER) shall be the actual number of water valve manhole frames that need to be reset to meet the finished grade of the final pavement surface.

Basis of Payment:

Item #1304025A-RESET MANHOLE (WATER) will be paid for at the Contract Unit price per each, which price shall include all labor, materials (except Owner furnished materials), tools and equipment necessary for excavation and backfill; removal and resetting of the existing manhole frame and cover or Owner furnished replacement frame and cover; adjusting the height of the masonry stack; furnishing and installing additional manhole steps and all other work shown or specified.

ITEM #1401243A - 10" DUCTILE IRON PIPE (SANITARY SEWER)**Description:**

Work under Item #1401243A-10" DUCTILE IRON PIPE (SANITARY SEWER) shall consist of furnishing, all labor, materials, tools and equipment necessary to furnish and install 10-inch ductile iron sanitary sewer as required to replace portions of the vitrified clay sanitary sewer, if required, to provide adequate clearance between the existing sanitary sewer and new storm drains in the vicinity of Sta. 308+30. The work of this Item shall conform to the requirements of the Danbury Public Utilities Department.

Materials:

The Contractor shall submit 10 copies of shop drawings to Roald Haestad, Inc. Consulting Engineers, 37 Brookside Road, Waterbury, Connecticut 06708 for all materials to be furnished under this item including, but not limited to pipe and couplings.

Ductile Iron Pipe: Pipe shall be Class 52 ductile iron pipe as manufactured by Atlantic States Pipe Co., U.S. Pipe Co., Griffin Pipe Company or an approved equal. Pipe joints shall be push-on joint. Ductile iron pipe shall conform in all respects, except for ends, to ANSI A21.51 (AWWA C151), latest editions. Pipe ends shall conform to ANSI A21.11 (AWWA C111), latest editions.

All pipe shall be furnished with a bituminous sealcoat, double thickness, cement mortar lining in accordance with ANSI A21.4 (AWWA C104), latest revision, and an exterior bituminous coating. Coating that is damaged during shipment or placement shall be touched up in the field with two (2) coats of an asphaltic coating fully resistant to water and chemicals.

Couplings: Couplings shall be transition couplings to accommodate connections between the existing vitrified clay pipe and the new ductile iron pipe. Couplings shall be as manufactured by Fernco or an approved equal.

Bedding Material: Bedding material shall consist of bankrun gravel, screened gravel, or crushed stone fill. Bankrun gravel, as defined herein, shall be gravel of such size that 100% passes a sieve having 2" square openings and shall be reasonably uniform, graded down to the 100 mesh sieve size. It shall not contain vegetation or masses of roots and shall be substantially free from loam and other organic matter, clay, and other fine or harmful substances. Screened gravel shall be well graded in size, from 1/2" to the 100 mesh sieve size.

Construction Methods:

Notification of City of Danbury: Forty-eight (48) hours prior to bypassing the sewer, the Contractor shall notify the City of Danbury, Department of Public Utilities, Timothy P. Nolan at (203) 797-4367.

Excavation: Excavations shall be made in such a manner and to such widths as will give ample room for properly installing and inspecting the pipe or structures that they are to contain and for such sheeting and bracing, pumping and draining as may be necessary. The Contractor shall not use excavating equipment that requires the trench to be excavated to an excessive width. The width of the trench for pipe shall be sufficient to allow thorough compacting of earth or gravel refill adjacent to the bottom half of the pipe. Enlargements of the trench shall be made to give ample space for required operations at the pipe joints. Hand excavation shall be employed whenever, in the opinion of the Engineer, it is necessary to protect existing structures.

The Contractor's attention is directed to the fact that pipe must have bearing on a four inch (4") minimum layer of bankrun gravel, screened gravel, or crushed stone bedding thoroughly compacted for its entire length. Special care shall be taken to excavate accurately to grade. If the trench is over-excavated, it shall be brought to grade, at the Contractor's expense, by refilling with suitable material in compacted layers, each layer not to exceed six inches (6") in thickness.

Sheeting and Bracing or Trench Box: All excavations into which workers may be caused to enter shall be protected according to OSHA 29 CFR Part 1926, Subpart P-Excavations. Where necessary, the sides of the trenches and excavations shall be supported by adequate sheeting and bracing or trench boxes. The Contractor shall be held accountable and responsible for the sufficiency of all sheeting and bracing or trench boxes used and for all damages to persons or property resulting from the improper quality, strength, placing, maintaining, or removing of the same. When sheeting is removed, care shall be taken not to disturb the new work or existing utilities and structures. No sheeting is to be left in place unless expressly permitted by the Engineer.

Dewatering: The Contractor shall provide all necessary pumps, drains and other means for removing water from the trenches and other parts of the work. Before pipes are laid or structures built, the trenches and excavations shall be free from water and, if necessary, suitable drainage facilities shall be provided and maintained. Subgrade damaged by failure to properly dewater shall be repaired at the Contractor's expense. Water from the trenches and excavations shall be disposed of in such a manner as will neither cause injury to public health nor to public or private property, nor to the work completed or in progress.

Bypass Pumping and Removal of Existing Sanitary Sewer: The Contractor shall be fully responsible for maintaining sewage flows as required to allow for removal of a portion of the existing sanitary sewer at the proposed storm drains. The Contractor shall submit his plan for maintaining sewage flows to the Engineer for approval.

Construction Methods (continued):

Where pipes are disconnected or removed, temporary service must be promptly installed. Sewage flow must be maintained throughout the construction period. The Contractor shall provide adequate temporary pumps and piping necessary to insure that all sanitary sewage is properly discharged as the work proceeds. The Contractor shall take all precautions to prevent backups, and he shall be responsible for all backups of sewage into buildings, streets, or any other area outside of the sewer.

During removal of the pipe, care shall be taken so as not to damage existing pipe that is to remain.

Laying Ductile Iron Pipe: Ductile iron pipe shall be laid at the grade of the existing vitrified clay sanitary sewer. Pipe joints shall straddle the proposed storm drain so that the bells of the pipe are outside the limits of the storm drains.

After the pipe is laid in the trench, the spigot end shall be centered in the bell and forced home. Under no circumstances shall pipe be laid where there is water in the trench. The Contractor shall install and joint the pipe in accordance with the manufacturer's instructions. When necessary to cut pipe in the field, the cutting shall be done such that neither the pipe nor the lining shall be damaged and such that a smooth, right angle to axis cut is made. A machine designed for this purpose shall be used for the cutting.

Connections between the existing vitrified clay pipe and the new ductile iron pipe shall be made using a transition coupling installed in strict accordance with the manufacturer's instructions.

Backfilling: Unless otherwise specified or directed, all trenches and excavations shall be backfilled immediately after installation and inspection of the pipe. Selected material from excavation shall be used for backfilling trenches along and over the pipe to a level twelve inches (12") above the top of the pipe and shall be earth, sand, or well-graded gravel with a maximum size of four inches (4"). The Contractor shall use suitable material from excess excavation from other portions of the work or from approved gravel pits. It shall be carefully deposited in uniform layers not exceeding twelve inches (12") in depth, and unless otherwise permitted, each layer shall be carefully and solidly tamped with appropriate tools in such a manner as to avoid disturbing the completed work.

Backfilling for the remainder of trenches and excavations shall be approved material free from organic matter. No large stones shall be used in the trench until there is at least two feet (2') of fill over the top of the pipe or around the structure and, in depositing stone, care must be taken not to injure the pipe or structure. Stones which are used in backfilling shall be so distributed through the mass that all interstices are filled with fine material. Backfill shall be deposited in layers and solidly compacted.

Construction Methods (continued):

Rock and miscellaneous materials from trenches and excavations may be used in the fill, provided individual pieces are not larger than one-half cubic foot in volume and that they are placed so that voids are filled with sand, gravel, and earth.

Method of Measurement:

The quantity to be paid for under Item #1401243A-10" DUCTILE IRON PIPE (SANITARY SEWER) shall be the actual number of linear feet of new 10-inch sanitary sewer furnished and installed as required to replace portions of the vitrified clay sanitary sewer if required to provide adequate clearance between the existing sanitary sewer and new storm drains in the vicinity of Sta. 308+30.

Basis of Payment:

Item #1401243A-10" DUCTILE IRON PIPE (SANITARY SEWER) will be paid for at the Contract Unit price per linear foot, which price shall include all labor, materials, tools and equipment necessary for excavation and backfill; sheeting and shoring; dewatering; bypass pumping and removal of existing pipe; furnishing and installing pipe and couplings; furnishing and placing gravel or screened gravel bedding; and all other work shown or specified.

ITEM #1403501A-RESET MANHOLE (SANITARY SEWER)

Description:

Work under Item #1403501A-RESET MANHOLE (SANITARY SEWER) shall consist of furnishing all labor, materials (except Owner furnished materials), tools and equipment necessary to reset the frame and cover on existing sanitary sewer manholes in areas where the frames need to be reset to meet finished grade. The work of this Item shall conform to the requirements of the City of Danbury Department of Public Utilities (riser rings will not be allowed).

Materials:

Brick: Brick shall be hard burned sewer brick or concrete brick conforming to the requirements of the standard Specification for Clay Sewer Brick of the ASTM Serial Designation C32, latest revision, Grade SS; or standard specification for Concrete Building Brick of the ASTM Serial Designation C55, latest revision, Grade N.

Cement Mortar: All cement mortar used in the work, unless otherwise specified, shall be of one volume of cement and two volumes of sand. Lime shall not be used in the mortar.

Manhole Steps: Steps shall be made of copolymer polypropylene plastic molded around a #4 grade 60 reinforcing bar. Polypropylene plastic molded steps shall be "Safety Green" phosphorescent Model No. PS2-PF-SL as manufactured by M. A. Industries, Inc., 14" copolymer polypropylene step-part # P-14850 with built-in reflectors as manufactured by Lane International Corporation, or approved equal.

Construction Methods:

Notification of City of Danbury: Forty-eight (48) hours prior to resetting manhole frames and covers, the Contractor shall notify the City of Danbury, Department of Public Utilities, Timothy P. Nolan at (203) 797-4367 to schedule inspections of the existing manhole frames and covers that are to be reset. If during the inspection it is determined that the existing frames and covers are broken or worn to the point that they should be replaced, the City will furnish new frames and covers for installation by the Contractor.

Excavation and Backfilling: These items shall be as specified under # 1303196A but included for payment under this Item #1403501A-RESET MANHOLE (SANITARY SEWER).

Removal and Resetting of Existing Frames and Covers: The existing frames and covers shall be removed in areas where the sanitary sewer manhole frames need to be reset to comply with the finished grade of the final pavement surface. Care shall be taken so as not to damage the frame or cover during removal and resetting.

Construction Methods (continued):

Manhole frames, in general, are supported on concrete brick masonry stacks or concrete grading rings not over 12" nor less than 4" in height, constructed on cone sections or slab tops. The Contractor shall adjust the height of the stack as is necessary to bring the manhole frame to the proper grade. Manhole steps shall be set into masonry stacks as required to maintain 12" vertical spacing. See details on pages 3 and 4 of Item #1403501A.

Cement mortar shall be mixed in a suitable box or mortar pan. The cement and sand shall be thoroughly mixed dry until the mixture has a uniform color. Water shall then be added and the mass worked until a mortar which is uniform and of the required consistency is produced. Mortar shall be mixed in no greater quantity than is required for the work in progress, and any that sets sufficiently to require retempering shall not be used.

Brick shall be laid in a neat and workmanlike manner. The manhole frame shall be firmly set and bonded to the masonry as required to conform with the finished grade.

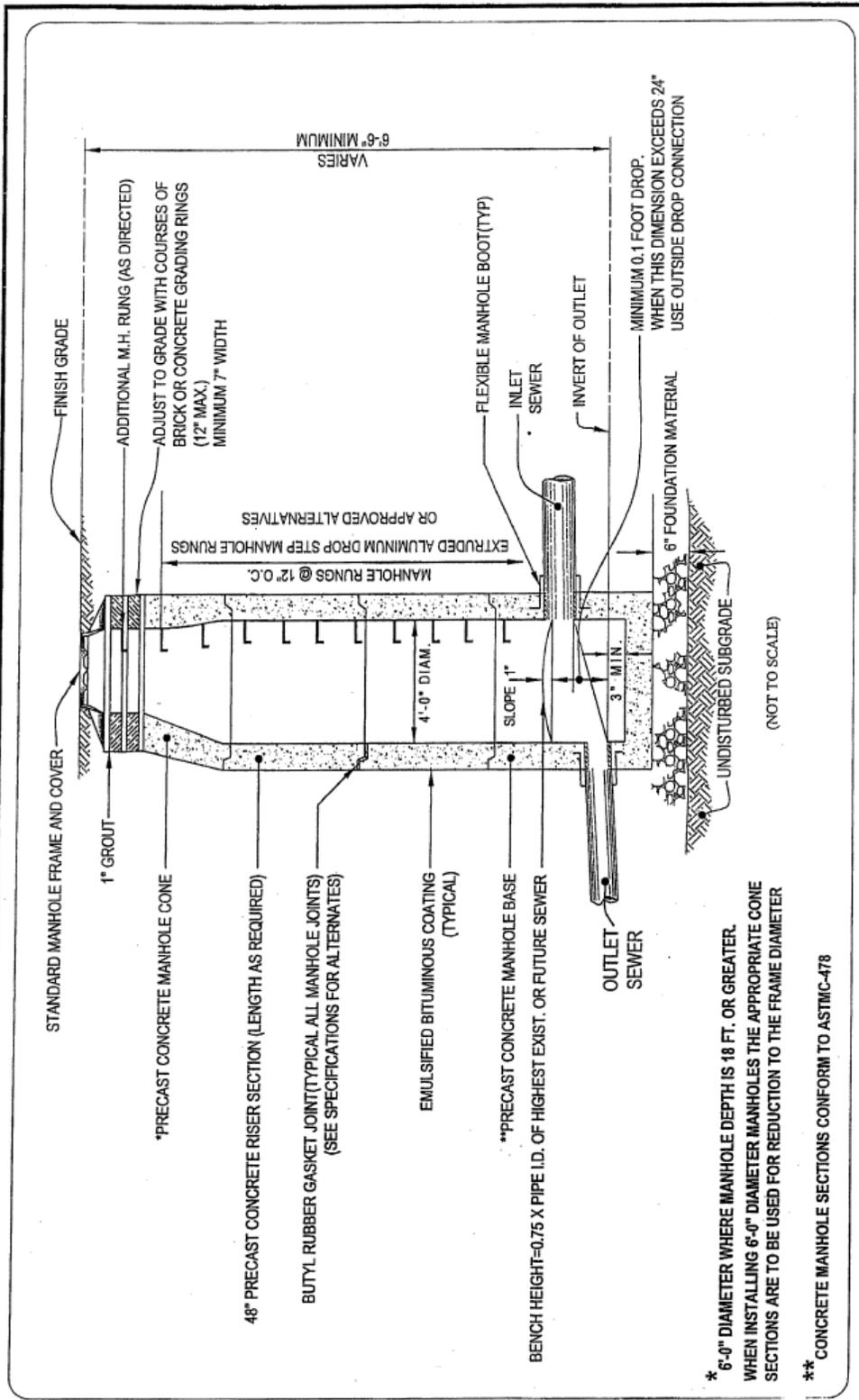
The City will perform a final inspection to ensure all work has been completed to their satisfaction. This inspection will take place following final pavement restoration.

Method of Measurement:

The quantity to be paid for under Item #1403501A-RESET MANHOLE (SANITARY SEWER) shall be the actual number of sanitary sewer manhole frames that need to be reset to meet the finished grade of the final pavement surface.

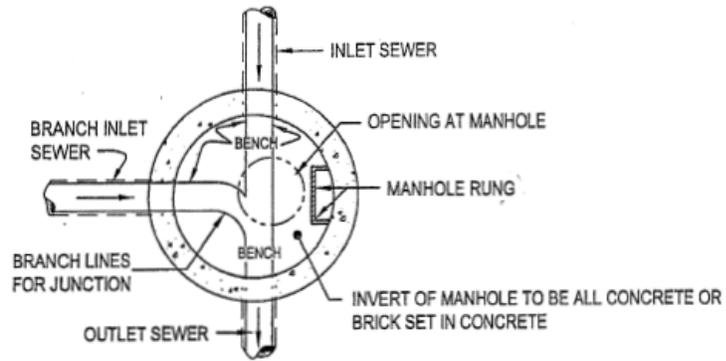
Basis of Payment:

Item #1403501A-RESET MANHOLE (SANITARY SEWER) will be paid for at the Contract Unit price per each, which price shall include all labor, materials (except Owner furnished materials), tools and equipment necessary for excavation and backfill; removal and resetting of the existing manhole frame and cover or Owner furnished replacement frame and cover; adjusting the height of the masonry stack; furnishing and installing additional manhole steps and all other work shown or specified.

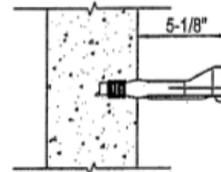
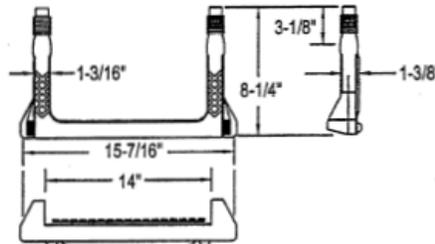


REVISIONS	
NO.	DATE COMMENTS
1	3/13/2012

CITY OF DANBURY ENGINEERING DIVISION	SANITARY SEWER SECTION STANDARD MANHOLE DETAIL
CHECKED BY: D.W.N.	DRAWN BY: P.J.T.



PLAN SECTION
STANDARD MANHOLE



MANHOLE STEPS FOR
CONCRETE STRUCTURES

(NOT TO SCALE)

ALTERNATIVES:

I. M.A. INDUSTRIES, INC.
MODEL NO. PS2-PFSL
CO POLYMER POLYPROPYLENE
PLASTIC COATED 1/2"
GRADE 60 STEEL REINFORCEMENT
WITH REFLECTOR.

II. PRESS-SEAL GASKET CORP.
STEEL REINFORCED,
CO POLYMER POLYPROPYLENE,
14" MANHOLE SAFETY STEP
PART # P-14850 WITH REFLECTOR.

* ALL RUNGS/STEPS ARE TO BE FACTORY INSTALLED IN NEW MANHOLES

REVISIONS		
No.	DATE	COMMENTS
1	6/5/2012	

CITY OF DANBURY
ENGINEERING
DIVISION

SANITARY SEWER
STANDARD MANHOLE
RUNG/STEP

CHECKED BY: D.W.N.

DRAWN BY: P.J.T.

ITEM #1700001A – SERVICE CONNECTIONS (ESTIMATED COST)

Description: This work shall consist of disconnection, alteration and reconnection of those existing utility services owned by property owners at locations necessary to complete this project and as ordered by the Engineer. This work shall include the coordination with the affected utility companies and customers. Any damage caused by the Contractor or Subcontractors, as determined by the Engineer, shall be corrected by the Contractor in accordance with this specification.

Materials: All materials shall be provided by the Contractor and shall meet the current standards of the affected service.

Construction Methods: The Contractor shall perform all work in coordination with the Utility Company and affected property owner and as directed by the Engineer. Certain work may require use of a licensed and/or certified tradesman when such work is required by local and/or state codes.

Any utility customer's service interruption shall be done in a way that minimizes adverse impacts to the customer and affected utility.

Any work and materials supplied by the utility companies shall be on a billable basis to the Contractor.

Method of Measurement: The work and materials shall be measured for payment as provided for under Article 1.04.05 Extra Work.

The sum of money shown on the estimate and in the itemized proposal as "Estimated Cost" for this work will be considered the price bid even though payment will be made only for actual work performed. The estimated cost figure is not to be altered in any manner by the bidder. Should the bidder alter the amount shown, the altered figure will be disregarded and the original price will be used to determine the total amount for the contract.

Corrective work required to repair damage caused by the Contractor or its Subcontractors shall not be measured for payment.

Basis of Payment: This work will be paid as Extra Work.

Pay Item
Service Connections (Estimated Cost)

Pay Unit
Estimated Cost

ITEM #1803071A - TYPE B IMPACT ATTENUATION SYSTEM
(TANGENTIAL)

Description: This item shall consist of furnishing and installing an impact attenuation system for use as a metal beam rail terminal where shown on the design plans, in accordance with the Manufacturer's details and specifications including reflective sheeting for delineation.

Performance Criteria: This attenuation system shall be a crash tested device having approval in writing from FHWA conforming to the requirements in National Cooperative Highway Research Program (NCHRP) Report 350 or the AASHTO Manual for Assessing Safety Hardware (MASH) as applicable.

Materials: The materials shall conform to the following requirements:

- 1) The material for the posts for this system shall be steel. All material shall meet the Manufacturer's specification for the latest version of a Tangential system chosen from the Department's Qualified Products List.
- 2) The Contractor shall submit a material certificate or certificate of compliance for each system supplied as defined in Article 1.06.07.
- 3) A Type III reflective sheeting shall be provided in conformance with Subarticle M18.09.01 and Connecticut Traffic Standard Sheet TR-1205_01, Sign #50-5032 or as provided by the Manufacturer.

Construction Methods: The impact attenuation system shall be installed in a neat and workman like manner at the location(s) shown on the plans and constructed in conformance with the Manufacturer's details. The reflective sheeting shall be installed on the nose of the impact attenuation system.

Failure to comply: In the event that, in the judgment of the Engineer, the Impact Attenuation system is not maintained adequately and/or safely on any part of the project, or the Contractor does not move or relocate traffic control devices to meet construction requirements for the safety of the traveling public when directed to do so by the Engineer, on any day, the sum of \$1500.00 per day will be deducted from any money due the Contractor as a charge for failure to comply with this specification.

Method of Measurement: This work shall be measured for payment by the number of each system installed as shown on the plans, conforming to the details and specifications and as accepted by the Engineer.

Basis of Payment: The impact attenuation system will be paid for at the Contract unit price for each "Type B Impact Attenuation System (Tangential)" chosen from the Department's Qualified Products List. This price shall include all materials, excavation, transition section, reflective sheeting, site preparation, transportation, and removal of surplus material, equipment, tools and labor incidental to complete the installation.

Pay Item	Pay Unit
Type B Impact Attenuation System (Tangential)	Each