

## **TABLE OF CONTENTS OF SPECIAL PROVISIONS**

Note: This Table of Contents 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 Table of Contents shall not be considered part of the contract.

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**JANUARY 14, 2015**

**FEDERAL AID PROJECT NO'S. 1042(124), 1042(125), 0032(193) & 1042(126)**

**STATE PROJECT NO'S. 0042-0204, 0042-0305, 0042-0310 & 0042-0316**

**(Project No. 42-304)**

**Replacement of Bridge No. 02374: SR 500 TR 805 over I-84 Connector**

**(Project No. 42-305)**

**Rehabilitation of Bridge No. 02375: SR 500 TR 801 over I-84 eastbound and I-84 Connector**

**(Project No. 42-310)**

**Rehabilitation of Bridge No. 02368A: Route 2 Westbound over I-84 Eastbound and I-84 Connector**

**(Project No. 42-316)**

**Rehabilitation of Bridge No. 02376: I-84 TR 831 over I-84 eastbound**

City of East Hartford  
Federal Aid Project No's. 1042(124), 1042(125), 0032(193) & 1042(126)

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 July 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 Replacement of Bridge No. 02374: SR 500 TR 805 over I-84 Connector, Rehabilitation of Bridge No. 02375: SR 500 TR 801 over I-84 Eastbound and I-84 Connector, Rehabilitation of Bridge No. 02368A: Route 2 Westbound over I-84 Eastbound and I-84 Connector and Rehabilitation of Bridge No. 02376: I-84 TR 831 over I-84 Eastbound in the City of East Hartford.

## **COMBINED PROJECTS**

There will be but one Contract for:

Federal Aid Project No. 1042(124) (State Project No. 0042-0304),  
Federal Aid Project No. 1042(125) (State Project No. 0042-0305),  
Federal Aid Project No. 0032(193) (State Project No. 0042-0310) and  
Federal Aid Project No. 1042(126) (State Project No. 0042-0316).

The four projects will be considered as a single contract in all respects.

## **CONTRACT TIME AND LIQUIDATED DAMAGES**

For State Project No. 42-304, State Project No. 42-305, State Project No. 42-310 and State Project No. 42-316, the Notice to Proceed with the work will be issued no later than 30 days after the Award. The project must be completed no later than November 30, 2016.

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 **three (3) assessments for liquidated damages** and they will be addressed in the following manner:

1. **The First Liquidated Damage:**

For this contract, liquidated damages will be assessed at a rate of **Three Thousand Four Hundred (\$3,400.00)** Dollars per day, for each calendar day that the work is not completed in excess of the November 30, 2016 completion date. These liquidated damages will be assessed independently, and in addition to any liquidated damages assessed for exceeding the allowable detour periods.

2. **The Second Liquidated Damage:**

**IMS Equipment Installation** - For this Contract, an assessment per day for liquidated damages, at a rate of **Two Thousand Dollars (\$2,000.00)** per day shall

be applied to each calendar day that the CCTV Cameras are not operational. The CCTV Camera Sites included in this Contract are the following:

- (Existing) CCTV Camera Site No. 21 (I-84 EB at Bridge No. 02375)

The contractor shall refer to the “Notice to Contractor – IMS Installation Qualifications”, “Notice to Contractor – IMS Installation” and “Item No. 11122250A - Equipment Operations” special provisions for terms and conditions.

3. **The Third Liquidated Damage:**

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.

**LIQUIDATED DAMAGES PER HOUR**

**Route 2 Eastbound**

2 Lane Section (MP 0.00 – MP 0.50)		
If Working Periods Extends Into	A.M. 1 Lane Closure	P.M. 1 Lane Closure
1st Hour of Restrictive Period	\$ 500	\$ 500
2nd Hour of Restrictive Period	\$ 500	\$ 9,000
3rd Hour or any Subsequent Hour of Restrictive Period	\$ 500	\$ 2,000

**Route 2 Eastbound**

2 Lane Section (MP 0.71 – MP 0.93)		
If Working Periods Extends Into	A.M. 1 Lane Closure	P.M. 1 Lane Closure
1st Hour of Restrictive Period	\$ 500	\$ 8,000
2nd Hour of Restrictive Period	\$ 500	\$ 35,000
3rd Hour or any Subsequent Hour of Restrictive Period	\$ 500	\$ 50,000

**Route 2 Eastbound**

3 Lane Section (MP 0.93 – MP 1.49)			
If Working Periods Extends Into	A.M. 1 Lane Closure	A.M. 2 Lane Closure	P.M. 1 Lane Closure
1st Hour of Restrictive Period	\$ 500	\$ 500	\$ 500
2nd Hour of Restrictive Period	\$ 500	\$ 2,000	\$ 9,000
3rd Hour or any Subsequent Hour of Restrictive Period	\$ 500	\$ 7,000	\$ 15,000

**Route 2 Eastbound**

2 Lane Section (MP 1.49 – MP 5.31)	
If Working Periods Extends Into	A.M. 1 Lane Closure
1st Hour of Restrictive Period	\$ 500
2nd Hour of Restrictive Period	\$ 3,000
3rd Hour or any Subsequent Hour of Restrictive Period	\$ 9,000

**Route 2 Westbound**

2 Lane Section (MP 0.00 – MP 0.46)		
If Working Periods Extends Into	A.M. 1 Lane Closure	P.M. 1 Lane Closure
1st Hour of Restrictive Period	\$ 5,000	\$ 500
2nd Hour of Restrictive Period	\$ 15,000	\$ 500
3rd Hour or any Subsequent Hour of Restrictive Period	\$ 30,000	\$ 500

**Route 2 Westbound**

3 Lane Section (MP 0.92 – MP 1.85)			
If Working Periods Extends Into	A.M. 1 Lane Closure	A.M. 2 Lane Closure	P.M. 1 Lane Closure
1st Hour of Restrictive Period	\$ 500	\$ 10,000	\$ 500
2nd Hour of Restrictive Period	\$ 2,000	\$ 50,000	\$ 500
3rd Hour or any Subsequent Hour of Restrictive Period	\$ 2,000	\$ 90,000	\$ 500

**Route 2 Westbound**

2 Lane Section (MP 1.85 – MP 5.33)	
If Working Periods Extends Into	A.M. 1 Lane Closure
1st Hour of Restrictive Period	\$ 60,000
2nd Hour of Restrictive Period	\$ 100,000
3rd Hour or any Subsequent Hour of Restrictive Period	\$ 100,000

**I-84 Eastbound**

2 Lane Section (MP 62.07 – MP 62.58)	
If Working Periods Extends Into	A.M. 1 Lane Closure
1st Hour of Restrictive Period	\$ 9,000
2nd Hour of Restrictive Period	\$ 40,000
3rd Hour or any Subsequent Hour of Restrictive Period	\$ 70,000

**I-84 Eastbound**

3 Lane Section (MP 62.58 – MP 62.84)		
If Working Periods Extends Into	A.M. 1 Lane Closure	A.M. 2 Lane Closure
1st Hour of Restrictive Period	\$ 500	\$ 20,000
2nd Hour of Restrictive Period	\$ 7,000	\$ 80,000
3rd Hour or any Subsequent Hour of Restrictive Period	\$ 15,000	\$ 100,000

**I-84 Eastbound**

2 Lane Section (MP 62.84 – MP 63.18)	
If Working Periods Extends Into	A.M. 1 Lane Closure
1st Hour of Restrictive Period	\$ 20,000
2nd Hour of Restrictive Period	\$ 80,000
3rd Hour or any Subsequent Hour of Restrictive Period	\$ 100,000

**I-84 Eastbound**

2 Lane Section (MP 63.18 – MP 63.67)	
If Working Periods Extends Into	A.M. 1 Lane Closure
1st Hour of Restrictive Period	\$ 500
2nd Hour of Restrictive Period	\$ 500
3rd Hour or any Subsequent Hour of Restrictive Period	\$ 500

**I-84 Westbound**

2 Lane Section (MP 63.05 – MP 63.46)	
If Working Periods Extends Into	A.M. 1 Lane Closure
1st Hour of Restrictive Period	\$ 15,000
2nd Hour of Restrictive Period	\$ 90,000
3rd Hour or any Subsequent Hour of Restrictive Period	\$ 100,000

**I-84 Westbound**

4 Lane Section (MP 63.46 – MP 64.08)					
If Working Periods Extends Into	A.M. 1 Lane Closure	A.M. 2 Lane Closure	A.M. 3 Lane Closure	P.M. 1 Lane Closure	P.M. 2 Lane Closure
1st Hour of Restrictive Period	\$ 500	\$ 3,000	\$ 20,000	\$ 500	\$ 2,000
2nd Hour of Restrictive Period	\$ 500	\$ 20,000	\$ 100,000	\$ 500	\$ 4,000
3rd Hour or any Subsequent Hour of Restrictive Period	\$ 500	\$ 40,000	\$ 100,000	\$ 500	\$ 3,000

**I-84 Westbound**

3 Lane Section (MP 64.08 – MP 64.73)			
If Working Periods Extends Into	A.M. 1 Lane Closure	A.M. 2 Lane Closure	P.M. 1 Lane Closure
1st Hour of Restrictive Period	\$ 500	\$ 10,000	\$ 500
2nd Hour of Restrictive Period	\$ 6,000	\$ 60,000	\$ 500
3rd Hour or any Subsequent Hour of Restrictive Period	\$ 10,000	\$ 100,000	\$ 500

**I-84 Westbound**

4 Lane Section (MP 64.73 – MP 66.44)					
If Working Periods Extends Into	A.M. 1 Lane Closure	A.M. 2 Lane Closure	A.M. 3 Lane Closure	P.M. 1 Lane Closure	P.M. 2 Lane Closure
1st Hour of Restrictive Period	\$ 500	\$ 500	\$ 10,000	\$ 500	\$ 500
2nd Hour of Restrictive Period	\$ 500	\$ 15,000	\$ 70,000	\$ 500	\$ 500
3rd Hour or any Subsequent Hour of Restrictive Period	\$ 500	\$ 35,000	\$ 100,000	\$ 500	\$ 500

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

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

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

## **NOTICE TO CONTRACTOR – SITE NUMBERS**

The proposed work on bridge structures included in this contract are assigned the following site designations:

- Site No. 1 – Replacement of Bridge No. 02374: SR 500 TR 805 over I-84 Connector (Project No. 42-304)
- Site No. 2 – Rehabilitation of Bridge No. 02375: SR 500 TR 801 over I-84 eastbound and I-84 Connector (Project No. 42-305)
- Site No. 3 – Rehabilitation of Bridge No. 02376: I-84 TR 831 over I-84 eastbound (Project No. 42-316)
- Site No. 4 – Rehabilitation of Bridge No. 02368A: Route 2 Westbound over I-84 Eastbound and I-84 Connector (Project No. 42-310)

## **NOTICE TO CONTRACTOR – PRE-BID QUESTIONS AND ANSWERS**

Questions pertaining to DOT advertised construction projects must be presented through the CTDOT Pre-Bid Q and A Website. The Department cannot guarantee that all questions will be answered prior to the bid date. **PLEASE NOTE - at 12:01 am, the day before the bid, the subject project(s) being bid will be removed from the Q and A Website, Projects Advertised Section, at which time questions can no longer be submitted through the Q and A Website. At this time, the Q and A for those projects will be considered final, unless otherwise stated and/or the bid is postponed to a future date and time to allow for further questions and answers to be posted.**

If a question needs to be asked the day before the bid date, please contact the Contracts Unit staff and email your question to [dotcontracts@ct.gov](mailto:dotcontracts@ct.gov) immediately.

Contractors must identify their company name, contact person, contact email address and phone number when asking a question. The email address and phone number will not be made public.

The questions and answers (if any) located on the Q and A Website are hereby made part of the bid/contract solicitation documents (located on the State Contracting Portal), and resulting contract for the subject project(s). It is the bidder's responsibility to monitor, review, and become familiar with the questions and answers, as with all bid requirements and contract documents, prior to bidding. By signing the bid proposal and resulting contract, the bidder acknowledges receipt of, and agrees to the incorporation of the final list of Q and A, into the contract document.

Contractors will not be permitted to file a future claim based on lack of receipt, or knowledge of the questions and answers associated with a project. All bidding requirements and project information, including but not limited to contract plans, specifications, addenda, Q and A, Notice to Contractors, etc., are made public on the State Contracting Portal and/or the CTDOT website.

## **NOTICE TO CONTRACTOR – CL&P TRANSMISSION LINES**

The Contractor is hereby notified that CL&P Transmission lines are in the vicinity of Bridge No. 02376 and should be aware of their location during all crane operations within the area. OSHA requires a minimum 15-foot clearance envelope for the 115kV lines. The following shall be observed during all construction activities:

- Assembly and disassembly of the crane is prohibited below energized transmission lines or within the 15 feet clearance distance.
- If the 15 feet clearance will be encroached on for any reason during construction, please contact John Landry at (860) 665-5425 to arrange for a CL&P construction representative to be present on site during construction. All workers at the site during these construction activities, including the crane operator and spotter, need to be qualified and trained in power line safety per OSHA Regulation 1926.1408 (g).
- The position of the crane with respect to the transmission lines must be observed at all times so that the minimum safe clearance is maintained in accordance with the “Northeast Utilities Overhead Transmission Standards” on the next page.



## **NOTICE TO CONTRACTOR – EXISTING IMS**

The Contractor is herein made aware of existing Incident Management System (IMS) conduit and appurtenances located on I-95 NB 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 Robert Kennedy (860-594-3458) or James Gannon (203-673-7373) of ConnDOT Highway Operations at to mark out IMS conduit and appurtenances.

In areas adjacent to existing incident management system equipment, the Contractor is required to hand excavate. Any damage caused to the IMS conduit/equipment will be the responsibility of the Contractor, and will be replaced by the Contractor at the Contractor’s expense, as directed by the Engineer. Mark out of the IMS will not relieve the Contractor of responsibility for repair of damage caused by the Contractor or the Contractor’s sub-contractors.

## **NOTICE TO CONTRACTOR – HAZARDOUS MATERIALS INVESTIGATIONS**

Limited hazardous materials site investigations have been conducted at Site No 1 (Bridge No. 02374), Site No. 2 (Bridge No. 02375), Site No. 3 (Bridge No. 02376), Site No. 4 (Bridge No. 02368A) and Sign Support No. 21607 (near Site No 4) in East Hartford, Connecticut. The scope of inspection was limited to the representative components projected for impact.

The results of the investigation indicated detectable amounts of lead in the painted surfaces of the steel/metal bridge components scheduled for impact at all four (4) Sites as well as Sign Support No. 21607.

A small amount of lead paint is also presumed on the painted asphalt shoulder divider lines scheduled for impact at Site No. 3.

TCLP waste stream sampling/analysis of the paint for leachable lead characterized the paint waste from the steel as RCRA hazardous waste and the paint waste (>5.0 mg/l) at all 4 Sites.

No TCLP sample for lead was warranted on the white painted shoulder lines of the asphalt at Site No. 3 as the XRF readings were below 1.0 mg/cm<sup>2</sup> and therefore the painted asphalt waste stream is presumed as **Non-hazardous** per CTDEEP/USEPA clarification memo of January 26, 2004.

TCLP waste stream sampling/analysis of the paint for leachable lead characterized the paint waste from the metal sign support components as non-hazardous C&D bulky waste (<5.0 mg/l)

Any steel and metal generated from the 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.

A dark grey caulking on the bridge guard rail brackets and parapet walls at Site No. 3, a black flashing tar at the metal bearings/concrete abutment pads at Site No. 4 and black flashing tar waterproofing on the base plates of Sign Support 21607 were all determined to contain asbestos. Asbestos containing damp-proofing is also presently presumed to be present on the back side of abutments and retaining walls at each bridge site.

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
- Item No. 0020804A – Removal of Asbestos

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, Replacement of Bridge No. 02368A, East Hartford, CT, TRC Environmental Corporation, October 11, 2013.
- HazMat Inspection Letter, Bridge No. 02376, East Hartford, CT, TRC Environmental Corporation, April 7, 2014.
- HazMat Inspection Letter, Bridge Nos. 02374 & 02375, East Hartford, CT, TRC Environmental Corporation, September 18, 2014.
- HazMat Inspection Letter, Sign Support No. 21607 near Bridge No. 02368A, East Hartford, CT, TRC Environmental Corporation, October 10, 2014.

## **NOTICE TO THE CONTRACTOR – IMS INSTALLATION**

The Contractor is alerted that no service interruption of the Incident Management System (IMS), resulting from the Contractors operations will be allowed. The existing IMS conduit system (junction boxes, conduit and fiber optic cable) are located behind the permanent concrete barrier on Route 2 ramp to Governor St.

In order to maintain an uninterrupted service of the existing IMS infrastructure, the Contractor will re-route the existing IMS conduit, electric service conduit, fiber optic cable and electric service cable from bridge mounted to trench and under I-84 EB avoiding the future reconstruction Bridge 02375.

### **New IMS Installation:**

The Contractor shall install as much of the new IMS conduit and service conduit as practical to minimize the downtime of the existing Incident Management System (Camera 21). The work associated with the new IMS conduit, electric service conduit, fiber optic cable, and electric service cable shall conform to the requirements of Notice to Contractor – Installation Qualifications and Section 1.08.04 Prosecution and Progress, Limitations of Operations - Incident Management System. The Contractor shall not begin the splicing operation of the fiber optic cable until the new IMS conduit, service conduit, fiber optic cable, and service cable is installed.

The work associated with the installation of the IMS conduit, electric service conduit, fiber optic cable and electric service cable includes the following:

### **Conduit and Fiber Cable Installation:**

- Install four (4)- Type II Handholes (two on the North side of 84EB and two on the South side of 84EB). See Drawing No. IMS-002.
- Install the two (2)- 2” RMC in trench from the North handholes to the Junction Boxes on Route 2 ramp to Governor St. See Drawing No. IMS-002.
- Install two (2)- 2” RMC under roadway from the North handholes to the South handholes. See Drawing No. IMS-002.
- Install the two (2)- 2” RMC in trench from the South handholes to the Existing CCTV Control Cabinet for Camera 21. See Drawing No. IMS-003.
- Install electric service cable from Camera 20 cabinet to Existing CCTV Control Cabinet for Camera 21.

### **Final Conduit, Fiber Cable and Splicing Operation:**

After the work described in “Conduit and Fiber Cable Installation” is complete, the Contractor shall notify the Department that they would like to schedule the “downtime” of the IMS fiber cable as described in the special provision “Notice to Contractor – Installation Qualifications”. The contractor shall be permitted to remove the electrical service and fiber

optic cable for a period of not more than two (2) consecutive work days, while the conduit run for CCTV is relocated.

- Before the Contractor shall be permitted to disconnect the existing fiber optic cable for Camera 84E-21, the Contractor shall contact the Highway Operations Center at 860-594-3447.
- During approved downtime, remove fiber optic cable and electric service cable from Existing CCTV Control Cabinet for Camera 21 to junction box.
- During approved downtime, remove fiber optic cable and electric service cable from the junction boxes to pull box and service transformer on cabinet.
- Clean existing fiber optic conduit from junction box to pull box.
- Clean existing electric service conduit from junction box to service Camera 20 cabinet.
- Install new fiber optic cable from pullbox to Existing CCTV Control Cabinet for Camera 21.
- Service conductors shall be single conductor, stranded copper, insulation Type XHHW and rated for 600 Volts
- Splice 2 Fiber Branch cable for Camera 84E-21 to existing 60 fiber trunkline cable

\* \* \* \* \*

The Contractor shall exercise extreme caution during all stages of the work. In the event of damage to the IMS system, the Contractor shall immediately notify the Engineer.

The Contractor is responsible for accurately locating the existing conduit carrying fiber optic cable as it is affected by his work. The Contractor shall contact Mr. Anthony Colangelo (860-594-2450) or Mr. James Gannon of Conn. DOT Highway Operations (203-673-7373) at least forty-eight (48) hours prior to locating mainline fiber optic conduit.

The Contractor is hereby notified that hand digging may be required to accurately locate the existing IMS conduit. The Contractor shall also be responsible for maintaining and protecting the existing IMS conduit and trunk fiber optic cable at all times and during all phases of the Contractor's work operations.

The Contractor shall notify the Engineer prior to the start of his work and shall be responsible for all coordination with the Department. The Engineer shall be present during any work involving the conduit carrying fiber-optic cable. The Contractor shall allow the Engineer complete access to the work.

## **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 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. John F. Korte  
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, 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, camera cabinets, mini-hub cabinets, Traffic Flow Monitors, Variable Message Signs, Highway Advisory Radio 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.

## **NOTICE TO CONTRACTOR – STAGING AND STORAGE AREAS**

The Contractor is hereby notified that there is to be no staging and/or storing of material and/or equipment within the 100-year floodplain, floodway, gore areas, Department property or areas with a natural resource impact without review and written approval by the Office of Environmental Planning (OEP) or by the District Environmental Coordinator (DEC). If staging and/or storing of material and/or equipment is allowed within these regulated areas, the Contractor must provide a flood contingency plan or an Erosion and Sedimentation Control Plan to the OEP or the DEC for review and approval.

The Contractor is also hereby notified that any staging and/or storing of material and/or equipment throughout the project is only permitted on existing pavement surfaces without review and written approval by the Office of Environmental Planning (OEP) or by the District Environmental Coordinator (DEC).

All staging and/or storage areas will be reviewed and approved by the Engineer.

No surplus material due to construction activities is to be disposed of on Department property in accordance with Section 1.17.18-Use of State Property.

The Contractor's attention is directed to the fact that only limited stockpiling and storage within the project are available for use. It may be required that the Contractor, according to his means and methods, make arrangements to have available for his use sufficient storage and staging areas outside of the limits of the project.

In all cases, the Contractor 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.

**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 2 Interchanges <u>East Hartford</u>	Route	Route	Route	Route
	PG 64-22	PG 76-22	Design Level	Design Level	Design Level	Design Level	Design Level
HMA S0.25	X	-	2	-	-	-	-
HMA S0.375	X	-	2	-	-	-	-
HMA S0.5	X	-	2	-	-	-	-
HMA S1	X	-	2	-	-	-	-
PMA S0.25	-	-	-	-	-	-	-
PMA S0.375	-	-	-	-	-	-	-
PMA S0.5	-	-	-	-	-	-	-
PMA S1	-	-	-	-	-	-	-

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

## **NOTICE TO CONTRACTOR – TRANSPORTATION MANAGEMENT PLAN**

Included in the Contract provisions is the Department's Transportation Management Plan (TMP) for this Project. The TMP was developed in conformance with Federal regulations and consists of strategies to manage the work zone impacts of this Project. Its scope, content, and degree of detail are based upon the State's work zone policies and regulations along with the State's understanding of the expected work zone impacts of the Project.

The TMP consists of a Temporary Traffic Control (TTC) plan and addresses both Transportation Operations (TO) and Public Information (PI) components.

The TMP is a living document that is to be updated and/or revised to manage the work zone impacts as the Project progresses.

This document is being provided for informational purposes.

Any costs associated with the TMP shall be included under the cost of Item No. 0971001A – Maintenance and Protection of Traffic.

For information on the regulations related to the TMP please go to:

[http://cfr.regstoday.com/23cfr630.aspx#23\\_CFR\\_630p1012](http://cfr.regstoday.com/23cfr630.aspx#23_CFR_630p1012)

## **NOTICE TO CONTRACTOR – SALVAGE**

The Contractor shall remove and salvage the precast concrete barrier curb that stretches across the bridge, as noted on the plans or directed by the Engineer. When the Contractor delivers the barrier curb pieces, the Contractor shall bring with him a piece of equipment large enough to unload the barrier curbs. Care shall be taken not to damage salvaged items during removal and handling. The salvaged material shall be properly stored until delivered and unloaded by the Contractor to the following State of Connecticut Department of Transportation Facility:

Glastonbury Maintenance Facility  
235 Oak Street  
Glastonbury, Connecticut  
Contact: Mr. Stephen Petrello  
Telephone: (860) 633-1159

The Contractor shall notify the above a minimum of one week prior to delivery of salvaged material to ensure that the storage facility is ready to receive the barrier curbs. Delivery of barrier curb shall be on flat-bed truck to facilitate removal at the DOT Facility.

**NOTICE TO CONTRACTOR – COODINATION WITH WORK BY  
OTHER PARTIES**

The Contractor shall be aware that other Contractors will be adjacent to and within the project limits before, during and after construction. The following State Project is, or may be, under construction concurrently with this project:

**State Project No. 42-300/301**  
East Hartford Multi-use Trail

The Contractor will be required to attend coordination meetings for and with the adjacent projects (as required) and will be required to fully coordinate operations, including traffic control signing patterns for temporary lane and/or shoulder closures, temporary traffic shifts and temporary detours on any roadway on the project with the adjacent projects.

The Contractor is responsible for coordination of all overlapping activities between these projects to ensure continuous sequence of construction activities such that the project is not delayed.

## **NOTICE TO CONTRACTOR – ELECTRICAL WORK**

The Contractor is hereby advised that the Department has identified the need to install the permanent highway lighting system circuit bypass prior to commencing the bridge rehabilitation work. The Contractor shall install the circuit bypass as indicated on the illumination plan and details and as directed by the Engineer. The Contractor shall carry out the electrical work in such a manner that there is no disruption of the proper nighttime operation of the highway lighting system. Prior to disconnection of the existing lighting circuit, the Contractor shall install the new RMC and circuit conductors. The Contractor shall only disconnect the existing conductors when the new conductors have been installed and are ready for final connection. All circuit connections shall be carried out during daylight hours.

Additionally, the Department has identified the need to order certain electrical materials and equipment, and thereby submit certain submittals for approval early in the construction process to ensure proper nighttime highway illumination and project coordination are maintained. Submittals shall be in accordance with Form 816 Article 1.20 – 1.05.02. The following items have been identified as possibly requiring early ordering thereby requiring early submission of shop drawings and product data:

Rigid Metal Conduit  
No. 2 Single Conductor  
No. 8 Bare Copper Grounding Conductor  
Splices

The list above is not intended to be all-inclusive and does not relieve the Contractor from coordinating the activities of its subcontractors and suppliers. The Contractor will not be permitted to remove any existing highway lighting facilities without approval of the required submittals. Failure to properly plan for long lead items within the contract schedule will not be justification for additional construction time.

It is recommended that the Contractor identify early in the construction sequencing process the subcontractors and suppliers associated with long lead time items and submit the appropriate shop drawings and supporting data for review upon Notice to Proceed.

**NOTICE TO CONTRACTOR - SECTION 4.06 AND M.04 MIX DESIGNATION EQUIVALENCY AND PG BINDER 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) and include the removal of mixes designed and governed by the Marshall Mix Design method. The following table is to be used to associate mix designations noted on the plans with those 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 Section 4.06 and M.04 Special Provisions for the Official Mix Designation in the leftmost column of the corresponding row in the table.

**Mix Designation Equivalency Table**

<b>Official Mix Designation</b>	<b>Equivalent Mix Designation (a)</b>	<b>Equivalent Mix Designation (b)</b>
(c)	Superpave 1.5 inch	Superpave 37.5 mm
<b>HMA S1</b>	Superpave 1.0 inch	Superpave 25.0 mm
<b>HMA S0.5</b>	Superpave 0.5 inch	Superpave 12.5 mm
<b>HMA S0.375</b>	Superpave 0.375 inch	Superpave 9.5 mm
<b>HMA S0.25</b>	Superpave 0.25 inch	Superpave 6.25 mm
(c)	Superpave #4	Superpave #4
<b>HMA S0.5 (d)</b>	Bituminous Concrete Class 1 (e)	Bituminous Concrete Class 1 (e)
<b>HMA S0.375 (d)</b>	Bituminous Concrete Class 2 where it is specified in lifts 1.25 or thicker (e)	Bituminous Concrete Class 2 where it is specified in lifts 1.25 or thicker (e)
<b>HMA S0.25 (d)</b>	Bituminous Concrete Class 2 where it is specified in lifts 1.0 inches to less than 1.25 inches (e); Bituminous Concrete Class 12 (e)	Bituminous Concrete Class 2 where it is specified in lifts 1.0 inches to less than 1.25 inches (e); Bituminous Concrete Class 12 (e)
<b>HMA S1 (d)</b>	Bituminous Concrete Class 4 (e)	Bituminous Concrete Class 4 (e)
<b>Curb Mix</b>	Bituminous Concrete Class 3	Bituminous Concrete Class 3

**Notes**

(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)** Unless approved by the Engineer, the Superpave Design Level for the Official Mix Designation bituminous concrete replacing a Marshall mix called for in the plans or other contract documents shall be Design Level 2 for mixes used on mainline or shoulders of state-maintained roadways and Design Level 1 elsewhere, including but not limited to driveways or sidewalks.

**(e)** All mixes designed under the Marshall mix-design method are no longer covered by the 4.06 Special Provision. Wherever they appear in Contract plans and documents they shall be substituted by the "Official Mix Designation" in the same row of the Mix Designation Equivalency Table. Unless approved by the Engineer, the Superpave Design Level shall be Level 1.

**PG Binder Designation Equivalency Table**

<b>Official Binder Designation</b>	<b>Equivalent Binder Designation</b>	<b>Use</b>
PG 64S-22	PG 64-22	Hot-Mix Asphalt (HMA S* pay items and pay items using HMA S* materials)(a),(b)
PG 64E-22	PG 76-22	Polymer-Modified Asphalt (PMA S* pay items and pay items using HMA S* materials)(a),(b)

**Notes**

- (a) Use the Mix Designation Equivalency Table above to identify the Official Mix Designation for materials using the Marshall mix design method, i.e. “Bituminous Concrete Class \*.”
- (b) Refer to the NTC – Superpave Design Level for the Superpave Design Level to use for each mix on a project. The PG Binder Designation Equivalency Table can be used to obtain the Official Binder Designation for each mix identified in the NTC – Superpave Design Level.

**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 - VOLUNTARY PARTNERING**

The Connecticut Department of Transportation (ConnDOT) intends to encourage the foundation of a cohesive partnership with the Contractor and its principal subcontractors on this project. This partnership will be structured to draw on the strengths of each organization to identify and achieve reciprocal goals. The objectives are effective and efficient contract performance and completion within budget, on schedule, and in accordance with plans and specifications.

This partnership will be bilateral in makeup, and participation will be totally voluntary. Any cost associated with effectuating this partnering will be agreed to by both parties and will be shared equally.

To implement this partner initiative, the Contractor and ConnDOT will meet and plan a partnering development seminar/team building workshop. At this planning session arrangements will be made to determine attendees at the workshop, agenda of the workshop, duration and location. Persons required to be in attendance will be the ConnDOT District Engineer and key project personnel, the Contractor's on-site project manager and key supervision personnel of both the prime and principal subcontractors. The project design engineers and key local government personnel will also be required to have Regional/District and Corporate/State level managers on the project team.

Follow-up workshops will be held periodically throughout the duration of the Contract as agreed by the Contractor and ConnDOT.

The establishment of a partnership charter on a project will not change the legal relationship of the parties to the Contract nor relieve either party from any of the terms of the Contract.

ConnDOT and the Contractor will jointly select a facilitator to conduct the partnering workshops. The Contractor will obtain the services of the chosen facilitator and ConnDOT will reimburse the Contractor for fifty percent (50%) of the costs agreed to between ConnDOT and the Contractor.

## **NOTICE TO CONTRACTOR - PROCUREMENT OF MATERIALS**

Upon award, the Contractor shall proceed with shop drawings, working drawings, procurement of materials, and all other submittals required to complete the work in accordance with the contract documents.

## **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 the requirements in National Cooperative Highway Research Program (NCHRP) Report 350 or the AASHTO Manual for Assessing Safety Hardware (MASH), as appropriate.

### **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) have been crash tested and have 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 appropriate.

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

Information regarding NCHRP Report 350 and AASHTO Manual for Assessing Safety Hardware (MASH) may be found at the following web sites:

FHWA: [http://safety.fhwa.dot.gov/roadway\\_dept/Policy\\_guide/road\\_hardware/](http://safety.fhwa.dot.gov/roadway_dept/Policy_guide/road_hardware/)

ATSSA: <http://www.atssa.com/resources.aspx>

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 have been crash tested and have 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 appropriate.

**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 1.03 – AWARD AND EXECUTION OF CONTRACT**

### **Article 1.03.02 – Award and Execution of Contract:**

Change the second sentence to read as follows:

The award, if made, will be made within 45 days after the opening of the proposals.

### **Article 1.03.03 – Return of Proposal Guaranty:**

Change the third sentence to read as follows:

Should no award be made within 45 calendar days after the opening of proposals, the Commissioner may reject all proposals and return the proposal guaranties, except that with the approval of the lowest bidder and its surety, the Commissioner may extend the time for the award and may retain the proposal and proposal guaranty of the lowest bidder for said extended time, or for any other period of time agreed upon by the Commissioner, bidder and surety.

### **Article 1.03.08 – Notice to Proceed and Commencement of Work:**

Change the first and second paragraphs to read as follows:

The Contractor will commence and proceed with the Contract work on the date specified in a written notice to proceed issued by the Engineer to the Contractor. The date specified will be no later than 30 days after the execution of the Contract by the Department.

## **SECTION 1.05 – CONTROL OF THE WORK**

**1.05.02(2)---Working Drawings:** is amended as follows:

Delete the first sentence in the first paragraph and substitute the following:

When required by the Contract or when ordered by the Engineer, the Contractor shall prepare and submit nine (9) copies of the working drawings and calculations to the following for review prior to implementation:

Connecticut Department of Transportation  
District 1 Office  
Attn: Ravi Chandran, P.E.  
District Engineering Manager  
1107 Cromwell Avenue  
Rocky Hill, Connecticut 06067  
(860) 258-4601

Add the following to the first paragraph:

When Working Drawings are submitted to the District, copies of the transmittal letter shall be sent to:

(Site Nos. 1 & 2)  
BL Companies, Inc.  
Attn: Nicholas R. Giardina, P.E.  
150 Trumbull Street, 6<sup>th</sup> Floor  
Hartford, Connecticut 06103-2403  
(860) 249-2200

(Site No. 3)  
Close, Jensen & Miller, P.C.  
Attn: Mark F. Levesque, P.E.  
1137 Silas Deane Hwy  
Wethersfield, CT 06109  
(860) 563-9375

(Site No. 4)  
State of Connecticut  
Department of Transportation  
Attn: Rabih Barakat, P.E.  
2800 Berlin Turnpike  
Newington, CT 06111  
(860) 594-3208

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 Incident Management System (IMS) related items to the Bureau of Highway Operations for approval before fabrication. IMS related items include multiduct conduit, pullboxes, fiber optic and communications cables, cabinets, cameras, camera lowering devices, variable message signs (VMS), traffic flow monitors (TFM) and telecommunications related equipment.

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 forward to:

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

**1.05.02(3)---Shop Drawings:** is amended as follows:

Delete the first sentence in the first paragraph and substitute the following:

When required by the Contract or when ordered by the Engineer, the Contractor shall prepare and submit nine (9) copies of the shop drawings to the following Contracting Engineers for review and approval before fabrication:

(Site No. 3)  
Stantec Consulting Services, Inc.  
Attn: Andrew Lessard, P.E.  
2321 Whitney Avenue  
Hamden, Connecticut 06518  
(203) 281-1350

(Site Nos. 1 & 2)  
McFarland Johnson, Inc.  
Attn: Gene McCarthy, P.E.  
53 Regional Drive  
Concord, NH 03301  
(603) 225-2978

(Site No. 4)  
State of Connecticut  
Department of Transportation  
Attn: Rabih Barakat, P.E.  
2800 Berlin Turnpike  
Newington, CT 06111  
(860) 594-3208

Add the following to the first paragraph:

When Shop Drawings are submitted to the Contracting Engineer, copies of the transmittal letter shall be sent to:

(Site Nos. 1 & 2)  
BL Companies, Inc.  
Attn: Nicholas R. Giardina, P.E.  
150 Trumbull Street, 6<sup>th</sup> Floor  
Hartford, Connecticut 06103-2403  
(860) 249-2200

(Site No. 3)  
Close, Jensen & Miller, P.C.  
Attn: Mark F. Levesque, P.E.  
1137 Silas Deane Hwy  
Wethersfield, CT 06109  
(860) 563-9375

(Site No. 4)  
State of Connecticut  
Department of Transportation  
Attn: Rabih Barakat, P.E.  
2800 Berlin Turnpike  
Newington, CT 06111  
(860) 594-3208

and to the District:

Connecticut Department of Transportation  
District 1 Office  
Attn: Ravi Chandran, P.E.  
District Engineering Manager  
1107 Cromwell Avenue  
Rocky Hill, Connecticut 06067  
(860) 258-4601

## **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 thirty (30) 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:

Add the following:

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  
Conduit  
Handhole Cover

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. Theodore H. Nezames  
Principal Engineer – Facilities Design  
Bureau of Engineering and Highway Operations  
Connecticut Department of Transportation  
P.O. Box 317546  
Newington, Connecticut 06131-7546

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 either in paper (hard copy) form or in an electronic portable document format (.pdf) one (1) copy 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, 11 inch by 17 inch sheets or on 24 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 20,000 lb.

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.

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.

Conductors

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.

Conductors  
Conduit

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 1.07 - 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.”

### **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 1.08 - PROSECUTION AND PROGRESS**

### **1.08.01—Transfer of Work or Contract:**

The first sentence of the first paragraph is hereby changed to read as follows:

The Contractor shall perform with its own organization Contract work with a value under the Contract of at least \_\_\_% of the original total Contract value.

## **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/ROUTE 2**

##### On the following State observed Legal Holidays:

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

The following restrictions also apply to the above Legal Holidays:

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 will be allowed to halt Route I-84 traffic for a period not to exceed 10 minutes to perform necessary work for the erection and setting of structural steel, for removal of existing bridge superstructures, for the installation and removal of overhead sign supports as approved by the Engineer, from 12:01 a.m. to 5:00 a.m. on all non-Holiday days.

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

### **Special Events**

The Contractor will not be allowed to perform any work that will interfere with the existing traffic operations during the time period from four hours prior to and four hours following any event scheduled at the XL Center, Xfinity Theater, Convention Center, Expo Center, Rentschler Field, Downtown Hartford, and Downtown East Hartford.

This restriction is in addition to the restrictions noted above for Route 2 and I-84 and the associated ramps and exit only lanes. A schedule of special events at these facilities shall be requested through the East Hartford and Hartford Police Departments and shall be the responsibility of the Contractor.

### **Route 44**

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

### **Ramps and Turning Roadways**

The Contractor shall not be permitted to perform any work that will interfere with existing traffic operations on any ramps and turning roadways within the project limits on:

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

During stage construction, the existing traffic operations is considered the number of lanes shown on the Maintenance and Protection of Traffic Plans contained in the Contract Plans.

The Contractor will be allowed to halt ramp traffic for a period not to exceed 10 minutes to perform necessary work for the erection and setting of structural steel, for removal of existing bridge superstructures, for the installation and removal of overhead sign supports as approved by the Engineer, from 12:01 a.m. to 5:00 a.m. on all non-Holiday or non-Special Event days.

### **All Other Roadways**

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

### **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.

### **SEQUENCE OF OPERATIONS**

Information on the anticipated traffic positions and construction activities of adjacent contracts are supplied for the Contractor's information. The Contractor shall conform to the sequence of operation as follows:

#### **Season One**

##### Site No. 1

- Implement detour for SR 500 TR 805 from Governor Street to Route 2 Eastbound
- Shift traffic to the western side of Bridge No. 02374 per Stage 1 Construction Plans and the Maintenance and Protection of Traffic special provision.
- Construct eastern portion of Bridge No. 02374.
- Shift traffic to the eastern side of Bridge No. 02374 per Stage 2 Construction Plans and the Maintenance and Protection of Traffic special provision.

##### Site No. 3

- Implement detour for Site No. 3.
- Construct Bridge No. 02376 while traffic is detoured
- Allow use of closed ramp for construction access and activities associated with Site No. 4
- Complete Construction

##### Site No. 4

- Construct access areas for Site No. 4.
- Perform initial earthwork
- Install Temporary Earth Retaining Systems
- Remove and install Sign Support

#### **Season Two**

##### Site No. 1

- Continue use of detour for SR 500 TR 805 from Governor Street to Route 2 Eastbound
- Construct western portion of Bridge No. 02374.
- Complete Construction

##### Site No. 4

- Implement detour for Site No. 4
- Construct Bridge No. 02368A while traffic is detoured
- Weekend closures of TR 831 from I-84 Connector to Governor Street, TR 833 (I-84 Connector), SR 500 TR 805 from Governor Street to Route 2 eastbound and TR 830 from I-

84 westbound to Route 2 eastbound during removal and installation of bridge superstructure elements.

- Complete Construction

Site No. 2

- Shift traffic to the western side of Bridge No. 02375 per Stage 1 Construction Plans and the Maintenance and Protection of Traffic special provision.
- Construct eastern portion of Bridge No. 02375.
- Shift traffic to the eastern side of Bridge No. 02375 per Stage 2 Construction Plans and the Maintenance and Protection of Traffic special provision.
- Construct western portion of Bridge No. 02375.
- Complete Construction

Route: 2 Eastbound Location: MP 0.00 – 0.93 & 1.49-5.31 Number of Through Lanes: 2							
Hour Beginning	Mon	Tue	Wed	Thu	Fri	Sat	Sun
Mid	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
3 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
6 AM	E	E	E	E	E	E	E
7 AM	E	E	E	E	E	E	E
8 AM	E	E	E	E	E	E	E
9 AM	E	E	E	E	E	E	E
10 AM	E	E	E	E	E	E	E
11 AM	E	E	E	E	E	E	E
Noon	E	E	E	E	E	E	E
1 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
4 PM	E	E	E	E	E	E	E
5 PM	E	E	E	E	E	E	E
6 PM	E	E	E	E	E	E	E
7 PM	E	E	E	E	E	2	E
8 PM	2	2	2	E	E	2	E
9 PM	2	2	2	2	2	2	2
10 PM	2	2	2	2	2	2	2
11 PM	1	1	1	1	1	1	1

Route: 2 Eastbound Location: MP 0.93-1.49 Number of Through Lanes: 3							
Hour Beginning	Mon	Tue	Wed	Thu	Fri	Sat	Sun
Mid	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
3 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
6 AM	2	2	2	2	2	2	2
7 AM	3	3	3	3	E	2	2
8 AM	3	3	3	3	E	2	2
9 AM	3	3	3	3	3	3	2
10 AM	3	3	3	3	3	3	3
11 AM	3	3	3	3	3	3	3
Noon	3	3	3	3	3	E	3
1 PM	3	3	3	3	3	E	3
2 PM	3	3	3	3	E	E	3
3 PM	E	E	E	E	E	3	E
4 PM	E	E	E	E	E	3	E
5 PM	E	E	E	E	E	3	3
6 PM	3	3	3	3	E	2	3
7 PM	2	2	2	2	3	2	3
8 PM	2	2	2	2	2	2	2
9 PM	2	2	2	2	2	2	2
10 PM	1	1	1	1	1	2	2
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: 2 Westbound Location: MP 0.00-0.46 & 1.85-5.33 Number of Through Lanes: 2							
Hour Beginning	Mon	Tue	Wed	Thu	Fri	Sat	Sun
Mid	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
3 AM	1	1	1	1	1	1	1
4 AM	1	1	1	1	1	1	1
5 AM	2	2	2	2	2	1	1
6 AM	E	E	E	E	E	E	E
7 AM	E	E	E	E	E	E	E
8 AM	E	E	E	E	E	E	E
9 AM	E	E	E	E	E	E	E
10 AM	E	E	E	E	E	E	E
11 AM	E	E	E	E	E	E	E
Noon	E	E	E	E	E	E	E
1 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
4 PM	E	E	E	E	E	E	E
5 PM	E	E	E	E	E	E	E
6 PM	E	E	E	E	E	E	E
7 PM	2	2	2	2	2	2	E
8 PM	2	2	2	E	E	2	2
9 PM	1	1	1	1	2	2	2
10 PM	1	1	1	1	1	2	2
11 PM	1	1	1	1	1	1	1

Route: 2 Westbound Location: MP 0.92-1.85 Number of Through Lanes: 3							
Hour Beginning	Mon	Tue	Wed	Thu	Fri	Sat	Sun
Mid	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
3 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
6 AM	2	2	2	2	2	2	2
7 AM	2	2	2	2	2	2	2
8 AM	2	2	2	2	2	2	2
9 AM	2	2	2	2	2	2	2
10 AM	2	2	2	2	2	2	2
11 AM	2	2	2	2	2	2	2
Noon	2	2	2	2	2	2	2
1 PM	2	2	2	2	2	2	2
2 PM	2	2	2	2	2	2	2
3 PM	2	2	2	2	2	2	2
4 PM	2	2	2	2	2	2	2
5 PM	2	2	2	2	2	2	2
6 PM	2	2	2	2	2	2	2
7 PM	1	1	1	1	1	1	1
8 PM	1	1	1	1	1	1	1
9 PM	1	1	1	1	1	1	1
10 PM	1	1	1	1	1	1	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 Eastbound Location: MP 62.07 - 62.58 & 62.84 - 63.67 Number of Through Lanes: 2							
Hour Beginning	Mon	Tue	Wed	Thu	Fri	Sat	Sun
Mid	1	1	1	1	2	2	1
1 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
4 AM	1	1	1	1	1	1	1
5 AM	2	2	2	2	2	1	1
6 AM	E	E	E	E	E	E	E
7 AM	E	E	E	E	E	E	E
8 AM	E	E	E	E	E	E	E
9 AM	E	E	E	E	E	E	E
10 AM	E	E	E	E	E	E	E
11 AM	E	E	E	E	E	E	E
Noon	E	E	E	E	E	E	E
1 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
4 PM	E	E	E	E	E	E	E
5 PM	E	E	E	E	E	E	E
6 PM	E	E	E	E	E	E	E
7 PM	E	E	E	E	E	E	E
8 PM	E	E	E	E	E	E	E
9 PM	E	E	E	E	E	E	E
10 PM	2	2	2	E	E	2	2
11 PM	2	2	2	2	2	2	2

Route: I-84 Eastbound Location: MP 62.58 - 62.84 Number of Through Lanes: 3							
Hour Beginning	Mon	Tue	Wed	Thu	Fri	Sat	Sun
Mid	1	1	1	2	2	2	2
1 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
4 AM	1	1	1	1	1	1	1
5 AM	2	2	2	2	2	1	1
6 AM	E	E	E	E	E	E	E
7 AM	E	E	E	E	E	E	E
8 AM	E	E	E	E	E	E	E
9 AM	E	E	E	E	E	E	E
10 AM	E	E	E	E	E	E	E
11 AM	E	E	E	E	E	E	E
Noon	E	E	E	E	E	E	E
1 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
4 PM	E	E	E	E	E	E	E
5 PM	E	E	E	E	E	E	E
6 PM	E	E	E	E	E	E	E
7 PM	E	E	E	E	E	E	E
8 PM	E	E	E	E	E	3	E
9 PM	3	3	3	E	E	3	E
10 PM	3	3	3	3	3	3	3
11 PM	2	2	2	2	2	2	2

**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 Westbound Location: MP 63.05 - 63.46 Number of Through Lanes: 2							
Hour Beginning	Mon	Tue	Wed	Thu	Fri	Sat	Sun
Mid	1	1	1	2	2	2	1
1 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
4 AM	1	1	1	1	1	1	1
5 AM	2	2	2	2	E	1	1
6 AM	E	E	E	E	E	E	E
7 AM	E	E	E	E	E	E	E
8 AM	E	E	E	E	E	E	E
9 AM	E	E	E	E	E	E	E
10 AM	E	E	E	E	E	E	E
11 AM	E	E	E	E	E	E	E
Noon	E	E	E	E	E	E	E
1 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
4 PM	E	E	E	E	E	E	E
5 PM	E	E	E	E	E	E	E
6 PM	E	E	E	E	E	E	E
7 PM	E	E	E	E	E	E	E
8 PM	E	E	E	E	E	E	E
9 PM	E	E	E	E	E	E	E
10 PM	E	E	2	E	E	2	2
11 PM	2	2	2	2	2	2	2

Route: I-84 Westbound Location: MP 63.46 - 64.08 Number of Through Lanes: 4							
Hour Beginning	Mon	Tue	Wed	Thu	Fri	Sat	Sun
Mid	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
3 AM	1	1	1	1	1	1	1
4 AM	1	1	1	1	1	1	1
5 AM	2	2	2	2	2	1	1
6 AM	4	4	4	4	E	2	1
7 AM	E	E	E	E	E	2	1
8 AM	E	E	E	E	E	3	2
9 AM	4	4	4	4	4	3	3
10 AM	3	3	3	3	4	4	3
11 AM	3	3	3	3	4	4	4
Noon	3	3	3	3	4	4	4
1 PM	3	3	3	4	4	4	4
2 PM	3	3	3	4	4	4	4
3 PM	4	3	3	4	4	4	4
4 PM	3	3	3	4	4	4	4
5 PM	3	3	3	3	4	4	4
6 PM	3	3	3	3	4	4	4
7 PM	2	2	2	3	3	3	3
8 PM	2	2	2	2	2	2	3
9 PM	2	2	2	2	2	2	3
10 PM	2	2	2	2	2	2	2
11 PM	1	1	1	1	2	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 Westbound Location: MP 64.08 - 64.73 Number of Through Lanes: 3							
Hour Beginning	Mon	Tue	Wed	Thu	Fri	Sat	Sun
Mid	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
3 AM	1	1	1	1	1	1	1
4 AM	1	1	1	1	1	1	1
5 AM	2	2	2	2	2	1	1
6 AM	E	E	E	E	E	2	1
7 AM	E	E	E	E	E	2	1
8 AM	E	E	E	E	E	3	2
9 AM	E	E	E	E	E	E	3
10 AM	3	3	3	E	E	E	3
11 AM	3	3	3	E	E	E	E
Noon	3	3	3	E	E	E	E
1 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
4 PM	3	3	3	E	E	E	E
5 PM	3	3	3	3	E	3	E
6 PM	3	3	3	3	3	3	E
7 PM	3	3	3	3	3	3	3
8 PM	2	2	2	2	3	3	3
9 PM	2	2	2	2	2	2	3
10 PM	2	2	2	2	2	2	2
11 PM	1	1	1	1	1	2	1

Route: I-84 Westbound Location: MP 64.73 - 66.44 Number of Through Lanes: 5							
Hour Beginning	Mon	Tue	Wed	Thu	Fri	Sat	Sun
Mid	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
3 AM	1	1	1	1	1	1	1
4 AM	1	1	1	1	2	1	1
5 AM	3	3	3	3	3	1	1
6 AM	E	E	E	E	E	3	3
7 AM	E	E	E	E	E	3	3
8 AM	E	E	E	E	E	3	3
9 AM	5	5	5	E	E	4	3
10 AM	5	5	5	5	5	4	3
11 AM	5	5	5	5	5	4	4
Noon	5	5	5	5	5	5	4
1 PM	5	5	5	5	5	4	4
2 PM	5	5	5	5	E	4	4
3 PM	5	5	5	5	E	4	4
4 PM	5	5	5	5	E	3	4
5 PM	5	5	5	5	E	3	4
6 PM	4	4	4	4	E	3	4
7 PM	3	3	3	3	4	3	3
8 PM	3	3	3	3	3	3	3
9 PM	3	3	3	3	3	2	3
10 PM	2	2	2	2	2	2	2
11 PM	2	2	2	2	2	2	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.**

**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 a.m. to 9:00 p.m.
- On Saturday and Sunday.
- On the day before or after any of the Legal Holidays listed below:

New Years 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 “Notice to Contractor – Installation Qualifications” and “Notice to Contractor –Installation of IMS Systems”.

**Article 1.08.07 - Determination of Contract Time:**

*Delete the second, third and fourth paragraphs and replace them with the following:*

When the contract time is on a calendar day basis, it shall be the number of consecutive calendar days stated in the contract, INCLUDING the time period from December 1 through March 31 of each year. The contract time will begin on the effective date of the Engineer's order to commence work, and it will be computed on a consecutive day basis, including all Saturdays, Sundays, Holidays, and non-work days.

**Article 1.08.08 - Extension of Time:**

*Delete the last paragraph, "If an approved extension of time... the following April 1".*

**Article 1.08.09 - Failure to Complete Work on Time:**

*Delete the second paragraph, "If the last day...the project is substantially completed" and replace it with "Liquidated damages as specified in the Contract shall be assessed against the Contractor per calendar day from that day until the date on which the project is substantially completed."*

## **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 (QCP) 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), or those defined on the basis of composition, such as those containing 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.

Polymer Modified Asphalt (PMA): A bituminous concrete mixture containing a polymer modified asphalt binder in accordance with contract specifications. All PMA mixtures shall incorporate a qualified warm mix technology.

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 gradation, temperature, or volumetric properties.

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 QCP requirements are defined in Section M.04.

**2. Recycled Materials:** Reclaimed Asphalt Pavement (RAP), Crushed Recycled Container Glass (CRCG), Recycled Asphalt Shingles (RAS), or crumb rubber (CR) from recycled tires may be incorporated in bituminous concrete mixtures in accordance with Section M.04 and Project Specifications. CRCG and RAS shall not be used in the surface course.

**4.06.03—Construction Methods:**

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

Delivery tickets shall 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.

- d. Mixture Designation; Mix type and level Curb mixtures for machine-placed curbing must state "curb mix only".
- e. If RAP is used, the plant printouts shall include the RAP dry weight, percentage and daily moisture content.
- f. If RAS is used, the plant printouts shall include the RAS dry weight and percentage daily moisture content.
- g. The delivery ticket for all mixes produced with Warm Mix Technology must indicate the additive name, and the injection rate (water or additive) incorporated at the HMA plant. The delivery ticket for all mixes produced with pre-blended WMA additive must indicate the name of the WMA Technology.
- h. Net weight of mixture loaded into truck (When RAP and/or RAS is used the moisture content shall be excluded from mixture net weight).
- i. Gross weight (Either equal to the net weight plus the tare weight or the loaded scale weight).
- j. Tare weight of truck – Daily scale weight.
- k. Project number, purchase order number, name of Contractor (if Contractor other than Producer).
- l. Truck number for specific identification of truck.
- m. Individual aggregate, Recycled Materials, and virgin asphalt high/target/low weights. For drum plants and silo loadings, the plant printouts shall be produced at 5 minute intervals maintained by the vendor for a period of three years after the completion of the project.
- n. 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.

**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 is 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. Lighting shall 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 electric power to operate the specified lighting equipment. The lighting options and minimum number of fixtures are listed in Tables 4.06-1 and 4.06-2:

**TABLE 4.06-1: Paver Lighting**

<b>Option</b>	<b>Fixture Configuration</b>	<b>Fixture Quantity</b>	<b>Requirement</b>
1	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
2	Type D Balloon	2	Mount over screed area

**TABLE 4.06-2: Roller Lighting**

<b>Option</b>	<b>Fixture Configuration*</b>	<b>Fixture Quantity</b>	<b>Requirement</b>
1	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
2	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
3	Type D Balloon	1	Mount above the roller

\*All fixtures shall be mounted above the roller.

Type A: Fluorescent fixture shall be heavy-duty industrial type. Each fixture shall have a minimum output of 8,000 lumens. The fixtures shall be mounted horizontally, and be designed for continuous row installation.

Type B: Each floodlight fixture shall have a minimum output of 18,000 lumens.

Type C: Each fixture shall have a minimum output of 19,000 lumens.

Type D: Balloon light: Each balloon light fixture shall have a minimum output of 50,000 lumens, and emit light equally in all directions.

**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 continuously remix the bituminous concrete mixture throughout the placement process.

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. 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.

**5. 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 50 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 40, 45, or 50 MPH
  - (1) Leading and Trailing = 4 feet per inch of vertical change (thickness)
- c) Posted speed limit is 35 MPH or less
  - (1) Leading and Trailing = 3 feet per inch of vertical change (thickness)

**Note:** Any temporary transition to be in-place over the winter shutdown period or during extended periods of inactivity (more than 14 calendar days) shall conform to the greater than 50 MPH requirements shown above.

**6. 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 QCP.

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**

<b>Mixture Designation</b>	<b>Lift Tolerance</b>
S1	+/- 3/8 inch
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: Immediately before application, the area to be tacked shall be cleaned by sweeping or by other means acceptable to the Engineer. A thin uniform coating of tack coat shall be applied to the pavement immediately before overlaying and be allowed sufficient time to break (set) prior to any paving equipment or haul vehicles driving on it. 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.

When placing a lift with a specified thickness less than one and one-half (1 ½) inches, or a wedge course, the Contractor shall provide a minimum rolling pattern as determined by the development of a compaction curve. The procedure to be used shall be documented in the Contractor's QCP for placement and demonstrated on the first day of placement.

The use of the vibratory system on concrete structures is prohibited. When approved by the Engineer, the Contractor may operate a roller using an oscillatory system at the lowest frequency setting.

If the Engineer determines that the use of compaction equipment in the dynamic 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.

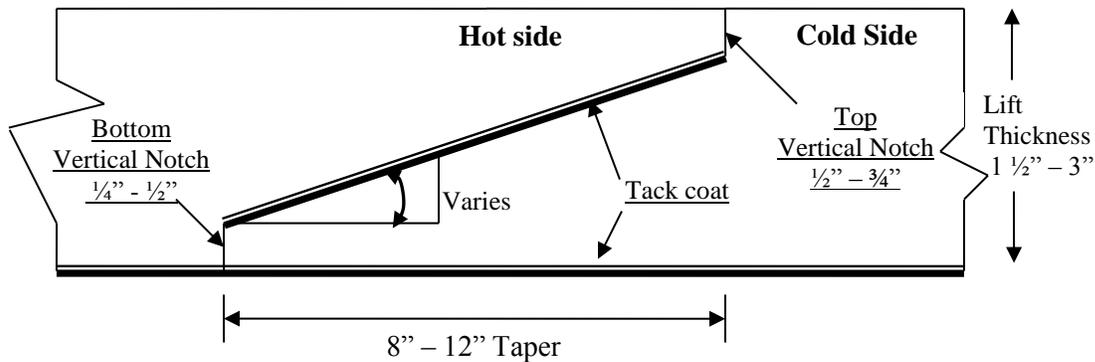
Rollers operating in the dynamic mode shall be shut off when changing directions.

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 of the mat and joints shall not exhibit segregation, rutting, cracking, disintegration, flushing or vary in composition as determined by the Engineer.

**7. Longitudinal Joint Construction Methods:** 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 S1mixes. 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 S1mixes. 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. The difference in elevation between the two faces of any completed longitudinal joint shall not exceed  $\frac{1}{4}$  of an inch in any location.

**Method I - Notched Wedge Joint:****FIGURE 4.06-1: Notched Wedge Joint**

A notched wedge joint shall be constructed as shown in Figure 4.06-1 using a device that is attached to the paver screed and is capable of independently adjusting the top and bottom vertical notches. The device shall have an integrated vibratory system.

The taper portion of the wedge 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 evenly compacted using equipment other than the paver or notch wedge joint device.

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

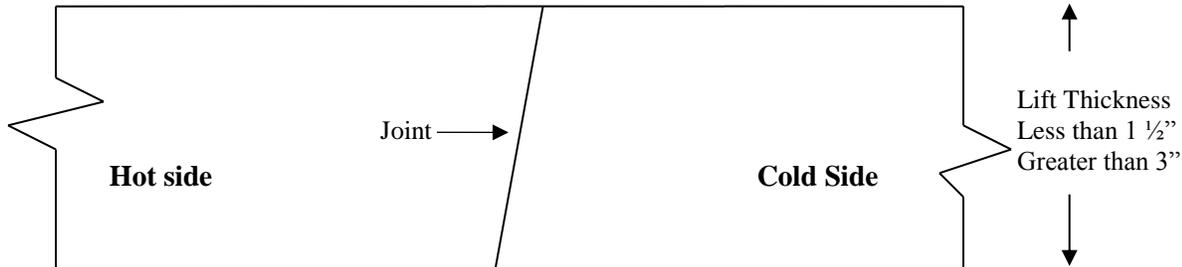
The pavement surface under the wedge joint must have an application of tack coat material. Prior to placing the completing pass (hot side), an application of tack coat must be applied to the exposed surface of the tapered section; regardless of time elapsed between paver passes. The in-place time allowance 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.

If Method I, Notched Wedge Joint cannot be used on lifts between 1.5 and 3 inches, Method III Butt Joint may be substituted according to the requirements below for “Method III – Butt Joint with Hot Pour Rubberized Asphalt Treatment.”

**Method II - Butt Joint:**

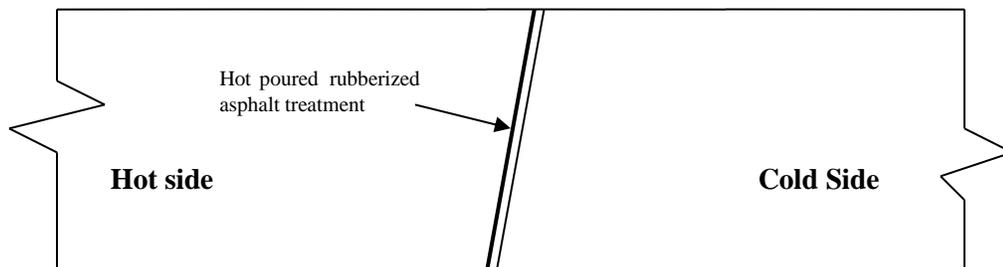


**FIGURE 4.06-2: Butt Joint**

When adjoining passes are placed, the Contractor shall utilize equipment that creates a near vertical edge (refer to Figure 4.06-2). 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:** If Method I Wedge Joint cannot be used due to physical constraints in certain limited locations; the contractor may submit a request in writing for approval by the Engineer, to utilize Method III Butt Joint as a substitution in those locations. There shall be no additional measurement or payment made when the Method III Butt Joint is substituted for the Method I Notched Wedge Joint. When required by the contract or approved by the Engineer, Method III (see Figure 4.06-3) shall be used.



**FIGURE 4.06-3: Butt Joint with Hot Poured Rubberized Asphalt Treatment**

All of the requirements of Method II must be met with Method III. In addition, the longitudinal vertical edge must be treated with a rubberized joint seal material meeting the requirements of ASTM D 6690, Type 2. The joint sealant shall be placed on the face of the “cold side” of the butt joint as shown above prior to placing the “hot side” of the butt joint. 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.

**8. Contractor Quality Control (QC) Requirements:**

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

This effort must be documented in Quality Control Plans and 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 Standard QCP for production shall consist of the quality control program specific to the production facility.

There are three components to the QCP for placement: a Standard QCP, a Project Summary Sheet that details project specific information, and if applicable a separate Extended Season Paving Plan as required in Section 9 "Temperature and Seasonal Requirements".

The Standard QCP for both production and placement shall be submitted to the Department for approval each calendar year and at a minimum of 30 days prior to production or placement.

Production or placement shall not occur until all QCP components have been approved by the Engineer.

Each QCP shall 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. The QCPs shall also include the name and qualifications of any outside testing laboratory performing any QC functions on behalf of the Contractor.

Approval of the QCP does not relieve the Contractor of its responsibility to comply with the project specifications. The Contractor may modify the QCPs as work progresses and must document the changes in writing prior to resuming operations. These changes include but are not limited to changes in quality control procedures or personnel. The Department reserves the right to deny significant changes to the QCPs.

QCP for Production: Refer to Section M.04.03-1.

**QCP for Placement:** The Standard QCP, Project Summary Sheet, and Extended Season Paving Plan shall conform to the format provided by the Engineer. The format is available at [http://www.ct.gov/dot/lib/dot/documents/dconstruction/pat/qcp\\_outline\\_hma\\_placement.pdf](http://www.ct.gov/dot/lib/dot/documents/dconstruction/pat/qcp_outline_hma_placement.pdf).

The Contractor shall perform all quality control sampling and testing, provide inspection, and exercise management control to ensure that bituminous concrete placement conforms to the requirements as outlined in its QCP during all phases of the work. The Contractor shall document these activities for each day of placement.

The Contractor shall submit complete field density testing and inspection records to the Engineer within 48 hours 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. The core holes shall be filled to the same requirements described in Sub article 4.06.03-10.

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

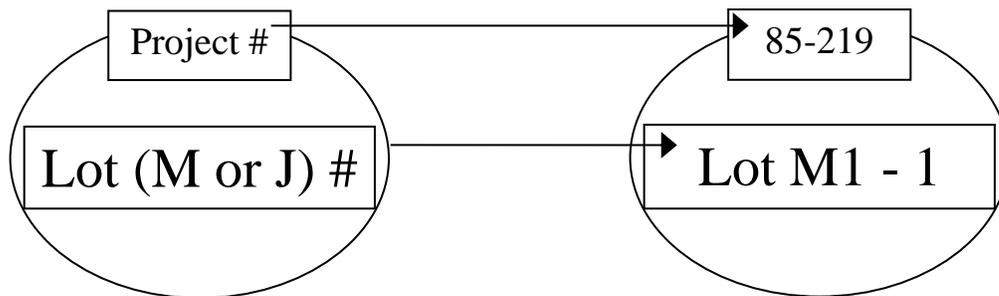
- Bituminous concrete mixes shall not be placed when the air or sub base temperature is below 40°F regardless of the season.
- Should paving operations be scheduled during the Extended Season, the Contractor must submit an Extended Season Paving Plan for the project that addresses minimum delivered mix temperature considering WMA, PMA or other additives, maximum paver speed, enhanced rolling patterns and the method to balance mixture delivery and placement operations. Paving during Extended Season shall not commence until the Engineer has approved the plan.

**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. All material placed in a lift shall be compacted to the degree specified in Tables 4.06-9 and 4.06-10. The density of each core will be determined using the production lot’s average maximum theoretical specific gravity (Gmm) established during the testing of the parent material at the plant. When there was no testing of the parent material or any Gmm exceeds the specified tolerances in the Department’s current QA Program for Materials, the Engineer will determine

the maximum theoretical density value to be used for density calculations. Bituminous concrete HMA S1 mixes 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: Labeling of Cores**

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  $\geq$  500 Tons**

Lot Type	No. of Mat Cores		No. of Joint Cores		Target Lot Size (Tons)
Lot Without Bridge <sup>(1)</sup>	4		4		2000
Lot With Bridge(s) <sup>(1)(2)</sup>	4 plus	1 per structure ( $\leq$ 300')	4 plus	1 per structure ( $\leq$ 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 <sup>(1)</sup>	3	3	1 per lift
Lot With Bridge(s) <sup>(1)(2)</sup>	3	3	1 per lift

Notes:

<sup>(1)</sup> 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.

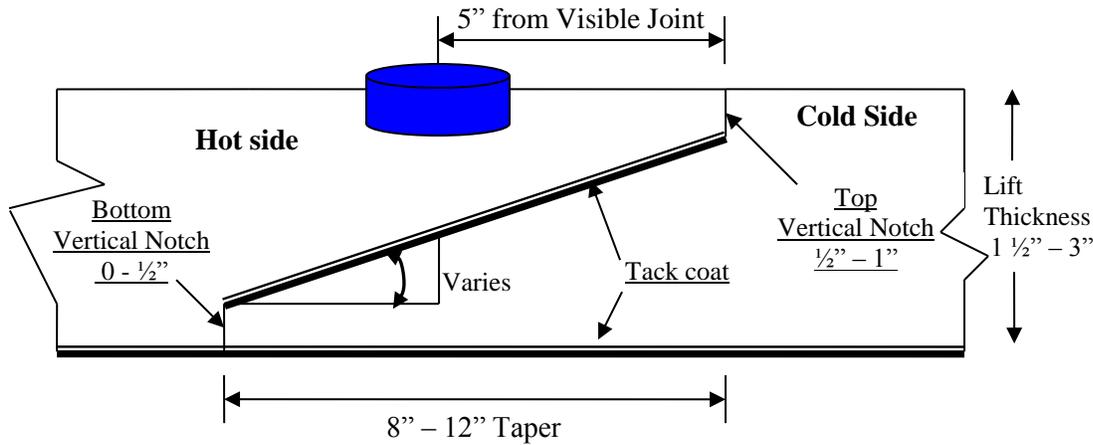
<sup>(2)</sup> If a non-bridge mat or joint core location randomly falls on a structure, the core is to be obtained on the structure in addition to the core(s) required on the structure.

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.

Method I, Notched Wedge Joint cores shall 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: Notched Wedge Joint Cores**

When Method III Butt Joint is utilized, cores shall be taken from the hot side so the edge of the core is within 1 inch of the longitudinal joint.

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.

Each core hole shall be filled within four hours 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 using a bituminous concrete mixture at a minimum temperature of 240°F containing the same or smaller nominal maximum aggregate size and compacted with a hand compactor or other mechanical means to the maximum compaction possible. The bituminous concrete fill shall be compacted to 1/8 inch above the finished pavement.

**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, theoretical maximum density (Gmm), 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 test results for a subject lot or sub lot may be replaced with the Department's

results 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.

**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 7 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. No request for Dispute Resolution will be allowed for a Density Lot in which any core was not taken within the required 5 calendar days of placement. 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 14 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 randomly located within the respective original sub lot. 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 match the specified lift 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. 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<sub>A</sub>)** = [(L x W<sub>adj</sub>)/9] x (t) x 0.0575 Tons/SY/inch = (-) Tons

Where: L = Length (ft)

(t) = Actual thickness (inches)

W<sub>adj</sub> = (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<sub>T</sub>)** = A x t<sub>adj</sub> x 0.0575 = (-) Tons

Where:  $A = \text{Area} = \{ [L \times (\text{Designed width} + \text{tolerance (lift thickness)}) / 12] / 9 \}$   
 $t_{\text{adj}} = \text{Adjusted thickness} = [(\text{Dt} + \text{tolerance}) - \text{Actual thickness}]$   
 $\text{Dt} = \text{Designed thickness (inches)}$

- 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:** The quantity of bituminous concrete representing the production lot will be adjusted based on test results and values listed in Tables 4.06-6 and 4.06-7 , . The Department’s Division of Material Testing will calculate the daily adjustment value for  $T_{SD}$ .

The adjustment values in Table 4.06-6 and 4.06-7 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<sub>t</sub> + AdjPB<sub>t</sub>) / 100] X Tons**

**Percent Adjustment for Air Voids = AdjAV<sub>t</sub> = [AdjAV<sub>1</sub> + AdjAV<sub>2</sub> + AdjAV<sub>i</sub> + ... + AdjAV<sub>n</sub>] / n**

Where: AdjAV<sub>t</sub> = Total percent air void adjustment value for the lot  
 AdjAV<sub>i</sub> = 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 4.06-6: Adjustment Values for Air Voids**

Adjustment Value (AdjAV <sub>i</sub> ) (%)	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

Positive air void adjustment values will not be calculated for any test that fails to meet gradation or binder content tolerances of the JMF in Table M.04.03– 5.

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

Where:  $\text{AdjPB}_t$  = Total percent liquid binder adjustment value for the lot  
 $\text{AdjPB}_i$  = Adjustment value from Table 4.06-7 resulting from each sub lot  
 $n$  = number of binder tests in a production lot

**TABLE 4.06-7: Adjustment Values for Binder Content**

Adjustment Value (AdjAV <sub>i</sub> ) (%)	<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 in a lift of pavement specified to be 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).

No positive adjustment will be applied to a Density Lot in which any core was not taken within the required 5 calendar days of placement.

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

Where:  $T_D$  = Total tons adjusted for density for each lot  
 $\text{PA}_M$  = Mat density percent adjustment from Table 4.06-9  
 $\text{PA}_J$  = 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) <sup>(1)(2)</sup>
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**

<b>Average Core Result Percent Joint Density</b>	<b>Percent Adjustment (Bridge and Non-Bridge) <sup>(1)(2)</sup></b>
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)

<sup>(1)</sup> ACRPD = Average Core Result Percent Density

<sup>(2)</sup> 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 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 tack coat based on the density 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, or from the automated metering system on the delivery vehicle.

**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. HMA S\* or PMA S\*:** The furnishing and placing of bituminous concrete will be paid for at the Contract unit price per ton for “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 cleaning the surface to be paved, including mechanical sweeping, 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 acceptance testing 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 are not equal to zero. A positive or negative adjustment will be applied to monies due the Contractor.

**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 Bituminous Concrete Adjustment Cost item if included in the bid proposal or estimate is not to be altered in any manner by the Contractor. If the Contractor should alter the amount shown, the altered figure will be disregarded and the original estimated cost will be used 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>
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 6.01-CONCRETE FOR STRUCTURES**

### **6.01.02 - Materials:**

Subarticle M.03.01-8(b)-Joint Sealer for Structures: *Add the following:*

Structure joint sealers shall conform to the following:

Where “Joint Seal” is specified in the plans, it shall conform to the Federal Specifications SS-S-200-E (Self-leveling type), TT-S-0227E (COM-NBS) Type II-Class A (Non-sag type), or one component polyurethane-based elastomeric sealants conforming to the Federal Specification TT-S-00230C Type II-Class A.

A Certified Test Report will be required in accordance with Article 1.06.07, certifying the conformance of the sealant to the requirements set forth in the Federal Specification. Should the consignee noted on the Certified Test Report be other than the Prime Contractor, the materials Certificates shall be required to identify the shipment.

### **6.01.03-Construction Methods:**

Subarticle 6.01.03-24-Joint Seal: *Add the following:*

Sealant shall be applied as outlined in the manufacturer’s printed instructions.

Primer shall be supplied by the sealant manufacturer and shall be applied on contact surfaces of the joint in accordance with the requirements of the particular sealant manufacturer.

## **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<sub>sa</sub>, G<sub>sb</sub>, and P<sub>w</sub><sub>a</sub> 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](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:

<b>CRCG Grading Requirements</b>	
<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 ¾" sieve. (i) Mixtures finer than condition (h) above. (j) Class 5 mixture shall contain no fibers. Class 5A mixture shall have 3/8 to ½ 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 ¼ 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
¼"									
3/8 "	60 - 82	90 - 100	95 - 100	42 - 66	98 - 100	100	100	100	8
½ "	70 - 100	100	100		100				8
¾"	90 - 100			60 - 80					8
1"	100								
2"				100					
<b>Additionally, the fraction of material retained between any two consecutive sieves shall not be less than 4%</b>									
<b>Mixture Temperature</b>									
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
<b>Mixture Properties</b>									
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<sub>sa</sub>, G<sub>sb</sub>, Pw<sub>a</sub> 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 <sup>(3)</sup>		RESTRICTED ZONE		CONTROL POINTS <sup>(3)</sup>		RESTRICTED ZONE		CONTROL POINTS <sup>(3)</sup>		RESTRICTED ZONE		CONTROL POINTS <sup>(3)</sup>		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 <sup>(1)</sup>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
VMA <sup>(2)</sup> (%)	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 <sup>(4)</sup>	0.6 – 1.2				0.6 – 1.2				0.6 – 1.2				0.6 – 1.2			
Agg. Temp <sup>(5)</sup>	280 – 350F				280 – 350F				280 – 350F				280 – 350F			
Mix Temp <sup>(6)</sup>	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**

<b>Notes:</b> (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 <sup>(1)</sup> ASTM D 5821	Fine Aggregate Angularity <sup>(7)</sup> 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 <sup>(1)</sup>
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**

<b>Daily quantity produced in tons (lot)</b>	<b>Number of Sub Lots/Tests</b>
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)	<sup>(1)</sup> Superpave Gyratory molds compacted to N <sub>des</sub>
5	AASHTO T 166(M)	<sup>(2)</sup> Bulk specific gravity of bituminous concrete
6	AASHTO R 35(M)	<sup>(2)</sup> 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 Gyratory 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 (Pb) 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**

<b>Notes:</b> (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.									
	<b>S0.25</b>		<b>S0.375</b>		<b>S0.5</b>		<b>S1</b>		<b>Tolerances</b>
<b>Sieve</b>	<b>CONTROL POINTS (4)</b>		<b>CONTROL POINTS (4)</b>		<b>CONTROL POINTS (4)</b>		<b>CONTROL POINTS (4)</b>		<b>JMF Limits (4)</b>
<b>inches</b>	<b>Min(%)</b>	<b>Max(%)</b>	<b>Min(%)</b>	<b>Max(%)</b>	<b>Min(%)</b>	<b>Max(%)</b>	<b>Min(%)</b>	<b>Max(%)</b>	<b>±Tol</b>
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 <sup>(2)</sup>	-	-	-	-	-	-	-	-	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 <sup>(5)</sup>	280 – 350F		280 – 350F		280 – 350F		280 – 350F		
Mix Temp <sup>(6)</sup>	265 – 325 F <sup>(1)</sup>		265 – 325 F <sup>(1)</sup>		265 – 325 F <sup>(1)</sup>		265 – 325 F <sup>(1)</sup>		
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 Gyrotory 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 <sup>(1)</sup>
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.**

<b>AASHTO Standard Specification</b>	
<b>Reference</b>	<b>Modification</b>
<b>M 320</b>	<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>
<b>AASHTO Standard Methods of Test</b>	
<b>Reference</b>	<b>Modification</b>
<b>T 27</b>	Section 7.7 Samples are not washed
<b>T 30</b>	Section 6.2 thru 6.5 Samples are not routinely washed
<b>T 168</b>	<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>
<b>T 195</b>	Section 4.3 only one truck load of mixture is sampled. Samples are taken from opposite sides of the load.
<b>T 209</b>	<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>
<b>T 245</b>	<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>
<b>T 283</b>	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.
<b>T 308</b>	<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 <math>148 \pm 5^{\circ}\text{C}</math> (<math>300 \pm 9^{\circ}\text{F}</math>) to a constant weight. RAP samples are to be oven dried at a maximum temperature of <math>110 \pm 5^{\circ}\text{C}</math> (<math>230 \pm 9^{\circ}\text{F}</math>) 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.
<b>AASHTO Standard Recommended Practices</b>	
<b>Reference</b>	<b>Modification</b>
R 35	<p><b><u>Volumetric Calculations of VMA and Correction Factor</u></b>  VMA<sub>a</sub> - Voids in Mineral Aggregate from (V<sub>a</sub> + V<sub>b</sub>) 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<sub>a</sub> when the P<sub>b</sub> × (100-P<sub>b</sub>) / 100 is known and substituted for A<sub>cf</sub>, as shown in <i>Formula 5.16.1A (ii)</i>. Test results from VMA<sub>a</sub> shall therefore be required to meet all contract specifications. Values of VMA<sub>a</sub> 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<sub>a</sub> 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 &amp; effective binder method:</p> $VMA_a = V_a + \left[ \frac{(Gmb_d \times (Pb_t - A_{cf}))}{G_b} \right]$ <p>Where: VMA<sub>a</sub> = VMA calculated from plant production mix( V<sub>a</sub> + V<sub>b</sub>)  Gmb<sub>d</sub> = Bulk specific gravity as determined by AASHTO T 166(M)  Pb<sub>t</sub> = Total Binder Content (corrected) by AASHTO T 308(M)  A<sub>cf</sub> = 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<sub>f</sub> 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<sub>cf</sub> are shown, although method (i) will be the desired method to be used. Both methods are equivalent when the G<sub>sa</sub>, G<sub>sb</sub> and P<sub>wa</sub> are recent and valid for the mix.</p> <p>i. <math>A_{cf} = D_f \times P_{wa} \times (100 - P_{b_t}) / 100</math>  ii. <math>A_{cf} = (P_{b_a} \text{ from annual JMF submittal}) \times (100 - P_{b_t}) / 100</math></p> <p>Where: D<sub>f</sub> = as determined by Formula 5.16.1B.  P<sub>wa</sub> = as determined by AASHTO T 84/85  P<sub>b<sub>a</sub></sub> = as determined by AASHTO M 323 (from annual JMF submittal)  D<sub>f</sub> (Density Factor): The Contractor shall calculate the bituminous concrete</p>

	<p>mix design <math>D_f</math> (derived from formula XI.2 APPENDIX XI of AASHTO R 35) for each class of material, in accordance with <i>Formula 5.16.1B</i>.</p> <p><i>Formula 5.16.1B.</i> Determining the Density Factor (<math>D_f</math>) of mix design bituminous concrete:</p> $D_f = \left( \frac{G_{se} - G_{sb}}{G_{sa} - G_{sb}} \right)$ <p>Where:  <math>D_f</math> = Density Factor or multiplier determined by AASHTO R-35(M)  <math>G_{se}</math> = Effective Specific Gravity determined by AASHTO M-323 at plant  <math>G_{sa}</math> = Apparent Specific Gravity determined by AASHTO T 84/85 of mix design  <math>G_{sb}</math> = Bulk Specific Gravity determined by AASHTO T 84/85 of mix design</p>
<p><b>R 26</b></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"> <li>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.</li> <li>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).</li> <li>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.</li> <li>4. All laboratories testing binders for the Department are required to be accredited by the AASHTO Materials Reference Laboratory (AMRL).</li> <li>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.</li> <li>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.</li> </ol> <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>

## **ON-THE-JOB TRAINING (OJT) WORKFORCE DEVELOPMENT PILOT:**

### **Description**

To provide construction industry related job opportunities to minorities, women and economically disadvantaged individuals; and to increase the likelihood of a diverse and inclusive workforce on Connecticut Department of Transportation (ConnDOT) projects.

All contractors (existing and newcomers) will be automatically placed in the Workforce Development Pilot. Standard OJT requirements typically associated with individual projects will no longer be applied at the project level for new projects. Instead, these requirements will be applicable on an annual basis for each contractor performing work on ConnDOT projects.

The OJT Workforce Development Pilot will allow a contractor to train employees on Federal, State and privately funded projects located in Connecticut. However, contractors should give priority to training employees on ConnDOT Federal-Aid funded projects.

### **Funding**

The Department will establish an OJT fund annually from which contractors may bill the Department directly for eligible trainee hours. The funds for payment of trainee hours on federal-aid projects will be allocated from the ½ of 1% provided for OJT funding, and will be based on hours trained, not to exceed a maximum of \$25,000.00 per year; per contractor.

### **Minorities and Women**

Developing, training and upgrading of minorities, women and economically disadvantaged individuals toward journeyman level status is the primary objective of this special training provision. Accordingly, the Contractor shall make every effort to enroll minority, women and economically disadvantaged individuals as trainees to the extent that such persons are available within a reasonable area of recruitment. This training commitment is not intended, and shall not be used, to discriminate against any applicant for training whether a member of a minority group or not.

### **Assigning Training Goals**

The Department, through the OJT Program Coordinator, will assign training goals for a calendar year based on the contractor's past two year's activities and the contractor's anticipated upcoming year's activity with the Department. At the beginning of each year, all contractors eligible will be contacted by the Department to determine the number of trainees that will be assigned for the upcoming calendar year. At that time, the Contractor shall enter into an agreement with the Department to provide a self-imposed on-the-job training program for the calendar year. This agreement will include a specific number of annual training goals agreed to by both parties. The number of training assignments may range from one (1) to six (6) per

contractor per calendar year. Each January, a summary of the trainees required and the OJT Workforce Development Pilot package will be sent to participating contractors. The number of trainees assigned to each contractor in the summary will increase proportionately not to exceed 6, as shown in the following table. This package will also be provided to contractors as they become newly eligible for the OJT Workforce Development Pilot throughout the remainder of the year. Projects awarded after September 30 will be included in the following year's Program.

The dollar thresholds for training assignments are as follows:

\$4.5 – 8 million=	1 trainee
\$ 9 – 15 million=	2 trainees
\$16 – 23 million=	3 trainees
\$24 – 30 million=	4 trainees
\$31 – 40 million=	5 trainees
\$41 – and above=	6 trainees

**Training Classifications**

Preference shall be given to providing training in the following skilled work classifications. However, the classifications established are not all-inclusive:

Equipment Operators	Electricians
Laborers	Painters
Carpenters	Iron / Reinforcing Steel Workers
Concrete Finishers	Mechanics
Pipe Layers	Welders

The Department has on file common training classifications and their respective training requirements; that may be used by the contractors. Contractors shall submit new classifications for specific job functions that their employees are performing. The Department will review and recommend for acceptance the new classifications proposed by contractors, if applicable. New classifications shall meet the following requirements:

Proposed training classifications are reasonable and realistic based on the job skill classification needs, and the number of training hours specified in the training classification is consistent with common practices and provides enough time for the trainee to obtain journeyman level status.

Where feasible, 25% percent of apprentices or trainees in each occupation shall be in their first year of apprenticeship or training. The number of trainees shall be distributed among the work classifications on the basis of the contractor's needs and the availability of journeymen in the various classifications within a reasonable area of recruitment.

No employee shall be employed as a trainee in any classification in which they have successfully completed a training course leading to journeyman level status or in which they have been employed as a journeyman.

## **Records and Reports**

The Contractor shall maintain enrollment in the program and submit all required reports documenting company compliance under these contract requirements. These documents and any other information shall be submitted to the OJT Program Coordinator as requested.

Upon the trainee's completion and graduation from the program, the Contractor shall provide each trainee with a certification Certificate showing the type and length of training satisfactorily completed.

## **Trainee Interviews**

In order to determine the continued effectiveness of the OJT Program in Connecticut, the department will periodically conduct personal interviews with current trainees and may survey recent graduates of the program. This enables the OJT Program Coordinator to modify and improve the program as necessary. Trainee interviews are generally conducted at the job site to ensure that the trainees' work and training is consistent with the approved training program.

## **Trainee Wages**

Contractors shall compensate trainees on a graduating pay scale based upon a percentage of the prevailing minimum journeyman wages (Davis-Bacon Act). Minimum pay shall be as follows:

60 percent	of the journeyman wage for the first half of the training period
75 percent	of the journeyman wage for the third quarter of the training period
90 percent	of the journeyman wage for the last quarter of the training period

*In no case, will the trainee be paid less than the prevailing rate for general laborer as shown in the contract wage decision (must be approved by the Department of Labor).*

## **Achieving or Failing to Meet Training Goals**

The Contractor will be credited for each trainee currently enrolled or who becomes enrolled in the approved training program and providing they receive the required training under the specific training program. Trainees will be allowed to be transferred between projects if required by the Contractor's schedule and workload. The OJT Program Coordinator must be notified of transfers within five (5) days of the transfer or reassignments by e-mail ([Phylisha.Coles@ct.gov](mailto:Phylisha.Coles@ct.gov)).

Where a contractor does not or cannot achieve its annual training goal with female or minority trainees, they must produce adequate Good Faith Efforts documentation. Good Faith Efforts are those designed to achieve equal opportunity through positive, aggressive, and continuous result-oriented measures. 23 CFR § 230.409(g) (4). Contractors should request minorities and females from unions when minorities and females are under-represented in the contractor's workforce.

Whenever a contractor requests ConnDOT approval of someone other than a minority or female, the contractor must submit documented evidence of its Good Faith Efforts to fill that position with a minority or female. When a non-minority male is accepted, a contractor must continue to attempt to meet its remaining annual training goals with females and minorities.

Where a contractor has neither attained its goal nor submitted adequate Good Faith Efforts documentation, ConnDOT will issue a letter of non-compliance. Within thirty (30) days of receiving the letter of non-compliance, the contractor must submit a written Corrective Action Plan (CAP) outlining the steps that it will take to remedy the non-compliance. The CAP must be approved by ConnDOT. Failure to comply with the CAP may result in your firm being found non-responsive for future projects.

### **Measurement and Payment**

Optional reimbursement will be made to the contractor for providing the required training under this special provision on ConnDOT Federal-Aid funded projects only.

Contractor will be reimbursed at \$0.80 for each hour of training given to an employee in accordance with an approved training or apprenticeship program. This reimbursement will be made even though the Contractor receives additional training program funds from other sources, provided such other source does not specifically prohibit the contractor from receiving other reimbursement.

Reimbursement for training is made annually or upon the trainees completion and not on a monthly basis. No payment shall be made to the Contractor if either the failure to provide the required training, or the failure to hire the trainee as a journeyman, is caused by the Contractor.

Program reimbursements will be made directly to the prime contractor on an annual basis. To request reimbursement, prime contractors must complete the Voucher for OJT Workforce Development Pilot Hourly Reimbursement for each trainee in the OJT Program. This form is included in the OJT Workforce Development Pilot package and is available on the Department's web site at:

[www.ct.gov/dot](http://www.ct.gov/dot)

The completed form must be submitted to the Office of Contract Compliance for approval. The form is due on the 15<sup>th</sup> day of January for each trainee currently enrolled and for hours worked on ConnDOT Federal-Aid funded projects only.

**D.B.E. SUBCONTRACTORS AND MATERIAL SUPPLIERS OR MANUFACTURERS**

**January 2013**

**I. ABBREVIATIONS AND DEFINITIONS AS USED IN THIS SPECIAL PROVISION**

A. *CTDOT* means the Connecticut Department of Transportation.

B. *USDOT* means the U.S. Department of Transportation, including the Office of the Secretary, the Federal Highway Administration (“FHWA”), the Federal Transit Administration (“FTA”), and the Federal Aviation Administration (“FAA”).

C. *Broker* means a party acting as an agent for others in negotiating Contracts, Agreements, purchases, sales, etc., in return for a fee or commission.

D. *Contract, Agreement or Subcontract* means a legally binding relationship obligating a seller to furnish supplies or services (including but not limited to, construction and professional services) and the buyer to pay for them. For the purposes of this provision, a lease for equipment or products is also considered to be a Contract.

E. *Contractor* means a consultant, second party or any other entity under Contract to do business with CTDOT or, as the context may require, with another Contractor.

F. *Disadvantaged Business Enterprise (“DBE”)* means a for profit small business concern:

1. That is at least 51 percent owned by one or more individuals who are both socially and economically disadvantaged or, in the case of a corporation, in which 51 percent of the stock is owned by one or more such individuals; and
2. Whose management and daily business operations are controlled by one or more of the socially and economically disadvantaged individuals who own it; and
3. Certified by CTDOT under Title 49 of the Code of Federal Regulations, Part 26, (Title 49 CFR Part 23 of the Code of Federal Regulations for Participation of Disadvantaged Business Enterprise in Airport Concessions)

G. *USDOT-assisted Contract* means any Contract between CTDOT and a Contractor (at any tier) funded in whole or in part with USDOT financial assistance.

H. *Good Faith Efforts (“GFE”)* means all necessary and reasonable steps to achieve a DBE goal or other requirement which by their scope, intensity, and appropriateness to the objective, can reasonably be expected to fulfill the program requirement.

I. *Small Business Concern* means, with respect to firms seeking to participate as DBEs in USDOT-assisted Contracts, a small business concern as defined pursuant to Section 3 of the Small Business Act and Small Business Administration (“SBA”) regulations implementing it (13 CFR Part 121) that also does not exceed the cap on average annual gross receipts in 49 CFR Part 26, Section 26.65(b).

J. *Socially and Economically Disadvantaged Individual* means any individual who is a citizen (or lawfully admitted permanent resident) of the United States and who is:

1. Any individual who CTDOT finds, on a case-by-case basis, to be a socially and economically disadvantaged individual.
2. Any individuals in the following groups, members of which are rebuttably presumed to be socially and economically disadvantaged:
  - “Black Americans”, which includes persons having origins in any of the Black racial groups of Africa;
  - “Hispanic Americans”, which includes persons of Mexican, Puerto Rican, Cuban, Dominican, Central or South American, or other Spanish or Portuguese culture or origin, regardless of race;
  - “Native Americans”, which includes persons who are American Indians, Eskimos, Aleuts, or Native Hawaiians.
  - “Asian-Pacific Americans”, which includes persons whose origins are from Japan, China, Taiwan, Korea, Burma (Myanmar), Vietnam, Laos, Cambodia (Kampuchea), Thailand, Malaysia, Indonesia, the Philippines, Brunei, Samoa, Guam, the U.S. Trust Territories of the Pacific Islands (Republic of Palau), the Commonwealth of the Northern Marianas Islands, Macao, Fiji, Tonga, Kiribati, Juvalu, Nauru, or Federated States of Micronesia;
  - “Subcontinent Asian Americans”, which includes persons whose origins are from India, Pakistan, Bangladesh, Bhutan, the Maldives Islands, Nepal or Sri Lanka;
  - Women;
  - Any additional groups whose members are designated as socially and economically disadvantaged by the SBA, at such time as the SBA designation becomes effective.

K. *Commercially Useful Function (“CUF”)* means the DBE is responsible for the execution of the work of the contract and is carrying out its responsibilities by actually performing, managing, and supervising the work involved with its own forces and equipment. The DBE must be responsible for procuring, determining quantity, negotiating price, determining quality and paying for all materials (where applicable) associated with their work. The DBE must also perform at least 30% of the total cost of its contract with its own workforce.

## **II. ADMINISTRATIVE REQUIREMENTS**

### **A. General Requirements**

A DBE goal percentage equaling **Fourteen Percent (14%)** of the Contract value has been established for this Contract. This DBE goal percentage will be applied to the final Contract value to ultimately determine the required DBE goal. If additional work is required, DBE firms should be provided the appropriate opportunities to achieve the required DBE goal.

In order to receive credit toward the Contract DBE goal, the firms utilized as DBE subcontractors or suppliers must be certified as DBEs in the type of work to be counted for credit by CTDOT’s Office of Contract Compliance prior to the date of the execution of the subcontract. Neither CTDOT nor the State of Connecticut’s Unified Certification Program (UCP) makes any representation as to any DBE’s technical or financial ability to perform the work. Prime contractors are solely responsible for performing due diligence in hiring DBE subcontractors.

All DBEs shall perform a CUF for the work that is assigned to them. The Contractor shall monitor and ensure that the DBE is in compliance with this requirement. The Connecticut DBE UPC Directory of certified firms can

be found on the CTDOT website <http://www.ct.gov/dot>. The directory lists certified DBE firms with a description of services that they are certified to perform. Only work identified in this listing may be counted towards the project's DBE goal. A DBE firm may request to have services added at any time by contacting CTDOT's Office of Contract Compliance. No credit shall be counted for any DBE firm found not to be performing a CUF.

Once a Contract is awarded, all DBEs that were listed on the pre-award DBE commitment document must be utilized. The Contractor is obligated to provide the value and items of the work originally established in the pre-award documentation to the DBE firms listed in the pre-award documentation. Any modifications to the pre-award commitment must follow the procedure established in Section II-C.

The Contractor shall designate a liaison officer who will administer the Contractor's DBE program. Upon execution of this Contract, the name of the liaison officer shall be furnished in writing to CTDOT's unit administering the Contract, CTDOT's Office of Contract Compliance and CTDOT's Office of Construction ("OOC"). Contact information for the designated liaison officer shall be furnished no later than the scheduled date for the pre-construction meeting.

**The Contractor shall submit a bi-monthly report to the appropriate CTDOT unit administering the Contract. This report shall indicate what work has been performed to date, with the dollars paid and percentage of DBE goal completed.**

**Verified payments made to DBEs shall be included in this bi-monthly report. A sample form is included on the CTDOT website.**

In addition, the report shall include:

1. A projected time frame of when the remaining work is to be completed for each DBE.
2. A statement by the Contractor either confirming that the approved DBEs are on schedule to meet the Contract goal, or that the Contractor is actively pursuing a GFE.
3. If retainage is specified in the Contract specifications, then a statement of certification that the subcontractors' retainage is being released in accordance with 1.08.01 (Revised or supplemented).

Failure by the Contractor to provide the required reports may result in CTDOT withholding an amount equal to one percent (1%) of the monthly estimate until the required documentation is received.

The Contractor shall receive DBE credit when a DBE, or any combination of DBEs, perform work under the Contract in accordance with this specification.

Only work actually performed by and/or services provided by DBEs which are certified for such work and/or services, as verified by CTDOT, can be counted toward the DBE goal. Supplies and equipment a DBE purchases or leases from the Contractor or its affiliate cannot be counted toward the goal.

Monitoring of the CUF will occur by CTDOT throughout the life of the project. If it is unclear that the DBE is performing the work specified in its subcontract with the prime Contractor, further review may be required. If it is determined that the DBE is not performing a CUF, then the work performed by that DBE will not be counted towards the DBE goal percentage.

## **B. Subcontract Requirements**

The Contractor shall submit to CTDOT's OOC all requests for subcontractor approvals on the standard CLA-12 forms provided by CTDOT. The dollar amount and items of work identified on the CLA-12 form must, at minimum, equal the dollar value submitted in the pre-award commitment. CLA-12 forms can be found at <http://www.ct.gov/dot/construction> under the "Subcontractor Approval" section. All DBE subcontractors must be identified on the CLA-12 form, regardless of whether they are being utilized to meet a Contract goal percentage. A copy of the legal Contract between the Contractor and the DBE subcontractor/supplier, a copy of the Title VI Contractor Assurances and a copy of the Required Contract Provision for Federal Aid Construction Contracts (Form FHWA-1273) (Federal Highway Administration projects only) must be submitted along with a request for subcontractor approval. These attachments cannot be substituted by reference.

If retainage is specified in the Contract specifications, then the subcontract agreement must contain a prompt payment mechanism that acts in accordance with Article 1.08.01 (Revised or supplemented).

If the Contract specifications do not contain a retainage clause, the Contractor shall not include a retainage clause in any subcontract agreement, and in this case, if a Contractor does include a retainage clause, it shall be deemed unenforceable.

In addition, the following documents are to be included with the CLA-12, if applicable:

- An explanation indicating who will purchase material.
- A statement explaining any method or arrangement for utilization of the Contractor's equipment.

The subcontract must show items of work to be performed, unit prices and, if a partial item, the work involved by all parties. If the subcontract items of work or unit prices are modified, the procedure established in Section II-C must be followed.

Should a DBE subcontractor further sublet items of work assigned to it, only lower tier subcontractors who are certified as a DBE firm will be counted toward the DBE goal. If the lower tier subcontractor is a non-DBE firm, the value of the work performed by that firm will not be counted as credit toward the DBE goal.

The use of joint checks between a DBE firm and the Contractor is acceptable, provided that written approval is received from the OOC prior to the issuance of any joint check. Should it become necessary to issue a joint check between the DBE firm and the Contractor to purchase materials, the DBE firm must be responsible for negotiating the cost, determining the quality and quantity, ordering the material and installing (where applicable), and administering the payment to the supplier. The Contractor should not make payment directly to suppliers.

Each subcontract the Contractor signs with a subcontractor must contain the following assurance:

"The subcontractor/supplier/manufacture shall not discriminate on the basis of race, color, national origin, or sex in the performance of this contract. The contractor shall carry out applicable requirements of 49 CFR Part 26 in the award and administration of DOT-assisted contracts. Failure by the contractor/subcontractor/supplier/manufacture to carry out these requirements is a material breach of this contract, which may result in the termination of this contract or such other remedy as the recipient deems appropriate."

## **C. Modification to Pre-Award Commitment**

Contractors may not terminate for convenience any DBE subcontractor or supplier that was listed on the pre-award DBE commitment without prior written approval of the OOC. This includes, but is not limited to, instances

in which a Contractor seeks to perform work originally designated for a DBE subcontractor with its own forces or those of an affiliate, a non-DBE firm, or with another DBE firm. Prior to approval, the Contractor must demonstrate to the satisfaction of the OOC, that it has good cause, as found in 49CFR Part 26.53 (f)(3), for termination of the DBE firm.

Before transmitting its request for approval to terminate pre-award DBE firms to the OOC, the Contractor must give written notice to the DBE subcontractor and include a copy to the OOC of its notice to terminate and/or substitute, and the reason for the notice.

The Contractor must provide five (5) days for the affected DBE firm to respond. This affords the DBE firm the opportunity to advise the OOC and the Contractor of any reasons why it objects to the termination of its subcontract and why the OOC should not approve the Contractor's action.

Once the Contract is awarded, should there be any amendments or modifications of the approved pre-award DBE submission other than termination of a DBE firm, the Contractor shall follow the procedure below that best meets the criteria associated with the reason for modification:

1. If the change is due to a scope of work revision or non-routine quantity revision by CTDOT, the Contractor must notify CTDOT's OOC in writing or via electronic mail that their DBE participation on the project may be impacted as soon as they are aware of the change. In this case, a release of work from the DBE firm may not be required; however the Contractor must concurrently notify the DBE firm in writing, and copy the OOC for inclusion in the project DBE file. This does not relieve the Contractor of its obligation to meet the Contract specified DBE goal, or of any other responsibility found in this specification.
2. If the change is due to a factor other than a CTDOT directive, a request for approval in writing or via electronic mail of the modification from the OOC must be submitted, along with an explanation of the change(s), prior to the commencement of work. The Contractor must also obtain a letter of release from the originally named DBE indicating their concurrence with the change, and the reason(s) for their inability to perform the work. In the event a release cannot be obtained, the Contractor must document all efforts made to obtain it.
3. In the event a DBE firm that was listed in the pre-award documents is **unable** or **unwilling** to perform the work assigned, the Contractor shall:
  - Notify the OOC Division Chief immediately and make efforts to obtain a release of work from the firm.
  - Submit documentation that will provide a basis for the change to the OOC for review and approval prior to the implementation of the change.
  - Use the DBE Directory to identify and contact firms certified to perform the type of work that was assigned to the unable or unwilling DBE firm. The Contractor should also contact CTDOT's Office of Contract Compliance for assistance in locating additional DBE firms to the extent needed to meet the contract goal.

Should a DBE subcontractor be terminated or fail to complete work on the Contract for any reason, the Contractor must make a GFE to find another DBE subcontractor to substitute for the original DBE. The DBE replacement shall be given every opportunity to perform at least the same amount of work under the Contract as the original DBE subcontractor.

If the Contractor is unable to find a DBE replacement:

- The Contractor should identify other contracting opportunities and solicit DBE firms in an effort to meet the Contract DBE goal requirement, if necessary, and provide documentation to support a GFE. (Refer to GFE in Section III.)
- The Contractor must demonstrate that the originally named DBE, who is unable or unwilling to perform the work assigned, is in default of its subcontract, or identify other issues that affected the DBE firm's ability to perform the assigned work. **The Contractor's ability to negotiate a more advantageous agreement with another subcontractor is not a valid basis for change.**

### **III. GOOD FAITH EFFORTS**

The DBE goal is **NOT** reduced or waived for projects where the Contractor receives a Pre-Award GFE determination from the Office of Contract Compliance prior to the award of the Contract. It remains the responsibility of the Contractor to make a continuing GFE to achieve the specified Contract DBE goal. The Contractor shall pursue every available opportunity to obtain additional DBE firms and document all efforts made in such attempts.

At the completion of all Contract work, the Contractor shall submit a final report to CTDOT's unit administering the Contract indicating the work done by and the dollars paid to DBEs. Only verified payments made to DBEs performing a CUF will be counted towards the Contract goal.

Goal attainment is based on the total Contract value, which includes all construction orders created during the Contract. If the Contractor does not achieve the specified Contract goal for DBE participation or has not provided the value of work to the DBE firms originally committed to in the pre-award submission, the Contractor shall submit documentation to CTDOT's unit administering the Contract detailing the GFE made during the performance of the Contract to satisfy the goal.

A GFE should consist of the following, where applicable (CTDOT reserves the right to request additional information):

1. A detailed statement of the efforts made to replace an unable or unwilling DBE firm, and a description of any additional subcontracting opportunities that were identified and offered to DBE firms in order to increase the likelihood of achieving the stated goal.
2. A detailed statement, including documentation of the efforts made to contact and solicit bids from certified DBEs, including the names, addresses, and telephone numbers of each DBE firm contacted; the date of contact and a description of the information provided to each DBE regarding the scope of services and anticipated time schedule of work items proposed to be subcontracted and the response from firms contacted.
3. Provide a detailed explanation for each DBE that submitted a subcontract proposal which the Contractor considered to be unacceptable stating the reason(s) for this conclusion.
4. Provide documentation, if any, to support contacts made with CTDOT requesting assistance in satisfying the specified Contract goal.

5. Provide documentation of all other efforts undertaken by the Contractor to meet the defined goal. Additional documentation of efforts made to obtain DBE firms may include but will not be limited to:
  - Negotiations held in good faith with interested DBE firms, not rejecting them without sound reasons.
  - Written notice provided to a reasonable number of specific DBE firms in sufficient time to allow effective participation.
  - Those portions of work that could be performed by readily available DBE firms.

**In instances where the Contractor can adequately document or substantiate its GFE and compliance with other DBE Program requirements, the Contractor will have satisfied the DBE requirement and no administrative remedies will be imposed.**

#### **IV. PROJECT COMPLETION**

At the completion of all Contract work, the Contractor shall:

1. Submit a final report to CTDOT's unit administering the Contract indicating the work done by, and the dollars paid to DBEs.
2. Submit verified payments made to all DBE subcontractors for the work that was completed.
3. Submit documentation detailing any changes to the DBE pre-award subcontractors that have not met the original DBE pre-award commitment, including copies of the Department's approvals of those changes.
4. Retain all records for a period of three (3) years following acceptance by CTDOT of the Contract and those records shall be available at reasonable times and places for inspection by authorized representatives of CTDOT and Federal agencies. If any litigation, claim, or audit is started before the expiration of the three (3) year period, the records shall be retained until all litigation, claims, or audit findings involving the records are resolved.

If the Contractor does not achieve the specified Contract goal for DBE participation in addition to meeting the dollar value committed to the DBE subcontractors identified in the pre-award commitment, the Contractor shall submit documentation to CTDOT's unit administering the Contract detailing the GFE made during the performance of the Contract to satisfy the goal.

#### **V. SHORTFALLS**

##### **A. Failure to meet DBE goals**

**As specified in (II-A) above, attainment of the Contract DBE goal is based on the final Contract value.** The Contractor is expected to achieve the amount of DBE participation originally committed to at the time of award; however, additional efforts must be made to provide opportunities to DBE firms in the event a Contract's original value is increased during the life of the Contract.

The Contractor is expected to utilize the DBE subcontractors originally committed in the DBE pre-award documentation for the work and dollar value that was originally assigned.

If a DBE is terminated or is unable or unwilling to complete its work on a Contract, the Contractor shall make a GFE to replace that DBE with another certified DBE to meet the Contract goal.

The Contractor shall immediately notify the OOC of the DBE's inability or unwillingness to perform, and provide reasonable documentation and make efforts to obtain a release of work from the firm.

If the Contractor is unable to find a DBE replacement, then the Contractor should identify other contracting opportunities and solicit DBE firms in an effort to meet the Contract DBE goal requirement, if necessary, and provide documentation to support a GFE.

When a DBE is unable or unwilling to perform, or is terminated for just cause, the Contractor shall make a GFE to find other DBE opportunities to increase DBE participation to the extent necessary to at least satisfy the Contract goal.

For any DBE pre-award subcontractor that has been released appropriately from the project, no remedy will be assessed, provided that the Contractor has met the criteria described in Section II-C.

#### **B. Administrative Remedies for Non-Compliance:**

In cases where the Contractor has failed to meet the Contract specified DBE goal or the DBE pre-award commitment, and where no GFE has been demonstrated, then one or more of the following administrative remedies will be applied:

1. A reduction in Contract payments to the Contractor as determined by CTDOT, not to exceed the shortfall amount of the **DBE goal**. The maximum shortfall will be calculated by multiplying the Contract DBE goal (adjusted by any applicable GFE) by the final Contract value, and subtracting any verified final payments made to DBE firms by the Contractor.
2. A reduction in Contract payments to the Contractor determined by CTDOT, not to exceed the shortfall amount of the **pre-award commitment**. The maximum shortfall will be calculated by subtracting any verified final payments made by the Contractor to each DBE subcontractor from the amount originally committed to that subcontractor in the pre-award commitment.
3. A reduction in Contract payments to the Contractor determined by CTDOT for any pre-award DBE subcontractor who has not obtained the dollar value of work identified in the DBE pre-award commitment and has not followed the requirements of Section II-C or for any DBE firm submitted for DBE credit that has not performed a CUF.
4. The Contractor being required to submit a written DBE Program Corrective Action Plan to CTDOT for review and approval, which is aimed at ensuring compliance on future projects.
5. The Contractor being required to attend a Non-Responsibility Meeting on the next contract where it is the apparent low bidder.
6. The Contractor being suspended from bidding on contracts for a period not to exceed six (6) months.

## **VI. CLASSIFICATIONS OTHER THAN SUBCONTRACTORS**

### **A. Material Manufacturers**

Credit for DBE manufacturers is 100% of the value of the manufactured product. A manufacturer is a firm that operates or maintains a factory or establishment that produces on the premises the materials or supplies obtained by the Contractor.

If the Contractor elects to utilize a DBE manufacturer to satisfy a portion of, or the entire specified DBE goal, the Contractor must provide the OOC with:

- Subcontractor Approval Form (CLA-12) indicating the firm designation,
- An executed "Affidavit for the Utilization of Material Suppliers or Manufacturers" (sample attached), and
- Substantiation of payments made to the supplier or manufacturer for materials used on the project.

### **B. Material Suppliers (Dealers)**

Credit for DBE dealers/suppliers is limited to 60% of the value of the material to be supplied, provided such material is obtained from an approved DBE dealer/supplier.

In order for a firm to be considered a regular dealer, the firm must own, operate, or maintain a store, warehouse, or other establishment in which the materials, supplies, articles or equipment of the general character described by the specifications and required under the contract are bought, kept in stock, and regularly sold or leased to the public in the usual course of business. At least one of the following criteria must apply:

- To be a regular dealer, the firm must be an established, regular business that engages, as its principal business and under its own name, in the purchase and sale or lease of the products in question.
- A person may be a regular dealer in such bulk items as petroleum products, steel, cement, gravel, stone, or asphalt without owning, operating or maintaining a place of business if the person both owns and operates distribution equipment for the products. Any supplementing of the regular dealers' own distribution equipment shall be by long term lease agreement, and not on an ad hoc or contract to contract basis.
- Packers, brokers, manufacturers' representatives, or other persons who arrange or expedite transactions are not regular dealers within the meaning of this paragraph.

If the Contractor elects to utilize a DBE supplier to satisfy a portion or the entire specified DBE goal, the Contractor must provide the OOC with:

- Subcontractor Approval Form (CLA-12) indicating the firm designation,
- An executed "Affidavit for the Utilization of Material Suppliers or Manufacturers" (sample attached), and
- Substantiation of payments made to the supplier or manufacturer for materials used on the project.

### **C. Brokering**

- Brokering of work for DBE firms who have been listed by the Department as certified brokers is allowed. Credit for those firms shall be applied following the procedures in Section VI-D.
- Brokering of work by DBEs who have been approved to perform subcontract work with their own workforce and equipment is not allowed, and is a Contract violation.

- Firms involved in the brokering of work, whether they are DBEs and/or majority firms who engage in willful falsification, distortion or misrepresentation with respect to any facts related to the project shall be referred to the U.S. DOT, Office of the Inspector General for prosecution under Title 18, U.S. Code, Part I, Chapter 47, Section 1020.

#### **D. Non-Manufacturing or Non-Supplier DBE Credit**

Contractors may count towards their DBE goals the following expenditures with DBEs that are not manufacturers or suppliers:

- Reasonable fees or commissions charged for providing a bona fide service such as professional, technical, consultant or managerial services and assistance in the procurement of essential personnel, facilities, equipment materials or supplies necessary for the performance of the Contract, provided that the fee or commission is determined by the OOC to be reasonable and consistent with fees customarily allowed for similar services.
- The fees charged only for delivery of materials and supplies required on a job site when the hauler, trucker, or delivery service is a DBE, and not the manufacturer, or regular dealer of the materials and supplies, and provided that the fees are determined by the OOC to be reasonable and not excessive as compared with fees customarily allowed for similar services.
- The fees or commissions charged for providing bonds or insurance specifically required for the performance of the Contract, provided that the fees or commissions are determined by CTDOT to be reasonable and not excessive as compared with fees customarily allowed for similar services.

#### **E. Trucking**

While technically still considered a subcontractor, the rules for counting credit for DBE trucking firms are as follows:

- The DBE must own and operate at least one fully licensed, insured, and operational truck used on the Contract.
- The DBE receives credit for the total value of the transportation services it provides on the Contract using trucks it owns, insures and operates using drivers it employs.
- The DBE may lease trucks from another DBE firm, including an owner-operator who is certified as a DBE. The DBE who leases trucks from another DBE receives credit for the total value of the transportation services the lessee DBE provides on the Contract.
- The DBE may lease trucks from a non-DBE firm; however the DBE may only receive credit for any fees or commissions received for arranging transportation services provided by the non-DBE firms. Additionally, the DBE firm must demonstrate that they are in full control of the trucking operation for which they are seeking credit.

#### **VII. Suspected DBE Fraud**

In appropriate cases, CTDOT will bring to the attention of the USDOT any appearance of false, fraudulent, or dishonest conduct in connection with the DBE program, so that USDOT can take the steps, e.g. referral to the

Department of Justice for criminal prosecution, referral to USDOT Inspector General, action under suspension and debarment or Program Fraud and Civil Penalties rules provided in 49 CFR Part 31.

**CONNECTICUT DEPARTMENT OF TRANSPORTATION  
(OFFICE OF CONSTRUCTION)  
BUREAU OF ENGINEERING AND CONSTRUCTION**

This affidavit must be completed by the State Contractor's DBE notarized and attached to the contractor's request to utilize a DBE supplier or manufacturer as a credit towards its DBE contract requirements; failure to do so will result in not receiving credit towards the contract DBE requirement.

State Contract No.

Federal Aid Project No.

Description of Project

I, \_\_\_\_\_, acting in behalf of \_\_\_\_\_,  
(Name of person signing Affidavit) (DBE person, firm, association or corporation)

of which I am the \_\_\_\_\_ certify and affirm that \_\_\_\_\_  
(Title of Person) (DBE person, firm, association or corporation)

is a certified Connecticut Department of Transportation DBE. I further certify and affirm that I have read and understand 49 CFR, Sec. 26.55(e)(2), as the same may be revised.

I further certify and affirm that \_\_\_\_\_ will assume the actual and  
(DBE person, firm, association or Corporation)

for the provision of the materials and/or supplies sought by \_\_\_\_\_.

If a manufacturer, I operate or maintain a factory or establishment that produces, on the premises, the materials, supplies, articles or equipment required under the contract an of the general character described by the specifications.

If a supplier, I perform a commercially useful function in the supply process. As a regular dealer, I, at a minimum, own and operate the distribution equipment for bulk items. Any supplementing of my distribution equipment shall be by long-term lease agreement, and not on an ad hoc or contract-by-contract basis.

I understand that false statements made herein are punishable by Law (Sec. 53a-157), CGS, as revised).

(Name of Corporation or Firm)

(Signature & Title of Official making the Affidavit)

Subscribed and sworn to before me, this \_\_\_\_\_ day of \_\_\_\_\_ 20 \_\_\_\_\_.

Notary Public (Commissioner of the Superior Court)

My Commission Expires \_\_\_\_\_

**CERTIFICATE OF CORPORATION**

I, \_\_\_\_\_, certify that I am the \_\_\_\_\_  
(Official) (President)

of the Corporation named in the foregoing instrument; that I have been duly authorized to affix the seal of the Corporation to such papers as require the seal; that \_\_\_\_\_, who signed said instrument on behalf of the Corporation, was then \_\_\_\_\_ of said corporation; that said instrument was duly signed for and in behalf of said Corporation by authority of its governing body and is within the scope of its corporation powers.

\_\_\_\_\_  
(Signature of Person Certifying)

\_\_\_\_\_  
(Date)

## **ITEM #0020801A – ASBESTOS ABATEMENT**

### **00.20.01 - 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.

### **00.20.02 - 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.

**00.20.03 - 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 I/II Non-Friable ACM, and it is not expected that the abatement procedures will render the Category I/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.

**Site No. 3 - Bridge No. 02376, Turning Point 831 over I-84, East Hartford**

**Includes the removal of:**

- **Dark grey caulking on the bridge guard rail brackets and parapet wall interface (both sides of the bridge)**

**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.**

**Site No. 4 - Exterior Flashing Tar, Bridge No. 02368, East Hartford**

**Includes the removal of:**

- **Black flashing tar on metal bearings/concrete abutment pads (both abutments)**

**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.**

**Sign Support No. 21607 near Bridge No. 02368A, East Hartford**

**Includes the removal of:**

- **Black flashing tar waterproofing on base plates of metal sign support**

**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.

**00.20.04 - Method of Measurement:**

No measurement will be made for the work in this Section. The completed work shall be paid as a lump sum.

**00.20.05 - 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	L.S.

## **ITEM #0020804A – REMOVAL OF ASBESTOS**

### **00.20.01 - Description:**

Work under this item shall include the removal 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.

### **00.20.02 - 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.

**00.20.03 - 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 I/II Non-Friable ACM, and it is not expected that the abatement procedures will render the Category I/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.

**All Four Bridge Sites**

**Includes the removal of:**

- **The presumed presence of asbestos containing damp proofing on the backside of the abutments and retaining walls**

**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.**

**The above material is` presently presumed to be present and is presumed to be ACM. Contractor shall expose the materials as directed under other contract items, at which time, if present, the Engineer will sample to confirm/refute the presence of ACM. When accessible, should the materials be confirmed present and be scheduled to be impacted,**

**they should be treated as asbestos containing materials unless sampled by the Engineer and confirmed as non-ACM.**

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.

**00.20.04 - Method of Measurement:**

The work of "REMOVAL OF ASBESTOS" shall be measured for payment as the actual square footage of ACM removed. Such determinations shall be made by measuring actual material to be removed at each work site.

**00.20.05 - Basis of Payment:**

The work shall be paid at the contract unit price per square foot, which 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 "REMOVAL OF ASBESTOS" 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>
Removal of Asbestos	S.F.

## **ITEM #0020903A – LEAD COMPLIANCE FOR MISCELLANEOUS EXTERIOR TASKS**

### **00.20.01 - 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.

### **00.20.02 - 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.

### **00.20.03 - 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 Contractor's 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.

**Site No. 1 - Bridge No. 02374, SR 500/TR 805 over I-84, TR 831 & TR 833, East Hartford**

- Lead paint was identified on the painted metal surfaces of Bridge No. 02374. XRF readings showed the paint to have detectable amounts of lead.

<b>Girders, Beam Ends, Rockers, Cross beams, etc</b>	<b>Metal</b>	<b>Grey</b>	<b>0.1-13.9 mg/cm<sup>2</sup></b>
<b>Railing</b>	<b>Metal</b>	<b>Galvanized (no paint)</b>	<b>--</b>

- TCLP waste stream sampling/analysis of the paint characterized the paint waste as RCRA/CTDEEP hazardous waste.

<b>Paint debris</b>	<b>140 mg/l</b>
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**Site No. 2 - Bridge No. 02375, SR 500 & TR 801 over I-84 & I-84 TR 833, East Hartford**

- Lead paint was identified on the painted metal surfaces of Bridge No. 02375. XRF readings showed the paint to have detectable amounts of lead.

<b>Girders, Beam Ends, Rockers, Cross beams, etc</b>	<b>Metal</b>	<b>Grey</b>	<b>0.1-8.5 mg/cm<sup>2</sup></b>
<b>Railings</b>	<b>Metal</b>	<b>Grey</b>	<b>8.8 mg/cm<sup>2</sup></b>

- TCLP waste stream sampling/analysis of the paint characterized the paint waste as RCRA/CTDEEP hazardous waste.

<b>Paint debris associated with structural steel superstructure</b>	<b>58 mg/l</b>
<b>Railings on roadside</b>	<b>140 mg/l</b>

**Site No. 3 - Bridge No. 02376, Turning Point 831 over I-84, East Hartford**

- Lead paint was identified on the painted metal surfaces of Bridge No. 02376. XRF readings showed the paint to have detectable amounts of lead.
- Painted shoulder line was not safely accessible for paint chip testing and therefore, small amounts of lead paint is presumed present on the painted surfaces of the asphalt deck on the bridge.

Girders, Bearings, Cross Beams, Beam Ends, Guard Rails, etc.	Metal	Blue/Green	8.0-9.5 mg/cm <sup>2</sup>
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- TCLP waste stream sampling/analysis of the paint located associated with the steel/metal components and railings characterized the paint waste as RCRA Hazardous waste.

Paint debris	240 mg/l
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- No TCLP sample for lead was warranted on the white painted asphalt as the XRF readings were below 1.0 mg/cm<sup>2</sup> and therefore the painted asphalt debris is presumed as Non-Hazardous per CTDEEP/USEPA clarification memo of January 26, 2004.

**Site No. 4 - Bridge No. 02368A, Rte 2 WB over I-84 EB & I-84 Ramps 831 & 833, East Hartford**

- Lead paint was identified on the painted metal surfaces of Bridge No. 02368A. XRF readings showed the paint to have detectable amounts of lead.

Girders, Beam Ends, Rockers, Cross beams, etc	Metal	Blue Green	3.1-16.9 mg/cm <sup>2</sup>
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- TCLP waste stream sampling/analysis of the paint characterized the paint waste as RCRA/CTDEEP hazardous waste.

Paint debris	250 mg/l
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**Sign Support No. 21607, Near Bridge No. 02368A, East Hartford**

- Lead paint was identified on the painted metal surfaces of Sign Support No. 21607. XRF readings showed the paint to have detectable amounts of lead.

Sign Support & Base	Metal	Green	0.3-0.4 mg/cm <sup>2</sup>
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- TCLP waste stream sampling/analysis of the paint characterized the paint waste as non-hazardous C&D bulky waste.

Paint debris	0.045 mg/l
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While conducting work to replace the bridges and remove the sign support, where it is necessary to impact the painted metal/asphalt surfaces, the Contractor shall either:

- a. Remove the paint to be impacted prior to impacting the metal/asphalt in accordance with OSHA Lead in Construction Standard 29CFR 1926.62, or
- b. Impact the metal/asphalt 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. 02374 (Site No. 1), the Engineer has previously characterized the projected paint waste stream associated with the structural 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.

On Bridge No. 02375 (Site No. 2), the Engineer has previously characterized the projected paint waste stream associated with the structural steel, metal bridge components and railings 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.

On Bridge No. 02376 (Site No. 3), the Engineer has previously characterized the projected paint waste stream associated with the structural 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.**

**On Bridge No. 02376 (Site No. 3), no TCLP sample for lead was warranted on the white painted asphalt as the XRF readings were below 1.0 mg/cm<sup>2</sup> and therefore the painted asphalt debris is presumed as Non-Hazardous per CTDEEP/USEPA clarification memo of January 26, 2004.**

**On Bridge No. 02368A (Site No. 4), the Engineer has previously characterized the projected paint waste stream associated with structural 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.**

**On Sign Support No. 21607 near Bridge No. 02368A (Site No. 4), the Engineer has previously characterized the projected paint waste stream associated with the metal sign support components as Non-Hazardous waste. If the paint is removed from the metal, the paint shall be handled and disposed of at the Contractor's proposed construction and demolition (C&D) lead debris bulky waste disposal facility (CTDEEP-permitted Solid Waste landfill).**

**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, CO<sub>2</sub>, 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).

**00.20.04 - 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.”

**00.20.05 - 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	L.S.

END OF SECTION

## **ITEM #0100600A – CONSTRUCTION ACCESS**

**Description:** Work under this item shall consist of constructing and restoring access areas required for the construction of Bridge No. 02374 (Site No. 1) and Bridge No. 02368A (Site No. 4). The major work activities included under this item are:

- Excavation of existing embankment material.
- Transportation of said embankment material to a storage facility
- Construction of access ways, work areas, and crane platforms
- Reinstallation of the embankment material to its original condition.
- Work under this item shall also consist of the construction of such cofferdams, flow diversions, barriers, diversion pipes, or other such protective facilities and methods necessary for the conduction of water beyond the limits of construction; the dewatering of the site on which the permanent structure is to be constructed; and the removal of all such temporary structures and facilities upon the completion of the permanent work or as required. The handling of water shall be in accordance with the requirements of Section 1.10.

For the purposes of this specification, such work shall be understood to mean any temporary type of protective facility which satisfies the condition that the permanent structures are built in the dry. The handling of flood flows and the protection of existing structures, and any or all of the finished construction during high water are included in the scope of work under this item.

**Materials:** None required under this item

### **Construction Methods:**

**Excavation:** The Contractor shall excavate material as required to create suitable access areas to enable the bridge constructions to proceed. The Plans contain suggested locations for temporary access ways and crane locations; however, it shall be the Contractor's responsibility to determine the exact locations and sizes of the access ways and crane locations.

**Stockpiling:** The excavated material shall be transported to, and stored at, a storage facility that is not within a regulated area. See the "Notice to Contractor – Staging and Storage Areas" for additional information.

**Replacement of Embankment Material:** All of the stockpiled material shall be returned to the access areas and used for restoration of the embankments. The embankments shall be shaped and graded to their original condition. This work, including compaction, shall be done in accordance with Article 2.02.03, subarticles 5 through 7.

**Cofferdams and Dewatering:** The Contractor shall investigate and verify the existing conditions and design the necessary protection to conform with the plan. Before commencing construction the Contractor shall furnish the Engineer with details of the plan and methods he proposes to use for handling water and accomplishing the work. The furnishing of such plans and methods shall not relieve the Contractor of any of his responsibility for the safety of the work and for the successful completion of the project.

The height of any cofferdams, flow diversion, or barriers required to accomplish the work shall be shown. Any necessary diversion pipes shall be installed in accordance with the contract. All such temporary structures or facilities shall be safely designed for all applicable loadings, extended to sufficient depth and be of such dimensions and water-tightness so as to assure construction of the permanent work in the dry. They shall not interfere with proper performance of the work. Their locations shall be such as to permit excavation for permanent work to the limits shown on the plans. Interior dimensions shall give sufficient clearance for construction and inspection of forms. Movements or failures of the temporary protection facilities, or any portions thereof, which prevent proper completion of the permanent work shall be corrected at the sole expense of the Contractor.

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 is done from a suitable sump pump properly located and with a capacity to protect against damage from sudden rising of water. **Any pumped water must be discharged in accordance with the requirements of Section 1.10.**

Unless otherwise provided, or directed, all such temporary protective work shall be removed and disposed of in an approved manner when no longer required.

The Contractor shall be responsible for the scheduling of work under this item so as not to interfere with any sequence of operations 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.

**Method of Measurement:** This work, being paid for on a lump sum basis, will not be measured for payment.

**Basis of Payment:** This work will be paid for at the contract lump sum price for "Construction Access", which price shall include all equipment, tools, and labor incidental thereto.

## **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 #0207150A – LIGHTWEIGHT FILL**

**Description:** Work shall consist of furnishing and placement of lightweight fill in the formation of embankments or as backfill in front of and behind structures. This work shall be performed as hereinafter specified, to the dimensions indicated on the plans, or as directed by the Engineer. 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.

**Materials:** Lightweight fill shall be a rotary kiln expanded shale aggregate meeting the requirements of ASTM C 330. No by-product slags, cinders or by-products of coal combustion shall be permitted. The aggregate shall consist of tough, durable, non-corrosive particles with the following gradation:

<b>Square Mesh Sieves</b>	<b>Percent Passing by Weight</b>
1-inch	100
¾ inch	90 - 100
3/8 inch	10 - 50
No. 4	0 – 15

The dry loose unit weight shall be less than 50 pounds per cubic feet ( pcf). The lightweight aggregate supplier shall submit verification of an in-place compacted total unit weight (by methods defined in AASHTO T99) of less than 65 pcf. For purposes of this specification, the total unit weight is defined as the maximum dry density multiplied by one plus the moisture content (as a decimal). For example, if the maximum dry density is 45 pcf and the moisture content is 9%, the total unit weight is 49 pcf.

The maximum soundness loss when tested with 5 cycles of magnesium sulfate shall be 10 percent (ASTM C 88). The maximum Los Angeles Abrasion loss when tested in accordance with ASTM C 131 (B grading) shall be 40 percent.

The lightweight aggregate producer shall submit verification that the angle of internal friction is equal to or greater than 40 degrees when measured in a triaxial compression test on a laboratory sample with a minimum diameter of 250mm.

The materials for bagged stone shall conform to the following requirements: 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; the bag shall be of burlap and shall be large enough to contain one cubic foot of loosely packed granular material.

**Construction Methods:** When applicable and except where noted below, lightweight fill placement shall conform to the requirements of Sections 2.02.03 and 2.16.03 of the Standard Specifications, Form 816.

The lightweight fill shall be placed in layers of a thickness of 1.5 ft to a maximum of 2.0 ft. Each layer shall be compacted by the use of self-propelled vibratory compaction equipment with static mass (weight) less than 6,600 lbs. The minimum number of passes shall be two (2) and the maximum four (4). The actual lift thickness and exact number of passes shall be determined by the Engineer depending on the type of compaction equipment. The contractor shall take all necessary precautions during construction activities in operations on or adjacent to the lightweight fill to ensure that the material is not over compacted. Construction equipment, other than for compaction, shall not be operated on the exposed lightweight fill.

Where weep holes are installed within the limits of the lightweight fill, bagged stone shall be placed around the inlet end of each weep hole, to prevent movement of the lightweight fill 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 lightweight fill material is placed around them and bags which are broken or burst prior to or during the placing of the lightweight fill material shall be replaced at the expense of the contractor.

**Method of Measurement:** Lightweight fill shall be measured in place after compaction, including allowances for settlement. 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 "Lightweight Fill".

**Basis of Payment:** This work will be paid for at the contract unit price per cubic yard for "Lightweight Fill", complete in place, which price shall include all materials, transportation, tools, equipment and labor incidental thereto.

Pay Item	Pay Unit
Lightweight Fill	c.y.

## **ITEM #0210820A – WATER POLLUTION CONTROL**

**2.10.01 - Description:** Replace with the following:

This work shall consist of measures to control water pollution and soil erosion through the use of berms, dikes, dams, sediment basins, sediment tanks, erosion control matting, gravel, mulches, grasses, slope drains, ditches, channels, riprap, grading to control surface runoff and other erosion control devices or methods chosen by the Contractor or as directed by the Engineer.

If the Contractor proposes changes in construction or his scheduling that would affect the designed pollution controls, he shall submit plans before starting construction for revised pollution controls for the approval of the Engineer.

The Contractor shall submit a plan showing erosion and sedimentation controls above and beyond those called for in the plans and/or specifications, necessitated by the proposed sequence of operations and/or construction activities. The construction shall not proceed until the erosion and sedimentation control plans have been approved by the Engineer. The Engineer may order additional control measures if the measures mentioned above prove insufficient.

## **ITEM #0406125A - BITUMINOUS CONCRETE SURFACE PATCH**

**4.06.01 - Description:** This work shall consist of milling and patching an existing deteriorated bituminous concrete pavement surface. A milling machine shall be used to remove the existing pavement to a depth of 1.5 to 2.5 inches. The milled surface shall be swept and then be blown clean with compressed air. Tack coat is to be applied to the milled surface and any vertical or semi-vertical walls formed by the milling. The milled out area shall then be filled and compacted with HMA S0.375.

**4.06.02 - Materials:** Materials for this work shall consist of the following:

Hot-mix Asphalt (specifically HMA S0.375) conforming to the requirements of Sections 4.06 and M.04 of the Standard Specifications. An equivalent PMA may be used conforming to the requirements of Sections 4.06 and M.04 of the Standard Specifications.

Tack coat conforming to the material requirements for tack coat in Sections 4.06 and M.04 of the Standard Specifications.

**Equipment:** Equipment for this work shall include, but is not limited to, the following:

1. Milling machine – A milling machine 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 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.

In addition to meeting those requirements, the milling machine shall be capable of removing the existing pavement to a minimum width of 20 inches in any direction. This makes the minimum achievable patch size - 20 inches by 20 inches, or 0.30 square yards.

2. 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.
3. Air compressor – The unit shall consist of an air compressor capable of producing 100 psi, oil free, compressed air for blowing the milled pavement surface clean.
4. Hot air lance – The unit shall be designed for cleaning and drying the pavement surface. It shall consist of an air compressor capable of delivering 100 psi, oil free heated air. The compressed air emitted from the tip of the lance shall be flame free and be capable of achieving a temperature of at least 1500°F.
5. Paving and compaction equipment – All equipment used to place and compact the hot mix asphalt required for this work shall meet the requirements of Section 4.06 of the Standard Specifications. Due to the nature of this work, it is expected that much of the placement of hot mix asphalt will require hand work or a mixture of equipment and hand work methods and tools to achieve the required results. The same consideration is to be given to compaction of the hot mix asphalt. Smaller type compaction equipment, including vibratory plate compactors, shall be allowed to achieve the required results. At all times the Contractor is required to meet the density and compaction and all other requirements specified in Sections 4.06 and M.04 of the Standard Specifications.

**4.06.03 - Construction Methods: Demarcation of Areas to be Patched:**

Areas to be patched under this item shall consist of pavement surfaces in which the existing surface lift of pavement is raveling, disintegrating, or delaminated from the lift of pavement directly beneath it. Under this specification a “lift” of pavement is defined as an individual layer of bituminous concrete that was placed and compacted previously with one placement pass of a

paver or other asphalt pavement placement device or method. "Surface lift" is defined as the last individual layer of bituminous concrete placed and compacted that currently serves as the driving surface of the roadway. This could include a milled surface. These definitions apply to previously placed "surface lifts" of pavement that were between 1 inch and 2.5 inches thick.

All areas in which the surface lift of pavement displays raveling, disintegration, or delamination from the underlying lift of pavement, of such a severity, that it will not likely support traffic loadings, or remain sound and in-tact, for an additional 2 years, shall be marked out by the Engineer for removal. The minimum width of any given area shall be 20 inches. All areas to be patched shall completely encompass the entire raveled, disintegrated, or delaminated area and extend at least 6 inches beyond into the surrounding pavement.

#### Patch Preparation and Construction:

Utilizing the specified milling machine, mill the demarcated areas to a depth that completely removes the surface lift of pavement. The minimum depth shall be 1.5 inches and the maximum depth shall not exceed 2.5 inches.

As specified in the requirements for milling, the milled surface shall be swept clean (by hand if necessary.) Once all millings are practicably removed by sweeping, the milled areas shall be allowed to dry if necessary. Any moisture in or on the milled areas must be allowed to evaporate or be removed with the assistance of a hot air lance as specified above. Once the milled area is deemed dry by the Engineer it shall be blown with compressed or hot lance air, as specified above, so that no debris or dust is present on or within the milled area.

Once deemed clean by the Engineer, the milled area, including the sides/walls of the milled area, shall receive an application of tack coat as specified above and in Section 4.06 of the Standard Specifications.

After the tack coat has had sufficient time to cure or break, HMA S0.375 shall be placed and compacted to the requirements above and in Section 4.06 of the Standard Specification. It shall be compacted to match the elevation of the surrounding pavement surface.

**4.06.04 - Method of Measurement:** This work shall be measured by the total area, in square yards, of "Bituminous Concrete Surface Patch."

**4.06.05 - Basis of Payment:** This work will be paid for at the contract unit price per square yard of “Bituminous Concrete Surface Patch.” The price shall include milling, pavement excavation and removal, cleaning of the milled area, tack coat application to the milled surface area, and placement and compaction of HMA S0.375. All other miscellaneous tools, materials, and equipment needed to complete the work shall also be included in the cost of the work.

<u>Pay Item</u>	<u>Pay Unit</u>
Bituminous Concrete Surface Patch	S.Y.

**ITEM #0406267A - MILLING OF HOT MIX ASPHALT (HMA) –  
(0- 4 INCHES)**

**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 +/-  $\frac{1}{2}$  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) (greater than 4 to 8 inches) (greater than 8 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 Hot Mix Asphalt (HMA) – (0- 4 inches)	Sq. Yd
Milling of Hot Mix Asphalt (HMA) – (greater than 4 to 8 inches)	Sq. Yd
Milling of Hot Mix Asphalt (HMA) – (greater than 8 inches)	Sq. Yd

**ITEM #0406285A – FINE MILLING OF HOT MIX ASPHALT (HMA)**  
**(0 TO 4 INCHES)**

**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 machine shall be able to provide a 0 to 4 inch deep cut in one pass. The rotary drum of the machine shall utilize carbide tip tools spaced not more than  $\frac{5}{16}$  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 ¼ inch. The variation of the top of any ridge to the bottom of the groove adjacent to that ridge shall not exceed ¼ 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 +/- ½ 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.

**Basis of Payment:** This work will be paid for at the contract unit price per square yard for “Fine 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
Fine Milling of Hot Mix Asphalt (HMA) (0 to 4 inches)	S.Y.

## **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:**

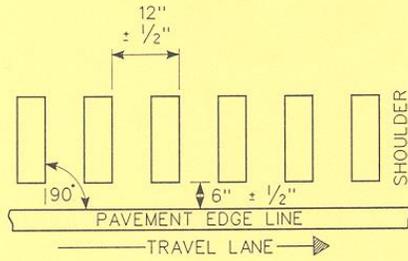
This work will be measured for payment by the actual number of feet of shoulder where the rumble strips are placed and accepted. This distance shall be measured longitudinally along the edge of pavement with deductions for bridge decks, acceleration and deceleration lanes, drainage structures, loop detector sawcut locations, and other sections where the rumble strips were not installed.

**Basis of Payment:**

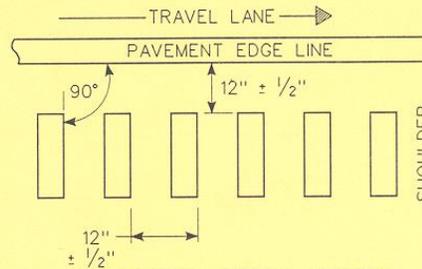
This work will be paid for at the Contract unit price per foot for "Rumble Strips - Automated". The price shall include furnishing all equipment, tools, labor, a technical representative and work incidental thereto and also disposal of any waste material resulting from the operation. The Contractor will 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.

<u>Pay Item</u>	<u>Pay Unit</u>
Rumble Strips - Automated	l.f.

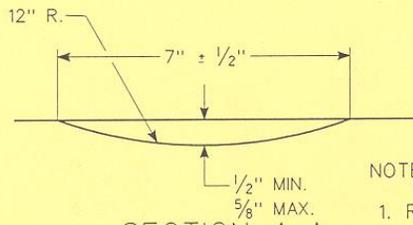
DETAILS AND SECTIONS OF RUMBLE STRIPS



LOCATION DETAIL (TYP.)  
LEFT SHOULDER



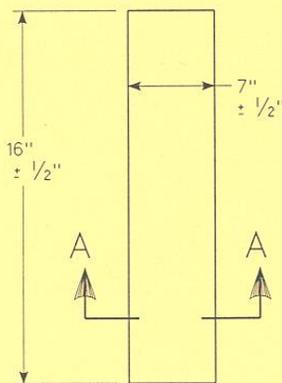
LOCATION DETAIL (TYP.)  
RIGHT SHOULDER



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

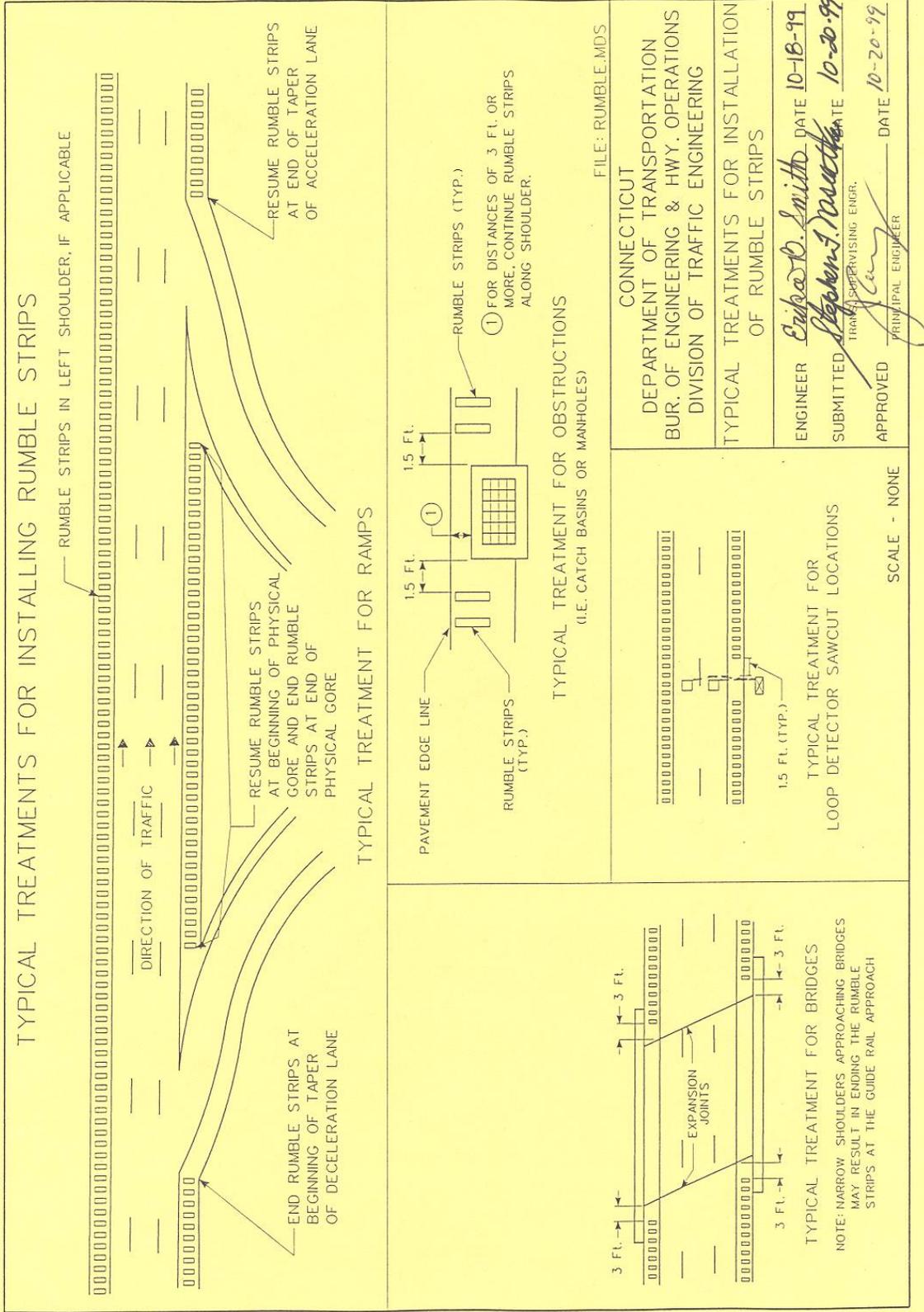
SUBMITTED *Stephen J. Masich* DATE 10-20-99  
TRAFFIC SUPERVISING ENGR.

APPROVED *[Signature]* DATE 10-20-99  
PRINCIPAL ENGINEER

SCALE - NONE

ITEM # 0406287A

ITEM # 0406288A



## **ITEM #0406289A - REMOVAL OF RUMBLE STRIPS**

### **Description:**

Work under this item shall consist of removing rumble strips through milling and repaving with hot mix asphalt (HMA) where shown on the plans or where directed by the Engineer, and in conformance with these specifications. The surface lift of the existing pavement shall be removed by milling out the existing rumble strip to a depth of 1.5 to 2.5 inches. The milled surface shall be swept by hand or machine and then be blown clean with compressed air or a hot air lance. Tack coat is to be applied to the milled surface and any vertical or semi-vertical walls formed by the milling. The milled out area shall then be filled and compacted with HMA S0.375.

### **Definitions:**

Surface lift of pavement: The thickness of the last lift of pavement placed prior to performing crack sealing. A lift is defined as single bituminous-concrete mixture placed at a defined thickness in a single paver pass (or by handwork.)

### **Materials:**

Materials for this work shall consist of the following:

Hot-mix Asphalt (specifically HMA S0.375) conforming to the requirements of Sections 4.06 and M.04 of the Standard Specifications.

Tack coat conforming to the material requirements for tack coat in Sections 4.06 and M.04 of the Standard Specifications.

### **Equipment:**

Equipment for this work shall include, but is not limited to, the following:

Milling machine – A milling machine designed and built for milling HMA pavements. It shall be self propelled with sufficient power, traction, and stability to maintain depth.

The rotary drum of the machine shall utilize carbide tip tools spaced not more than 5/8 inches apart. Use of a fine-milling drum with a tighter tooth spacing of 0.3 inches is desirable, but optional. 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. It must include dust control equipment during the removal process.

It shall be capable of removing the existing pavement to a width of 2 to 10 inches wider than the rumble strip.

A wider milling width may be used in cases where two rumble strips are located near and parallel to each other, as may occur in a median area; see Construction Methods.

Sweeper – A hand broom is acceptable for smaller areas when approved by the Engineer. If a mechanized sweeper is used, it shall be equipped with a water tank and be capable of removing the millings and loose debris from the surface. Other sweeping or vacuum type equipment may be provided in lieu of the sweeper where acceptable by the Engineer.

Air compressor – The unit shall consist of an air compressor capable of producing 100 psi, oil free, compressed air for blowing the milled pavement surface clean.

Hot air lance – The unit shall be designed for cleaning and drying the pavement surface. It shall consist of an air compressor capable of delivering 100 psi, oil free heated air. The compressed air emitted from the tip of the lance shall be flame free and be capable of achieving a temperature of at least 1500°F.

Paving and compaction equipment – All equipment used to place and compact the hot mix asphalt required for this work shall meet the requirements of Section 4.06 of the Standard Specifications, except no grade and slope control shall be required. Also, due to the nature of this work, it is expected that much of the placement of hot mix asphalt will require hand work. Either vibratory plate compactors or rollers may be used for compaction.

### **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 width of milling shall be as specified on the Plans or other specifications. If no other width specification exists, the width of milling shall be 2 to 10 inches wider than the existing rumble strip. Rumble strips are typically about 16 inches wide. If there are two rumble strips located near and parallel to one another, as may occur in median areas, and if they both can be removed by a single pass of a wider milling machine without adversely affecting drainage, safety, or quality of results, then a wider milling machine may be used. In this case the length measured for pay will be the sum of the lengths of the two individual rumble strips. Milling widths wider than specified above may be used with the written permission of the Engineer.

The depth of removal shall be as shown on the Plans, or as detailed in specifications, or as directed by the Engineer, generally from 1.5 to 2.5 inches. The intent is to remove the surface lift. If there are no Plans or other specifications, mill 1.5 to 2.5 inches as needed to match the thickness of the surface lift. The Engineer may alter the milling depth based on conditions discovered as work is in progress. It is expected that the milling depth will not exceed 2.5 inches. If the surface lift is 3 inches thick and it is in good condition, as determined by the Engineer, mill only 1.5 inches deep, unless directed otherwise by the Plans, project specifications, or Engineer.

As specified in the requirements for milling, the milled surface shall be swept clean (by hand if necessary.) Once all millings are removed by sweeping, the milled areas shall be allowed to dry if necessary. Any moisture in or on the milled areas must be allowed to evaporate or be removed with the assistance of a hot air lance as specified above. Once the milled area is deemed dry by the Engineer it shall be blown with compressed or hot lance air, as specified above, so that no debris or dust is present on or within the milled area.

Once deemed clean by the Engineer, the milled area, including the sides/walls of the milled area, shall receive an application of tack coat as specified above and in Section 4.06 of the Standard Specifications.

After the tack coat has had sufficient time to cure or break, HMA S0.375 (Superpave Level 2) shall be placed and compacted to the requirements above and in Section 4.06 of the Standard Specification. It shall be compacted to match the elevation of the surrounding pavement surface.

At all times the Contractor is required to meet the density and compaction and all other requirements specified in Sections 4.06 and M.04 of the Standard Specifications and any supplementals that have been issued by the bid date of the project.

The Contractor shall resurface the milled area prior to opening the roadway to traffic. The milled area shall be swept, cleaned with compressed air, tacked and repaved in the same day.

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 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. If two rumble strips are near one another and are removed by a single milling machine pass, the length measured for pay will be the sum of the lengths of the two rumble strips.

**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, 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:  
PG% = 4.5
    - For Superpave 1.5 inch (37.5mm), Superpave 1.0 inch (25.0mm), PMA S1, HMA S1, and Class 4
  - PG % = 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 #0503151A - REMOVAL OF SUPERSTRUCTURE (SITE NO. 1)**

**ITEM #0503153A - REMOVAL OF SUPERSTRUCTURE (SITE NO. 3)**

**ITEM #0503154A - REMOVAL OF SUPERSTRUCTURE (SITE NO. 4)**

*Work under these items shall conform to the requirements of Section 5.03 of the Standard Specifications, Form 816, amended as follows:*

**5.03.01 - Description:** Add the following:

This work shall consist of the removal and satisfactory disposal of the existing superstructure at Site Numbers 1, 3 and 4, as shown on the plans. The existing bridges at Site Numbers 1 and 3 consist of three simply supported steel multi girder spans with reinforced concrete decks. The existing bridge at Site Number 4 consists of seven curved simply supported steel plate girders composite with a reinforced concrete deck.

Record plans are available for Site Numbers 1, 3 and 4 from the Connecticut Department of Transportation Engineering Records building located at 160 Pascone Place, Newington, Connecticut 06111.

This work shall also include the removal of the two concrete approach slabs at Site No. 4.

**5.03.03 - Construction Methods:** Add the following:

All work shall proceed as directed by and to the satisfaction of the Engineer and in accordance with the details shown on the plans, or as approved by the Engineer.

The superstructure at each site shall be dismantled in accordance with the methods proposed by the Contractor and approved by the Engineer.

The Contractor's method of demolition shall not result in damage to any adjacent facility or to adjoining property. If damage does occur, it shall be repaired by the Contractor to the satisfaction of the Engineer at no additional expense to the State.

Prior to initiating work, the Contractor shall submit for approval, plans and written documentation describing his falsework, methods of removal and shielding required for the protection of traffic, utilities and adjoining properties. Approval of the Contractor's plans shall not be considered as relieving the Contractor of any of his responsibility. Working drawings and design computations showing the Contractor's means and method for temporary shielding shall be submitted to the Engineer in accordance with Section 1.05.02(2).

**5.03.05 - Basis of Payment:** Replace the first paragraph with the following:

This work shall be paid for at the contract lump sum price for “Removal of Superstructure – Site No. ()” which price shall include all materials, equipment, tools, labor, and all work incidental to the removal of the superstructure including furnishing, erecting and removing any and all temporary shielding required during demolition. This item shall also include removal of the two bridge mounted signs at Site No. 1, and removal of the two concrete approach slabs at Site No. 4. It shall also include the satisfactory removal and disposal of all waste materials from the demolition.

A schedule of values for payment shall be submitted to the Department for review and comment prior to payment.

<u>Pay Item</u>	<u>Pay Unit</u>
Removal of Superstructure (Site No. 1)	L.S.
Removal of Superstructure (Site No. 3)	L.S.
Removal of Superstructure (Site No. 4)	L.S.

**ITEM #0506550A – DOWNSPOUT SPLASH PAD**

**Description:** Work under this item shall consist of fabricating, furnishing, transporting and installing concrete downspout splash pads where shown on the plans and in accordance with this specification. Downspout splash pads may consist of cast-in-place or precast concrete. Also included in this item shall be all other necessary materials and equipment required to complete the work described in this item.

**Materials:** Materials for splash pads shall conform to the following requirements:

1. Concrete: Concrete shall be Class “A” Concrete conforming to Article M.03.01 of the Standard Specifications.
2. Welded Wire Fabric: Welded wire fabric shall conform to the requirements of ASTM A185 and shall conform to Article M.06.01 as applicable.
3. Lifting and Seating Fixtures: The Contractor / Fabricator shall be fully responsible for the design of lifting devices. All fixtures cast into the concrete for the purpose of lifting and seating splash pad units shall have a corrosive resistant coating.
4. Corrosive Resistant Coating: Corrosive resistant coating for lifting devices shall either be epoxy, mechanical or hot-dip galvanizing, or electroplating.

**Construction Methods:** Downspout splash pads shall be constructed where indicated on the Contract Plans, to the dimensions, details and requirements shown on the plans, or as ordered by the Engineer. Splash pads shall be sloped a minimum of 2% or as noted on the plans.

**Method of Measurement:** This work shall be measured for payment by the number of downspout splash pads constructed, installed, complete in place and accepted. Welded wire fabric and lifting inserts will not be measured for payment but shall be included in the cost of this item.

**Basis of Payment:** This work shall be paid for at the contract unit price per each for “Downspout Splash Pad”, complete in place, which price shall include all work associated with the furnishing, fabrication, construction and installation of downspout splash pads and all materials, equipment, tools and labor incidental thereto.

<u>Pay Item</u>	<u>Pay Unit</u>
Downspout Splash Pad	EA

**ITEM #0513003A – 1½" POLYVINYL CHLORIDE PLASTIC PIPE**

Work under this item shall conform to the requirements of Section 5.13 amended as follows:

**Description:** Delete and replace with the following:

This item shall consist of furnishing and installing polyvinyl chloride pipe for use as drains through the backwall at the approach slab seat where shown on the plans or as ordered by the Engineer.

**Construction Methods:** Installation of drain pipes shall not result in damage to the backwall reinforcement. If any damage does occur it shall be repaired by the Contractor to the satisfaction of the Engineer at no additional expense to the State.

**Method of Measurement:** This work will be measured for payment by the number of linear feet of pipe installed in the backwall as indicated on the plans.

**Basis of Payment:** This work will be paid for at the contract unit price per linear foot for 1½” Polyvinyl Chloride Plastic Pipe, complete and accepted, which price shall include the installation of drain pipes, repair of backwall surrounding drain pipes, and all equipment, tools and labor.

Pay Item  
1½” Polyvinyl Chloride Plastic Pipe

Pay Unit  
L.F.

## **ITEM #0520032A - ELASTOMERIC CONCRETE HEADERS**

**5.20.01 - Description:** Work under this item shall consist of saw-cutting, removal and disposal of hot mix asphalt, placing and furnishing all required labor, equipment, material, and performing all operations necessary for the installation of elastomeric concrete for bridge expansion joint headers, in accordance with the details shown on the plans, as directed by the Engineer, and in accordance with the requirements of these specifications.

**5.20.02 - Component Materials:** Provide a field-mixed bridge joint header elastomeric concrete material. The elastomeric concrete material shall be field-mixed and shall consist of two-part polymer, kiln-dried pre-graded aggregate, and bonding agent with the material being supplied as a unit by the Manufacturer.

A Materials Certificate will be required in accordance with Article 1.06.07 certifying the conformance of the elastomeric concrete for bridge expansion joint headers components to the requirements set forth in this specification.

Each container of product furnished shall be delivered to the job site in the Manufacturer's original sealed container. Each container shall be labeled to include the name of material, Manufacturer's name and contact information, expiration date, mixing instructions, material safety data sheets and the Manufacturer's lot/batch number. All materials must be stored in accordance with the Manufacturer's written recommendations and as approved by the Engineer. Materials whose shelf-life has expired shall not be used in the project.

Provide material that complies with the following minimum requirements at either 14 days or at the end of the specified curing time. In addition to the following requirements, the bridge elastomeric concrete header shall be resistant to water absorption, chemical, UV, ozone exposure and capable of withstanding temperature extremes.

<b>Elastomeric Concrete Properties at 24 hr. Cured Stage</b>	<b>Test Method</b>	<b>Requirement</b>
Compressive Strength, Method B	ASTM C 579	Min. 2000 psi
Bond Shear Strength	ASTM C 882	Min. 700 psi
Abrasion Resistance Wear Index	ASTM C 501	Max. 1
Resilience	ASTM D 695	Min. 70%
Durometer Hardness	ASTM D 2240	Min. 50

ITEM #0520032A

Bond Strength to Concrete	ASTM C 882	Min. 450 psi
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The following Elastomeric Concrete products are qualified for use under this item:

Silicone Specialties Corp.  
P.O. Box 50009  
Tulsa, OK 74150  
Phone: (918) 587-5567

Silspec 900 PNS Nosing System

Watson Bowman Acme  
95 Pineview Drive  
Amherst, NY 14228  
Phone: (716) 817-5410

WaboCrete II

R. J. Watson Inc.  
11035 Walden Ave  
Alden, NY 14004  
Phone: (716) 901-7020

Poly Tron Elastomeric Concrete

Backer Rod: All backer rods shall satisfy the requirements of ASTM D5249, Type 1.

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.

A Materials Certificate for the backer rod and parapet sealant shall be submitted by the Contractor in accordance with the requirements of Article 1.06.07

**5.20.03 - Construction Methods:** An experienced technical representative from the manufacturer, acceptable to the Engineer, shall be present during initial installations of the bridge elastomeric concrete joint header to provide the Contractor aid and independent instruction as required to obtain an installation satisfactory to the Engineer. The technical representative must certify that the bridge elastomeric concrete joint header was installed to the manufacturer’s recommendations.

Blackouts shall be formed in the elastomeric concrete headers as required to accept the subsequent installation of the performed gland.

Work under this item shall consist of saw-cutting, removal and disposal of hot mix asphalt, installing the bridge elastomeric concrete header 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”.

Elastomeric concrete is moisture sensitive. Therefore, new decks and deck ends that have been reconstructed or patched should be properly cured. The Contractor should follow the manufacturer's recommendations for curing and substrate moisture before installation of elastomeric concrete headers.

Tools, equipment, and techniques used to prepare the bridge elastomeric concrete header shall be approved by the Engineer and the Manufacturer's technical representative prior to the start of construction.

Provide sufficient material in storage at the site prior to beginning construction to complete the entire bridge elastomeric concrete header as detailed on the plans or as directed by the Engineer.

The Contractor shall saw cut the hot mix asphalt overlay full depth in order to delineate the location of the elastomeric concrete headers. At the time of installation of the bridge elastomeric concrete header, all existing material shall be removed from the bridge joint header. All surfaces in the bridge header shall be cleaned of all dust, dirt, debris, and other loose materials as recommended by the Manufacturer. The surfaces shall also be frost free. Additionally, all bonding surfaces shall be abrasive blast cleaned. Following the abrasive blast cleaning operations all surfaces shall again be wiped clean to remove any remaining dust.

Prepare and apply bonding agent to areas specified by Manufacturer and in accordance with manufacturer's instruction. The bonding agent shall be allowed to cure undisturbed for a minimum of one hour prior to installation of the bridge elastomeric concrete header or longer if required by the Manufacturer or the Engineer.

The mixing and installation of the two-part bridge elastomeric concrete header shall be done in strict conformance with the Manufacturer's written recommendations including the use of static mixing devices if so indicated. Traffic must not be allowed on the newly-placed bridge elastomeric concrete header to let the material cure properly prior to opening the work area to traffic according to the Manufacturer specification. During curing time the bridge elastomeric concrete header should be protected from any damages.

Form, place and cast the bridge elastomeric concrete headers to smoothly match the surface of the finished roadway. Finish the surface to a moderately rough texture such as that produce by a wood float.

When blast cleaning is performed under this specification the Contractor shall take adequate measures to ensure that the blast cleaning will not cause damage to adjacent traffic or other facilities.

The parapet 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.

**5.20.04 - Method of Measurement:** This work will be measured for payment by the number of cubic foot of bridge elastomeric concrete header installed into the final work, measured on the length-basis for the material required to construct the header from face-of-curb to face-of-curb, multiplied by the nominal header depth as indicated on the plans or as ordered by the Engineer.

Only a single measurement will be taken along each installed joint, regardless of the number of recesses, opening or voids filled with the elastomeric concrete header material. Measurement will be taken along the centerline of the joint, between the outer limits of the installed material.

**5.20.05 - Basis of Payment:** This work will be paid for at the contract unit price per cubic foot for "Elastomeric Concrete Headers", complete in place, including the cost of saw-cutting of hot mix asphalt overlay to delineate the vertical edges of the elastomeric concrete headers; removal and disposal of hot mix asphalt and abrasive blast cleaning; cleaning of the bonding surfaces; mixing, constructing and curing the elastomeric concrete headers; and the cost of all services associated with the technical representative, furnishing all required labor, all other materials, equipment, tools, and labor incidental thereto and perform all operations necessary for the installation of elastomeric concrete for bridge expansion joint headers.

The silicone sealant will not be measured for payment but will be included in the contract unit price.

Providing the Manufacturer's Representative and the Manufacturer's warranty will be incidental to the item "Elastomeric Concrete Headers".

Pay Item  
Elastomeric Concrete Headers

Pay Unit  
C.Y.

## **ITEM #0520035A – SILICONE EXPANSION JOINT SYSTEM**

**Description:** Work under this item shall consist of furnishing and installing the silicone expansion joint system as shown on the plans, as directed by the Engineer, and in accordance with these specifications.

**Materials:** The following elastomeric silicone joint system manufacturers and their associated component materials have been approved for use:

Watson Bowman & Acme Corp.  
95 Pineview Dr.  
Amherst, NY 14120  
Phone: (716) 691-7566

SPS Expansion Joint System  
Wabocrete II  
Watson Bowman Acme  
2-Part Silicone Sealant

R.J. Watson, Inc  
11035 Walden Ave.  
Alden, NY 14004  
Phone: (716) 901-7020

Silicoflex Joint Sealing System  
Silicoflex Gland  
Silicoflex Adhesive

A Materials Certificate will be required in accordance with Article 1.06.07 certifying the conformance of the silicone expansion joint system components to the requirements set forth in the contract specification.

Each container of product furnished shall be delivered to the job site in the Manufacturer's original sealed container. Each container shall be labeled to include the name of material, Manufacturer's name, and the Manufacturer's lot/batch number. All materials must be stored in accordance with the Manufacturer's written recommendations and as approved by the Engineer. Materials whose shelf-life has expired shall not be used in the project.

**Construction Methods:** A technical representative for the silicone expansion joint system, approved by the Manufacturer, shall be present during the installation of the expansion joint to provide guidance to the Contractor in the proper installation procedures to the satisfaction of the Engineer.

The silicone joint system 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".

Tools, equipment, and techniques used to prepare the joints shall be approved by the Engineer and the Manufacturer's technical representative prior to the start of construction.

The Contractor shall saw cut the overlay to full depth in order to delineate the location of the silicone expansion joint system. Within these limits, the overlay and membrane shall be removed. Joints shall be cleaned of all old joint seals and other expansion devices, bituminous materials, dirt grease, and all other deleterious materials. Following the removal of all loose materials, all concrete and bituminous concrete bonding surfaces shall be blast cleaned.

The bridge joint opening shall be cleaned over the total area of the blockout or openings to receive the elastomeric concrete. The joint blockout opening, in which elastomeric concrete is to be installed must be sound, clean, dry and the concrete substrate temperature 45 degrees Fahrenheit or higher.

Forms shall be used to keep the elastomeric concrete from entering the open joint between the concrete deck slab and approach slab.

The elastomeric concrete shall be mixed and placed in accordance with the Manufacturer's printed instructions and as provided herein. The Contractor shall furnish the Engineer with one set of the Manufacturer's instructions not less than one week before the placement is to begin.

The elastomeric concrete shall be installed when the temperature is 45 degrees Fahrenheit and rising. Cure time of the elastomeric concrete may be accelerated by the use of methods and techniques as approved by the Manufacturer when deemed necessary by the Contractor and Engineer.

Prior to placement the elastomeric concrete, the surface of the substrate against which the elastomeric concrete is to be placed shall be coated with a primer as recommended by the Manufacturer. The elastomeric concrete shall be installed within 15 minutes of the mixing and must be thoroughly consolidated and finished within 30 minutes of mixing and before the primer has set. The elastomeric concrete shall be finished flush with the top of the adjacent roadway surface and finished to provide a smooth surface free of voids and tears.

The elastomeric concrete may be heat cured with the use of external heat sources, as required by the Manufacturer. Curing may require that vulcanizing heat be applied for approximately 2 to 3 hours. Traffic shall not be permitted over the joint until proper cooling of the joint has occurred and the elastomeric concrete has developed adequate strength in accordance with the Manufacturer's recommendations.

Before installation of the silicone sealant, the vertical surfaces in the expansion joint opening, to which the silicone sealant will bond, shall be cleaned of a dust, dirt, debris and other loose materials as recommended by the Manufacturer. Additionally, the bonding surfaces shall be blast cleaned if recommended by the Manufacturer.

Primer, if required by the Manufacturer, shall be applied to the vertical surfaces of the elastomeric concrete on which the silicone sealant will bond. The primer shall be allowed to cure undisturbed for a minimum of one hour prior to installation of the silicone adhesive, as required by the Manufacturer and as directed by the Engineer.

The mixing and installation of the two-part silicone sealant should be in strict conformance with the Manufacturer's written recommendations. Traffic must not be allowed on the newly sealed joint for 60 minutes after sealant installation unless otherwise specified by the Manufacturer.

The silicone sealant shall also be installed within the parapet using a backer rod. Following blast cleaning, a backer rod of a diameter 25% larger than the joint opening shall be installed in the joint opening. The backer rod shall be comprised of closed cell expanded polyethylene foam, compatible with cold applied seals unless otherwise approved by the Manufacturer. The backer rod shall be installed as shown on the plans.

Any portion of the Silicone Expansion Joint System that is punctured, ruptured, debonded, delaminated, or damaged in any other way shall be removed and replaced by the Contractor at no additional cost to the State.

All work shall be done in accordance with the special provisions for "Maintenance and Protection of Traffic" and "Prosecution and Progress" contained elsewhere within.

**Method of Measurement:** This work will be measured for payment by the number of linear feet of the Silicone Expansion Joint System, installed and accepted, by the Engineer, measured from gutterline to gutterline, along the centerline of the joint. Sealing of curblines shall not be measured for payment.

**Basis of Payment:** This work will be paid for at the contract unit price, per linear foot, for "Silicone Expansion Joint System", complete in place, including all materials, equipment, tools, and labor incidental thereto.

<u>Pay Item</u>	<u>Pay Unit</u>
Silicone Expansion Joint System	L.F.

## **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**

<b><u>Square Mesh Sieves</u></b>	<b>1" (25.0 mm)</b>	<b>¾" (19.0 mm)</b>	<b>½" (12.5 mm)</b>	<b>⅜" (9.5 mm)</b>	<b>No. 4 (4.75 mm)</b>
<b>% passing</b>	<b>100</b>	<b>90 - 100</b>	<b>20 - 55</b>	<b>0 - 15</b>	<b>0 - 5</b>

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 ¼" thick and 8" wide. For joint openings in excess of 3" the minimum plate dimensions shall be ⅜" 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**

<b>Properties - As Supplied</b>	<b>Test Method</b>	<b>Requirement</b>
Extrusion Rate	ASTM C1183	200-600 grams/min
Leveling	ASTM C639	Self-Leveling
Specific Gravity	ASTM D792	1.20 to 1.40
<b>Properties - Mixed</b>	<b>Test Method</b>	<b>Requirement</b>
Tack Free Time	ASTM C679	60 min. max.
Joint Elongation – Adhesion to concrete	ASTM D5329 <sup>1,2,3</sup>	600% min
Joint Modulus @ 100% elongation	ASTM D5329 <sup>1,2,3</sup>	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:  $\frac{1}{2}$ " wide by  $\frac{1}{2}$ " 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**

<b>Product</b>	<b>Supplier</b>
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 45<sup>0</sup>F to 95<sup>0</sup>F.

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**

<b>Installation Restrictions</b>	
<b>Designed Deck Joint Thermal Movement Range<sup>2</sup></b>	<b>Bridge Superstructure Surface Temperature<sup>1</sup></b>
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 #0520038A – PREFORMED SILICONE JOINT SEALING SYSTEM**

**5.20.01 - Description:** Work under this item shall consist of furnishing and installing a preformed silicone joint sealing system as shown on the Contract Drawings and in conformance with these specifications or as directed by the Engineer. The preformed silicone joint sealing system shall seal the deck surface and prevent water from seeping through the joint area.

### **5.20.02 - Materials:**

**1 - Acceptable Manufacturer:** The Manufacturer supplying the Preformed Silicone Joint Sealing System shall be:

RJ Watson, Inc  
Bridge and Structural Engineered Systems  
78 John Glen Drive  
Amherst, New York 14228  
Tel: (716) 691-3301 Fax: (716) 691-3305  
Web site: <http://www.rjwatson.com>

Models: SF400 (Site No. 3 and Site No. 4)

### **5.20.03 - Construction Methods:**

A technical representative of the Preformed Silicone Joint Sealing System approved by the Manufacturer shall be notified of the scheduled installation a minimum of 2 weeks in advance and be present to provide direction and assistance for the first joint installation and succeeding joint installations until the Contractor becomes proficient in the work and to the satisfaction of the Engineer. The Preformed Silicone Joint Sealing System shall be completely installed following the recommended procedures by its Manufacturer.

The Preformed Silicone Joint Sealing System shall be installed at the locations shown on the plans and in conformance with the traffic staging requirements specified in the special provisions “Maintenance and Protection of Traffic” and “Prosecution and Progress”.

Tools, equipment, and techniques used to prepare the joints shall be approved by the Engineer and the Manufacturer's technical representative prior to the start of construction.

The minimum temperature for installing the Preformed Silicone Joint Seal is 40 degrees Fahrenheit and rising ambient air temperature. The joint surface shall be completely dry before installing the Preformed Silicone Joint Seal. The Preformed Silicone Joint Seal shall not be installed immediately after precipitation or if precipitation is forecasted for the day. Joint preparation and installation of the Preformed Silicone Joint Seal must be done during the same day. Traffic will not be allowed to pass over the joint after sandblasting has occurred.

**5.20.04 - Method of Measurement:** This work will be measured for payment by the number of linear feet of Preformed Silicone Joint Sealing System installed. The measurement will be made at the top surface and along the centerline of the joint measured from gutter line to gutter line.

**5.20.05 - Basis of Payment:** This work will be paid for at the contract unit price per linear foot for "Preformed Silicone Joint Sealing System", complete in place all materials, equipment, tools, and labor incidental to both constructions. The price for this work shall also include the cost for all services associated with the technical representative from the Manufacturer of the Preformed Silicone Joint Sealing System.

<u>Pay Item</u>	<u>Pay Unit</u>
Preformed Silicone Joint Sealing System	L.F.

## **ITEM #0521003A – BEARING REPLACEMENT WITH ELASTOMERIC BEARING PADS**

**Description:** Work under this item shall consist of removal and disposal of the existing bearings in accordance with the plans, as directed by the Engineer and these specifications.

**Materials:** See Item “Steel-Laminated Elastomeric Bearings”.

**Construction Methods:** Existing bearings assemblies shall be removed in their entirety and properly disposed of off-site, including the removal of the top of the existing anchor bolts.

Removal of the existing bronze bearing assemblies shall be by methods that do not damage them. The Engineer shall determine the salvagability of the bearing assemblies and direct the contractor to salvage or dispose of them accordingly. The salvage or proper disposal of the bearing assemblies shall be included in the cost of the item. If the Engineer determines that the bearing assemblies shall be salvaged, they shall be properly stored until they are delivered to the specified DOT salvage facility. Since lead paste may be present under the existing bearings, the use of flame cutting equipment to cut the swedge bolts is not allowed. The method of removal shall be by sawing of the bolts unless another method is approved by the Engineer.

Tarps shall be used by the Contractor to prevent debris from the work operations from falling onto the ground. This debris shall be disposed of properly under the applicable contract items.

The Contractor shall remove any existing guide angles welded to the bottom flange and dispose of them accordingly.

The Engineer will inspect the concrete bearing pads before the installation of the elastomeric bearings. Portions of protruding anchor bolts shall be cut off below the surface of the concrete and the holes filled in with non-shrink grout. All other cracks, spalls, or deterioration shall be repaired as determined by the Engineer.

The concrete bearing pads shall have smooth, even, and level surfaces. They shall show no variation from a true plane greater than 1/16 inches over the entire area upon which the elastomeric bearings are to rest. The Contractor shall grind the concrete as required to achieve these requirements.

The Contractor shall provide the Engineer with safe access to the work for inspection purposes.

**Method of Measurement:** This work shall be measured for payment by the actual number of bearing locations adequately prepared for the installation of new steel-laminated elastomeric bearings.

**Basis of Payment:** This work shall be paid for at the contract unit price each for "Bearing Replacement with Elastomeric Bearing Pads" complete, in place and accepted, which price shall include but not limited to disposal or salvage of the existing bearings, and all materials, equipment, tools and labor incidental thereto, including removal of existing welded guide angles.

ITEM #0521003A

Pay Item  
Bearing Replacement with Elastomeric Bearing Pads

Pay Unit  
EA

## **ITEM #0521014A – STEEL-LAMINATED ELASTOMERIC BEARINGS**

**5.21.01 - Description:** Work under this item shall consist of furnishing and installing steel-laminated elastomeric bearings as shown on the plans, as directed by the Engineer and in accordance with these specifications.

### **5.21.02 - Materials:**

1. Elastomer: The elastomer shall be Grade 3 Virgin Neoprene (polychloroprene) with Shore “A” Durometer hardness as shown on the plans and conforming to the requirements of the AASHTO Standard Specifications for Highway Bridges, Division II - Construction. Elastomer shall have shear modulus as indicated on the Contract Plans when measured using the apparatus and procedure described in Annex A of ASTM D4014.
2. Steel Laminae: The internal steel laminae shall be mild rolled steel conforming to ASTM A570, Grade 36 or 40, ASTM A611, Grade C or D, or an approved equal. Laminae shall be sandblasted and cleaned of all surface coatings, rust and mill scale before bonding and shall be free of sharp edges and burrs. Steel laminae shall develop minimum peel strength of 473 lb/ft when tested in accordance with ASTM D429 Method B.
3. External Load Plates (if indicated on the plans): The external load plates shall conform to AASHTO M270, Grade 50WT2. Bonding surface of the external load plates shall be abrasive blast cleaned prior to being hot bonded to the bearing during vulcanization. Adhesive bonding of the load plate surface to the elastomer is not allowed.
4. Fabrication and Fabrication Tolerances: The fabrication and fabrication tolerances of elastomeric bearings shall conform to the requirements of the AASHTO LRFD Bridge Construction Specifications (3<sup>rd</sup> Edition) with 2010 and 2011 Interim Revisions.

If guide pins or other devices are used to control the side cover over the steel laminae, any exposed portions of the steel laminae shall be sealed by vulcanized patching.

5. Testing: The materials for the elastomeric bearing and the finished bearings themselves shall be subjected to testing. The testing shall conform to the requirements of the AASHTO LRFD Bridge Construction Specifications (3<sup>rd</sup> Edition) with 2010 and 2011 Interim Revisions.

Test bearings, in addition to the bearings shown on the plans, shall be furnished for each type (size and thickness) of bearing for destructive testing. The test bearings shall be furnished without external load plates.

6. **Marking:** Each steel-laminated elastomeric bearing shall have marked on it, with indelible ink, the following: the manufacturer's identification code or symbol, and the month and year of manufacture, the orientation, order number, lot number, bearing identification number, and elastomer type and grade (Neoprene, Grade 3). The markings should be placed on a side of the bearing that is visible after installation.
7. **Certification:** The Contractor shall furnish a Certified Test Report, confirming that the elastomeric bearings satisfy the requirements of these specifications, in conformance with the requirements set forth in Article 1.06.07.
8. **Adhesive:** The adhesive, for bonding the shims, shall be a long lasting, high strength, cold applied, air cured, water and heat resistant material specifically formulated for bonding neoprene and shall meet the following requirements:

Property	Requirement	ASTM Test Procedure
Adhesion	30 lbf/in	D429, Method B
Hardness	50 ± 5 Shore A points	D2240
Tensile Strength, min	1800 psi	D412
Elongation before breaking, min.	750 %	D412

### 5.21.03 - Construction Methods:

**Shop Drawings:** Before fabricating any materials, the Contractor shall submit shop drawings to the Engineer, for review and approval, in accordance with sub-article 1.05.02-3 of the Standard Specifications. These drawings shall include, but shall not be limited to the following information: manufacturer's name, complete details of the bearings, material designations, nominal hardness of the elastomer, the quantity of bearings required, including test bearings, and the location of the bearing identification.

In lieu of the low temperature crystallization test for each lot of bearings and shear modulus test for each batch of material, the manufacturer may provide certificates from tests performed on identical formulations within the preceding year.

**Fabrication:** The bearing shall be cast as a unit in a mold and shall be bonded and vulcanized under heat and pressure. The mold finish shall conform to standard shop practice.

Fabrication tolerances shall conform to AASHTO LRFD Bridge Construction Specifications (3<sup>rd</sup> Edition) with 2010 and 2011 Interim Revisions. Flash tolerance, finish and appearance shall meet the requirements of the latest edition of the Rubber Handbook, published by the Rubber Manufacturer's Association, Inc., RMA F3 and T.063.

Every bearing shall be visually inspected for compliance with dimensional tolerance and for overall quality of manufacture. Buffing, cutting, or other attempt to alter the size of the bearings, for the purpose of meeting the tolerances stated herein will not be permitted. Adhesive bonding of the elastomeric bearings to steel and concrete surfaces is not permitted.

Each elastomeric bearing pad shall have embossed on it the following: the word "CONN", project number, manufacturer's identification code or symbol, and the month and year of manufacture. The bearing shall also have stenciled on it, with indelible ink, the lot number, bridge number, and the bearing number. The marking shall be placed on a side of the bearing that is visible after installation.

For structures requiring less than fifty pads, one test pad shall be furnished. For structures requiring more than fifty pads, one test pad shall be furnished for each additional fifty pads or part thereof. If there are two or more types of pads in one structure, and only one test pad is required, the pad will be furnished for the type of which there are the greater numbers. All test pads shall be furnished without charge.

The same firm shall manufacture all of the elastomeric bearing pads to be installed on this structure.

The manufacturer shall furnish facilities for the test and inspection for the completed bearing in its plant or at the independent test facility and the inspectors shall be allowed free access to the manufacturer's plant and test facility.

Short-Duration Compression Test: Each bearing shall be tested as follows for a Short-Duration Compression Test:

1. The Bearing shall be loaded in compression to 1.5 times the design load shown on the plans. The load shall be held constant for 5 minutes, removed and reapplied for another 5 minutes.
2. The bearing shall be carefully examined while under the second loading.
3. If the bulging pattern indicates lamina parallelism of layer thickness outside of specified tolerance, or poor lamina bond, the bearing shall be rejected. If there are three or more separate surface cracks greater than  $\frac{1}{16}$ " wide and  $\frac{1}{16}$ " deep, the bearing shall be rejected.

A Certified Test Report in accordance with Section 1.06.07 of the Standard Specifications shall be required for the specified test on the elastomer and for the specified short duration tests.

Installation: Bearing areas of the masonry upon which the elastomeric bearing pads are to be placed shall be cleaned of all debris. Bearing areas shall be carefully finished, by grinding if necessary, to a smooth, even, level surface of the required elevation, and shall show no variations from a true plane greater than  $\frac{1}{16}$  inch over the entire area upon which the elastomeric bearing pads are to rest.

There shall be full contact and uniform bearing between the elastomeric bearing pad and the concrete seat after application of full dead load. Also after application of full dead load, there shall be uniform deflection of the elastomeric bearing pad.

The elastomeric bearings shall be installed as shown on the plans. The elastomeric bearings shall be installed when the ambient air temperature is between forty (40) and eighty five (85) degrees Fahrenheit and has been within this range for at least 2 hours.

In no case shall the elastomer or the vulcanized bond be subjected or exposed to temperatures greater than four hundred (400) degrees Fahrenheit.

Assembly with high strength bolts shall conform to the requirements of Article 6.03.

**5.21.04 - Method of Measurement:**

This work will be measured by the number of each elastomeric bearing assemblies installed as shown on the plans, conforming to the details and specifications and as accepted by the Engineer. No allowance shall be made for test bearings.

**5.21.05 -Basis of Payment:**

This work will be paid for at the contract unit price for each "Steel-Laminated Elastomeric Bearings", complete in place, which price shall include all vulcanized external load plates, test bearings and all materials, testing, equipment, tools and labor incidental thereto.

Pay Item

Steel-Laminated Elastomeric Bearings

Pay Unit

EA

## **ITEM #0522178A – CONSTRUCT CONCRETE KEEPER BLOCKS**

**Description:** Work under this item shall consist of constructing a concrete keeper block including roughening of existing concrete, furnishing and placing of reinforcing steel and steel keeper plates included welded studs, and concrete. Where called for in the plans the Contractor shall also drill and grout reinforcing steel into the concrete substructure. The Contractor shall perform work as indicated on the plans, in accordance with this special provision, and as directed by the Engineer.

**Materials:** The materials shall conform to the following requirements:

1. The steel keeper plates shall conform to ASTM A36. Steel for welded studs shall conform to the requirements of Subarticle M.06.02-12.
2. Where drilling of holes is called for in the plans, the chemical anchor material shall be a resin compound specially formulated to anchor steel bars in holes drilled into concrete for the purpose of resisting tension pull-out. The chemical anchor material shall conform to Subarticle M.03.01-15 of the Standard Specifications and be selected from the Department's Qualified Products List.
3. Concrete shall be a Contractor design mix which achieves a minimum 28 day strength of 4400 psi.
4. Reinforcement shall conform to ASTM A615, Grade 60 and uncoated.
5. The steel keeper plate assembly including plate and welded studs shall be galvanized after fabrication in accordance with ASTM A123.
6. Welding details, procedures and testing methods shall conform to the latest ANSI/AASHTO/AWS D1.5: Bridge Welding Code, unless otherwise notes.

In lieu of a Contractor designed concrete mix, the Contractor may at no additional cost to the State, submit for approval one of the following bagged repair mortars:

Emaco T415 Rapid Strength Repair Mortar

Manufactured by: BASF Building Systems  
889 Valley Park Drive  
Shakopee, MN 55379

Emaco T430 Rapid Strength Repair Mortar

Manufactured by: BASF Building Systems  
889 Valley Park Drive  
Shakopee, MN 55379

Rapid Set DOT Repair Mortar

Manufactured by: CTS Cement Manufacturing Corporation  
11065 Knott Avenue, Suite A  
Cypress, CA 90630

Five Star Structural Concrete V/O

Manufactured by: Five Star Products Inc.  
750 Commerce Drive  
Fairfield, CT 06825

The concrete repair mortar shall be extended with aggregate in accordance with and meeting the requirements of the manufacturer recommendations.

If one of the concrete repair mortars is selected for use, 4" x 8" test cylinders shall be used for testing in conformance with the Standard Specifications.

A Materials Certificate shall be required for the chemical anchor material, cementitious mortar and the steel keeper plates in accordance with Article 1.06.07, certifying the conformance of these materials to the requirements stated herein.

All materials shall be approved by the Engineer before use.

**Construction Methods:** Before fabricating any materials, the Contractor shall submit shop drawings to the Engineer for review in accordance with Article 1.05.02.

These drawings shall include but not be limited to the following:

1. Location and sizes of all reinforcing steel including splice lengths, steel plates and studs,
2. Material lists.
3. Material designations.
4. Type of drill.
5. Diameter of bit.
6. Method of cleaning holes.
7. Method of placement of the chemical anchor material.

Specifications and recommendations for the aforementioned may be obtained from the manufacturer of the chemical anchor material. The weight of the drill shall not exceed 20 pounds.

The anchor bolts shall be able to develop a pull-out resistance of 90 percent of their nominal yield strength when bonded at the embedment depths provided.

The Contractor shall design, furnish, install and remove temporary demolition shields to prevent debris from dropping below as directed by the Engineer. The Contractor shall submit working drawings to the Engineer in accordance with Section 1.05.02. The debris shield shall remain in place during construction until the Engineer determines it is no longer needed. The Contractor is responsible for the integrity and maintenance of the shield during their use. Any repairs to the shield shall be at no cost to the State.

All debris shall be removed from the shields daily and be disposed of, from the site, by the Contractor.

The Contractor shall install the keeper blocks after the two adjacent elastomeric bearings have been installed.

The surface on which the concrete keeper is to be poured shall be intentionally roughened to a depth of ¼ inch and wetted. There shall be no standing water on the surface. Mixing, placing, curing, and finishing of the concrete shall be in accordance with Article 6.01.03.

Where called for in the plans holes shall be drilled into the concrete at the locations shown on the plans.

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 rod or bolt being anchored.

Drilling methods shall not cause spalling, cracking, or other damage to the concrete. 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.

If existing reinforcing bars are encountered during the drilling operation, the hole shall be relocated to clear the existing reinforcing as directed by the Engineer. Uncompleted holes shall be filled with the chemical anchor material and finished smooth to the contour of the surrounding concrete surface. Care shall be taken not to damage exposed reinforcing bars.

The Contractor shall not core holes into the substructure.

Before placing the chemical anchoring material in the holes, the holes shall be cleaned of all dirt, moisture, concrete dust and other foreign material. The reinforcing steel and chemical anchor material shall be installed in the holes in accordance with the manufacturer's recommendations.

Fabrication and placement of reinforcing steel shall conform to the requirements of Article 6.02.03.

The installation of welded studs shall be in accordance with the requirements of Article 5.08.03.

Mixing, placing, curing, and finishing of the Contractor designed concrete shall be in accordance with Article 6.01.03. If a bagged repair mortar is to be used, the concrete surface preparation, mix, placement and curing shall be done in accordance with the manufacturer's recommendations and in accordance with Article 6.01.03.

The Contractor, as directed by the Engineer, shall take adequate precautions to prevent any materials from dropping to the areas below which may result in damage to any existing construction, traffic or to adjoining property. Should any damage occur as a result of the Contractor's operations, the Contractor shall repair and/or replace any such damage to the satisfaction of the Engineer at no cost to the State.

At no time during the Contractor's work will interruption in traffic carried by the structure be permitted solely as a result of constructing the keeper block.

**Method of Measurement:** This work will be measured for payment by the number of concrete keeper blocks, as described above, completed and accepted by the Engineer.

**Basis of Payment:** This work will be paid for at the contract unit price each for "Construct Concrete Keeper Blocks", complete in place, which price shall include drilling and grouting reinforcing steel, furnishing and placing reinforcing steel, keeper steel plates and welded studs, concrete or bagged repair mortar, debris shield, access and all materials, equipment, tools and labor incidental thereto.

## **ITEM #0601045A – RECONSTRUCT BRIDGE ENDBLOCK**

**6.01.01 - Description:** Work under this item shall consist of sawcutting, removing portions of existing concrete and granite curbing, and then reconstructing bridge endblocks, in accordance with the plans and as directed by the Engineer.

**6.01.02 - Materials:** Materials for the reconstruction of endblocks shall conform to the following:

- 1) Concrete: Concrete for constructing endblocks shall be Class “F” Concrete conforming to Section M.03.01. The minimum compressive strength shall be 4400 psi.
- 2) Reinforcing Steel: The deformed steel reinforcing bars for this work shall be uncoated, conforming to ASTM A615, Grade 60 and the requirements of Article M.06.01. Shop Drawings for the reinforcement need not be submitted.
- 3) Chemical Anchoring Material: The chemical anchoring material shall conform to Subarticle M.03.01-15.

**6.01.03 - Construction Methods:** The Contractor shall remove existing concrete and granite curbing to the neat lines shown on the plans and as directed by the Engineer. Should the Contractor damage the existing structure to remain, he shall repair or replace it to the satisfaction of the Engineer at no additional cost.

The concrete shall be saw cut to delineate the removal limits. A maximum size hammer of 30lb shall be used as directed by the Engineer. Pneumatic tools shall not be placed in direct contact with the reinforcing steel. Granite curbing shall be removed to the first mortar joint or as ordered.

The Contractor shall take adequate precautions to prevent any materials from entering on to adjacent traffic lanes and adjoining property or from falling to the area below the structure.

Hole drilling methods shall not cause spalling, cracking, or other damage to the existing concrete. The weight of the drill shall not exceed 20lb. The hole diameter for the reinforcement shall be as recommended by the manufacturer of the chemical anchoring material for its diameter.

Prior to placing the chemical anchoring material in the holes, the holes shall be cleaned of all dirt, moisture, concrete dust and other foreign materials. Fabrication and placement of reinforcing steel shall conform to the requirements of Article 6.02.03. The reinforcing steel and the chemical anchoring material shall be installed in the holes in accordance with the chemical anchoring material manufacturer's recommendations.

Prior to placing the concrete, the surface on which the concrete will be placed shall be intentionally roughened to a depth of ½ inch, all loose concrete and dust shall be removed, and the existing concrete surface shall be saturated immediately prior to placing the new concrete. Mixing, placing, curing, and finishing of the concrete shall be in accordance with Article 6.01.03.

Any newly placed concrete having a hollow sound when sounded with a hammer shall be replaced by the Contractor at his expense by a method acceptable to the Engineer.

The existing vertical faces of parapet shall be protected during the pouring and finishing of the modified section to prevent concrete staining. Any staining or discoloration of existing concrete caused by the Contractor shall be cleaned at the Contractor's expense by a method acceptable to the Engineer.

**6.01.04 - Method of Measurement:** This work will be measured for payment by the number of endblocks that are reconstructed as noted in the plans and as directed by the Engineer.

**6.01.05 - Basis of Payment:** This work will be paid for at the contract unit price each for "Reconstruct Bridge Endblock," which price shall include sawcutting, removal of concrete and granite curbing, and reconstruction of the endblocks and all other materials, equipment, tools and labor incidental thereto.

<u>Pay Item</u>	<u>Pay Unit</u>
Reconstruct Bridge Endblock	EA

## **ITEM #0601073A – CLASS “S” CONCRETE**

**Description:** Work under this item shall consist of substructure repairs as indicated on the plans to fill and repair voids in surfaces of vertical concrete areas.

Work under this item shall consist of surveying the existing vertical faced concrete of structures to be repaired with this material; locating and removing loose concrete, deteriorated concrete, and concrete overlying hollow areas; patching these areas as well as spalled and scaled areas with Class "S" Concrete formed to provide 2" minimum clear cover. The work shall also include sandblasting and cleaning areas to be patched and filled and any exposed reinforcing steel prior to placing the concrete. Exposed reinforcing shall have a zinc primer applied prior to placing the patch material.

The Contractor shall not perform any repair work without prior approval of the Engineer for location, limits and types of repairs.

### **Materials:**

1. General Composition of Concrete Mixes: Supplement to include Class "S" Superplasticized Concrete.

Type	Proportions By Weight (Approx.)	Water Per Bag (Gallons), (Max.)	Cement Factor (Bags/CY)
Class "S"	1:2.16:2.20	5.7	7.0

Type I or II Portland Cement shall be used for Class "S" Concrete and shall conform to the requirements of AASHTO M85.

2. Liquid Membrane Forming Compound: No liquid membrane forming compound shall be used for Class "S" Concrete.

### **Construction Methods:**

Composition: Class "S" Concrete shall conform to the requirements as specified in Article M.03.01 as amended herein. Class "S" Concrete shall contain not less than 6.5 percent and not more than 8.5 percent entrained air at the time of placement.

The Class "S" Concrete shall have a minimum 3000 psi compressive strength at 28 days.

Consistency: Class "S" Concrete shall have a slump range of 2 to 4 inches prior to the addition of the HRWR and from 6 to 8 inch slump after the addition of the HRWR. The addition rates of the air entraining admixture and the HRWR will vary. Frequent field testing of the air content and slump prior to and after addition of the HRWR will be the determining factor of actual addition rates for each admixture.

Mixing Concrete: For hand mixing of Class “S” Concrete, the Contractor shall provide scale(s) approved by the Engineer in which cement and aggregate can be accurately weighed for the required mix proportions.

Note: The Contractor shall also have measuring graduates marked in ounces for the proportioning of the A.E.A. and the HRWR. Do not mix the A.E.A. and the HRWR together before adding to the mix; the resultant solution will not work. Do not add the A.E.A. and the HRWR at the mixer simultaneously, these admixtures must be added separately in the mixing cycle. All manufactured materials shall be stored, mixed and used in strict accordance with the written recommendations of the respective manufacturers.

The single component coating shall be one of the zinc rich primers listed in the latest Product Reference List noted in Section M.07.02. The color of the coating shall be FS 26270 (Medium Gray).

Curing Concrete: Concrete shall be cured by leaving forms on for seven (7) days and wetting them frequently.

Material Storage: The Contractor shall store and maintain the A.E.A. and the HRWR materials in clean original containers as delivered by the manufacturer.

Repair Procedure: A survey of the existing structure shall be performed by the Contractor, under the direction and to the satisfaction of the Engineer, to determine the exact limits and locations of all areas to be repaired under this item. The limits of application shall not exceed the requirements as specified herein.

The perimeter of each deteriorated area shall be delineated with a ½” deep sawcut. When sawcutting the concrete, care shall be taken not to cut existing reinforcing.

Loose and deteriorated concrete shall be chipped away back to sound concrete at least 1” below reinforcing steel. The exposed surfaces shall be thoroughly sandblasted and vacuumed immediately prior to forming.

Hollow areas in the existing concrete shall be completely exposed by chipping away back to sound concrete and thoroughly sandblasted and vacuumed immediately prior to forming.

Spalled and scaled areas shall be cleaned of all loose deteriorated concrete. The exposed surfaces shall be thoroughly sandblasted and vacuumed immediately prior to forming.

Removal of unsound concrete material shall be such as to facilitate uniform placement of fresh concrete. All upper areas of excavated voids shall slope evenly out to within one inch (1”) of the face of the concrete to preclude entrapping air and forming hollow spots in the freshly placed concrete. Within one inch (1”) of the surface, the outline shall be essentially normal (perpendicular) to the surface.

All surfaces of exposed concrete and reinforcing steel shall be free of oil, solvent, grease, dirt, dust, bitumen, rust, loose particles and foreign matter. Prior to sandblasting of concrete and steel surfaces, all petroleum contamination on these surfaces shall be removed by appropriate solvent or detergent cleaning operations. All compressed air equipment used in cleaning shall have properly sized and designed oil separators, attached and functional, to assure the delivery of oil free air to the nozzle.

Extreme care shall be taken where reinforcing steel is uncovered not to damage the steel or its bond in the surrounding concrete. Pneumatic tools shall not be placed in directed contact with reinforcing steel. Maximum 15 lb. size hammers shall be used for general chipping and removal. Exposed reinforcing shall remain in place except where specifically indicated for removal by direction of the Engineer. Exposed reinforcing steel shall be sandblasted in accordance with SSPC-SP-6, Commercial Blast Cleaning, to remove all contaminants, rust and rust scale.

In areas where reinforcing steel is found to be surrounded by deteriorated concrete or has at least one-half of its surface area exposed or has less than 1" cover, the depth of removal shall be such as to include all deteriorated concrete but not less than 1" below or behind the reinforcing steel.

Where the existing reinforcing steel is severely corroded or damaged, it shall be cut out and replaced with new reinforcing steel of the same size with a minimum length for lap splices as required under the tension lap splice requirements set forth under the AASHTO LRFD Bridge Design Specifications, Customary U.S. Units, 6th Edition, including 2013 Interim Revisions.

When existing steel is determined by the Engineer to have insufficient cover, a bumpout detail shall be constructed as shown in the plans. Concrete shall be removed to a minimum depth of 1" behind the existing steel.

When using sandblasting equipment, all work shall be shielded and contained for the protection of the public and the environment.

The exposed blast cleaned reinforcing steel shall be coated with the single component zinc primer by brush. All application of the zinc primer shall be in accordance with the manufacturer's printed instructions.

All excavated areas on vertical surfaces of concrete members shall be formed using forms coated with a plastic or similar film to preclude the use of form release agents. Forms and support systems shall be properly designed in accordance with Subarticle 6.01.03-3. Forms shall be so designed that placement access shall be allowed at the top of each respective formwork assembly for contiguous void areas.

Forms and support systems shall be properly designed in accordance with M6.01.03-03. Forms shall be so designed that placement access shall be allowed at the top of the formwork assembly.

No bonding materials shall be used before or during the placement of this concrete material. Concrete surfaces against which this material is to be placed shall be sound, tight, and

thoroughly roughened by the removal and sandblasting procedures specified above. The exposed concrete surfaces shall be dampened with fresh water immediately prior to placement of the fresh concrete by “hosing” down the areas behind the forms as thoroughly as possible. Light rust formations on sandblasted reinforcing steel prior to concrete placement is normal and acceptable.

The minimum ambient and patch area surface temperature shall be 45 degrees Fahrenheit and rising at the time of concrete installation.

Prior to forming up vertical surfaces, 4 x 4, 6 gauge reinforcing steel wire fabric conforming to the requirements of M.06.01-3 shall be installed at the proper depth to those areas greater than six square feet (6 sq. ft.) and three inches (3”) deep or as directed by the Engineer. The fabric shall be tied to any exposed reinforcing steel or anchored to sound concrete with 1/4” powder actuated anchors such as Hilti “Gunite Clip”, W-6 Threaded Stud and Eye-Coupling, or equivalent as approved by the Engineer.

Placement of the fresh concrete shall be in the maximum height lifts possible under the circumstances and all freshly placed concrete shall be consolidated during placement with adequately sized and effective vibrators.

Following curing and stripping, the exposed faces of new concrete shall be finished off with the use of the appropriate tools to blend in the physical appearance to the surrounding areas as much as possible.

Cured patches shall be sounded by the Engineer to detect the presence of any hollow spots. Such spots shall be removed and replaced by the Contractor at his cost.

**Method of Measurement:** Class “S” Concrete shall be measured for payment by the actual volume in cubic feet of concrete placed and accepted by the Engineer. Wire fabric and reinforcing steel will not be measured for payment.

**Basis of Payment:** Class “S” Concrete will be paid for at the contract unit price, per cubic yard, for “Class “S” Concrete”, complete in place, which price shall include locating and removing unsound material, sandblasting, cleaning and forming, placing concrete, stripping formwork and finishing new concrete, and all materials, equipment, tools, labor and clean-up incidental thereto.

Pay Item  
Class “S” Concrete

Pay Unit  
C. F.

## **ITEM #0601118A –BRIDGE DECK CONCRETE**

Work under this item shall conform to the pertinent requirements of Section 6.01 supplemented and amended as follows:

**Description:** *Add the following:*

Where indicated in the plans, the Contractor shall furnish and install Bridge Deck Concrete (BDC), consisting of an Engineered Cementitious Composite (ECC) for use in Link-slabs for newly constructed bridges, rehabilitated or retrofitted bridges. The concrete shall be composed of Portland cement (Type 1), fine aggregate, poly-vinyl-alcohol fibers, fly ash (type-F), high range water reducer, and water. The use of truck mixed or transit mixed concrete is permitted for BDC. The Contractor shall work closely with the BDC manufacturer or their technical representative to ensure design criteria are met.

Work under this item also includes furnishing, installing and removing temporary bulkheads to define the edges of the bridge deck concrete.

**Materials:** *Add the following:*

Materials for Bridge Deck Concrete (BDC) shall conform to the requirements of Article M.03.01 amended as follows:

Concrete: The concrete shall consist of a homogeneous mixture of Portland cement (Type 1), fine aggregate, poly-vinyl-alcohol (PVA) fibers, fly ash (type-F), high range water reducer, and water. Fine aggregates used for ECC concrete shall be of virgin silica sand consisting of a gradation curve with 50% particles finer than 0.04 mils and a maximum grain size of 12 mils.

Fiber to be used by ECC concrete shall be manufactured of poly-vinyl-alcohol (PVA) with a fiber diameter of 1.5 mils and a length between 0.3 inch and 0.5 inch. The surface of the fiber shall be oiled by the manufacturer with 1.2% (by weight) hydrophobic oiling compound along the length of the fiber. Fiber strength shall be a minimum of 232 ksi with a tensile elastic modulus of at least 5,800 ksi.

Water Reducing, High Range Admixture: Water reducing, high range admixture (superplasticizer) complying with ASTM C 494, Type F or G, ASTM C 1017, Type 1 or 2. In addition, the selected water reducing-high range admixtures should be comprised of a polycarboxylate chemical composition.

Retarding admixture shall comply with ASTM C 494, Type D and M.03.01.09

Bridge Deck Concrete Mix Design Requirements:

Table 1

<b>Design Parameter</b>	<b>Value</b>
Water (H <sub>2</sub> O)	544 lb./yd <sup>3</sup>
Portland Cement, Type 1	973 lb./yd <sup>3</sup>
Fly Ash, Type F	1167 lb./yd <sup>3</sup>
Fine Aggregate, Dry	778 lb./yd <sup>3</sup>
High Range Water Reducer (HRWR)	14.6 lb./yd <sup>3</sup>
Poly-vinyl-alcohol (PVA) Fiber	43.8 lb./yd <sup>3</sup>
Retarding Admixture	Optional

Table 2

<b>Minimum Strength of BDC Material</b>	<b>7 day</b>	<b>14 day</b>	<b>28 day</b>
Compressive	3200 psi.	4000 psi.	4500 psi.
Tensile (uniaxial)	500 psi.	500 psi.	500 psi.
Ultimate Tensile Stain Capacity	2% (uniaxial tension)		

Trial Batch: The Contractor shall appoint a technical representative capable of making adjustments to the batching and mixing of BDC material. This representative must be familiar with the mixing, batching and placement of BDC material. The technical representative will designate a batching sequence of BDC material to ensure uniform fiber dispersion, and homogeneity of the material. The batching sequence must be approved by the Engineer. The technical representative shall be present at the trial batch and at the first placement of BDC material to make recommendations and adjustments.

A 4 yd.<sup>3</sup> trial batch shall be mixed and placed at the mix plant or as designated by the Engineer a minimum of 28 working days prior to full production. The Engineer must be notified of the time of the trial batch mix a minimum of 48 hours prior to batching. Quality assurance specimens shall be cast from this trial batch according to section 6.01.03-22 of the Standard Specifications, and a Certified Test Report, prepared by an independent Laboratory, shall be furnished by the Contractor to validate the early age hardened properties of the BDC mixture.

The trial batch shall be prepared following the adjusted mix design and with the same materials that will be used in the BDC link slab mixture. For the trial batch to be considered successful, workability, fiber dispersion, mixture rheology, 7 and 14 day compressive and tensile strengths,

and uniaxial tensile strain capacity must meet the requirements of this special provision, as demonstrated by the Certified Test Report furnished by the Contractor.

Workability is evaluated as outlined in previous section of this provision. Qualitative judgment must be made by the Engineer as to proper homogeneous fiber dispersion throughout the fresh material, and acceptable rheology of the mix for the intended application. If the trial batch does not meet these requirements the trial batch shall be repeated at no additional cost to the Department.

Neoprene Pads: Shall conform to M.03 of the Standard Specifications, or approved equal.

### **Construction Methods:**

Construction Methods for this work shall conform to the requirements of Section 6.01.03, amended as follows:

The Contractor shall install temporary bulkheads in the bridge deck slab, where indicated in the plans, to define the limits of the Bridge Deck Concrete. Reinforcement shall pass through the temporary bulkheads. The bulkheads shall be removed after curing of the Class "F" Concrete.

Trucks delivering ECC material to the project location must be fully discharged within one hour of charging at the plant. Prior to placement of the link-slab, all concrete/ECC interfaces shall be wetted with a uniform spray application of water so that all the surfaces are moist at the time of placement, with no standing water. Water collecting in depressed areas of the forms shall be blown out with clean, oil free, compressed air.

The Contractor is advised that due to the high flowability of BDC material it may be difficult to place the material on sloped bridge decks. The flowability problem may be exacerbated if vibration is present. Special methods with phased construction may be needed when vibrations are present during placement of the BDC material.

Sidewalk, curb or barriers shall not be cast on the bridge deck until the link-slab has received a minimum of two days continuous wet cure cycles. Heavy equipment is not allowed on the link-slab until the link-slab has reached an age of at least 4 days, and then not until the ECC material has attained the 28 days strength listed in Table 2. Sidewalks, curbs and parapets within the link-slab span shall be cast of BDC material.

If the workability limits within this special provision cannot be met, or due to other circumstances, the Contractor is allowed to use hand held vibration equipment to aid in the placement and consolidation of the BDC material if approved by the Engineer. Vibration should be used cautiously to acquire proper consolidation of the BDC material, and only as a final

measure in guaranteeing high quality construction. Precaution must be taken during vibration to not affect proper dispersion of the fibers within the fresh BDC material.

Neoprene Pads: Shall be placed on top of girder flanges, in accordance with the plans.

**Method of Measurement:** *Add the following:*

Bridge Deck Concrete shall be measured for payment by the actual volume in cubic yards of bridge deck concrete, complete and accepted, within the limits shown on the plans or as ordered by the Engineer.

**Basis of Payment:** *Add the following:*

Bridge Deck Concrete: This material will be paid for at the contract unit price per cubic yard for BDC, complete in place, which price shall include all materials, equipment, tools, labor and work incidental thereto, including temporary bulkheads, heating, all costs associated with the technical representative and all admixtures.

**Pay Item**

Bridge Deck Concrete

**Pay Unit**

c.y.

**ITEM #0601247A - PRECAST CONCRETE PIER CAP**

**Description:** Work under this item shall consist of furnishing, erecting and installing precast, post-tensioned pier caps, of the type and size shown on the plans. The use of cast-in-place concrete will not be considered for substitution.

**Materials:**

Concrete: Concrete shall conform to Article M.14.01-1. The concrete shall attain a minimum 28 day compressive strength,  $f'_c$ , of 5,000 psi.

Reinforcing Steel: All deformed bars shall be uncoated and conform to M.06.01.

All threaded concrete inserts, lifting fixtures and miscellaneous hardware cast into the pier caps shall be galvanized in accordance with ASTM A153 or ASTM B695, Grade 50, or be stainless steel.

Steel Shims: Shall conform to ASTM A36 or stronger and shall be hot dip galvanized in accordance with ASTM A123.

Grouted Splice Couplers: The grouted splice couplers shall meet the minimum requirements of Article 5.11.5.2.2 - Mechanical Connections, as described in the AASHTO LRFD Bridge Design Specifications. Grouted splice couplers, including the grout used inside the couplers, shall be furnished as a system by one of the following three companies:

NMB Splice Sleeve  
Splice Sleeve North America, Inc.  
38777 West Six Mile Road, Suite 205  
Livonia, MI 48152  
1-877-880-3230

Dayton Superior Sleeve-Lock Grout Sleeve  
Dayton Superior  
Corporate Headquarters  
1125 Byers Road  
Miamisburg, OH 45342  
800-745-3700

Erico Lenton Interlok  
ERICO United States  
34600 Solon Road  
Solon, Ohio 44139  
1-440-248-0100

Structural grout installed between the columns and the pier caps, whether flowable, or used as a bedding material, shall be a non-shrinking grout that shall comply with the requirements of ASTM C 1107. The grout shall be suitable for exterior applications. If the Contractor proposes a flowable grout, he shall produce documentation from the grout Manufacturer proving that the grout will be able to flow completely into horizontal gaps between the columns and the pier cap without creating air voids or honey-combing. Bagged, pre-mixed formulations of structural grout shall be clearly marked with the manufacturer's name, date of production, batch number, and written instructions for proper mixing, placement and curing of the product.

**Post-tensioning materials:**

Tendons: Wire strands for all tendons shall conform to the requirements of ASTM A416, Grade 270.

Anchorage Assemblies: All units comprising an anchorage assembly shall be capable of developing the ultimate strength of the attached tendon without visible deformation, and shall be furnished complete with all necessary fittings. All deformed bars, wire, mesh or structural shapes that are required for distributing the end anchorage loads shall conform to the requirements of Article M.06.01.

PVC Conduit: Sheathing for the tendons shall be semi-rigid or rigid, interlocked PVC tubing, of the proper dimensions, especially manufactured for this purpose. The conduit shall be completely sealed against leakage of mortar into the conduit.

Grout: The Contractor shall submit to the Engineer a proposed grout mix showing the exact proportions of the materials to be used. The grout shall consist of a mixture of Portland cement, water and an expansive admixture approved by the Engineer. The grout mix shall conform to the following requirements:

- a. The grout mix shall have an unrestrained volumetric expansion of not less than 3% nor more than 8%.
- b. The grout mix shall have a minimum 28-day compressive strength of 4,650 psi, when tested by methods conforming to the requirements of ASTM C109, except that the materials and the proportions of the materials shall conform to the Contractor's design.
- c. The water content of the grout shall be kept as low as possible for proper grouting. However, it shall not exceed 5 gallons per sack of cement.

The Contractor may substitute a grout mix especially manufactured for grouting tendons, conforming to the requirements stated herein.

The Contractor shall provide a Certified Test Report that the mix submitted meets the

requirements stated herein, in conformance with the requirements set forth in Article 1.06.07. Also, the Contractor shall provide, when required by the Engineer, samples of the grout mix for testing and approval.

Water shall conform to the requirements of Article M.03.01. Chlorides and nitrates shall not be used. The water shall be potable.

Portland cement shall be Type I or Type II cement conforming to the requirements of Article M.03.01-3.

Testing of Tendons and Anchorages: All strands to be shipped to the site shall be assigned a lot number and tagged for identification purposes. Anchorage assemblies to be shipped shall be likewise identified.

All samples submitted shall be representative of the lot to be furnished. In the case of strand it shall be taken from the same master roll.

All the materials specified for testing shall be furnished to the Engineer for testing, free of cost, in ample time for testing and approval. Approval of the material must be obtained before the material is incorporated in the work.

For seven-wire strand-furnish one strand 7' long and one typical tendon consisting of proposed number of strands 7' long.

The Contractor shall also furnish two anchorage assemblies, complete with distribution plates of each size or type to be used, if anchorage assemblies are not attached to tendon samples. Where a common distribution plate is used for anchoring a number of tendons, two equivalent plates for single tendon shall be furnished.

The anchorage assembly shall be designed so that the maximum bearing stress on concrete at service load will not exceed the smaller of 17.5 ksi or 0.9 fci.

The anchorage assembly shall hold the prestressing steel at a load producing a stress of not less than 95 percent of the guaranteed minimum tensile strength of the tendon.

Qualifications of the Precast Concrete Manufacturing Plant: The Contractor will be permitted to use more than one precast concrete manufacturing plant for this project, however all of the pier caps must be manufactured by one plant and all of the other components can be manufactured by one manufacturer. In no case will more than two manufacturing plants be permitted.

The manufacturer shall employ a minimum of one person, regularly present in the plant, who is certified by PCI for Plant Quality Personnel. Level II.

The precast concrete manufacturing plant(s) shall be certified under the PCI Certified Plant Program. The manufacturer shall be certified at the time of bidding. Certification shall be in the following product group(s) and category (ies):

## **B2 – Prestressed Miscellaneous Bridge Products (Non-Superstructure)**

Any precast, prestressed elements except for superstructure beams. This includes piling, sheet piling, retaining-wall elements, stay-in-place bridge deck panels, full-depth deck panels, and all products covered in B1.

### **Construction Methods:**

- 1. Shop Drawings:** Prior to fabrication, the Contractor shall submit shop drawings to the Engineer for approval in accordance with Article 1.05.02. These drawings shall include complete details of the methods, materials and equipment he proposes to use. The shop drawings shall also include details of the grout installation and curing procedures. The shop drawings shall also include the following from the grouted sleeve coupler manufacturer:

Documentation stating the minimum compressive strength the grout must attain so that the resistance of the grout filled sleeve coupler connection is not less than 100% of the yield strength of the connected reinforcement in tension based on testing.

Documentation stating the minimum compressive strength the grout must attain so that the resistance of the grout filled sleeve coupler connection is not less than 125% of the yield strength of the connected reinforcement in tension based on testing.

Shop Drawings for Post Tensioning shall include the following information:

- A. Complete details of the methods, materials, and equipment the Contractor proposes to use the post tensioning operations. Such details shall outline the method and sequence of stressing, jacking force, strain due to jacking and effective force for each tendon, and give complete specifications and details of the tendons and anchorage devices and other data pertaining to the operations.
- B. Complete details of the methods, materials and equipment the Contractor proposes to use in the grouting operations, including the manner of mixing, the equipment to be used, step by step procedures to be followed and the sequence for grouting of the conduits.
- C. The size of the anchorage assemblies and pockets shall be detailed
- D. The manner of securing the conduit and other components into place, including the interval of tie-downs.

Four (4) sets of design computations for the proposed method of post tensioning and sealed by a Professional Engineer licensed in Connecticut shall be submitted with the shop drawings. The design computations shall include, but not be limited to the following information:

- A. Computed losses for each tendon, such as creep and shrinkage of concrete, elastic shortening, creep of steel, losses in post-tensioned

steel due to sequence of stressing, friction and anchor set, and all other losses peculiar to the method or system of prestressing that may take place or have been provided for.

- B. Jacking force for each tendon
- C. Effective force for each tendon.
- D. Anchorage bearing stress at service load.
- E. All other computations required for the system of prestressing being used.

Approval of shop drawings must be obtained prior to the placing of metal conduits, tendons, or anchorage assemblies in the forms.

Deviations from prestressing details that have been approved by the Engineer will not be permitted unless details of such deviations are submitted, in advance of use, for approval. The approval by the Engineer of any proposed method, materials or equipment shall not be construed as relieving the Contractor, in any respect, of full responsibility for successfully completing the prestressing operations in accordance with the requirements of these special provisions.

**2. Fabrication and Manufacture:** The fabrication and manufacture of the pier caps shall conform to the latest edition of the AASHTO LRFD Bridge Design Specifications, including the latest interim specifications, as supplemented by the following:

**2-1. Forms and Forming Material:** Forms shall be mortar-tight and sufficiently strong to prevent misalignment of adjacent precast sections. Forms shall be constructed to allow their removal without damage to the concrete. A positive means of supporting reinforcing cages in place during forming shall be required.

The forms shall not be removed until the concrete is sufficiently strong to avoid possible damage to the concrete. Forms shall not be removed without approval being granted by the Engineer. Damage to the concrete due to early removal of the forms shall be cause for rejection.

All forming materials used for casting cylindrical openings for lifting holes or holes for grouting deformed steel bars shall be removed.

**2-2. Concrete Mix:** The Contractor shall design and submit to the Engineer for review a concrete mix that shall attain a minimum 28 day compressive strength,  $f'_c$ , of 5,000 psi.

**2-3. Reinforcement Steel:** Shall be subject to the provisions of Articles 6.02.03-2 through 6.02.03-8. The welding of reinforcement, unless specifically indicated in the Plans, shall not be permitted.

**2-4. Placing Concrete:** Concrete shall not be deposited in the forms until the

Engineer has verified the presence and proper location of the reinforcing steel, the couplers, and other components, and has given his approval thereof.

Concrete shall not be deposited into the forms when the ambient temperature is below 40° F or above 100° F, unless adequate heating or cooling procedures are provided and have been previously approved by the Engineer. The concrete temperature shall be within the range of 60° F to 90° F at the time of placement.

Production during the winter season, from November 15 to March 15 inclusive, will be permitted only in a completely enclosed structure of suitable size and dimension that provides a controlled atmosphere for the protection of both the casting operation and the product.

Outside concreting operations will not be permitted during rainfall unless the operation is completely under cover.

The concrete shall be vibrated internally, or externally, or both, as ordered by the Engineer. The vibrating shall be done with care in such a manner as to avoid displacement of reinforcing steel, forms, or other components. There shall be no interruption in the pouring of any of the members. Concrete shall be carefully placed in the forms and sufficiently vibrated to produce a surface that is free from imperfections such as honeycombing, segregation, cracking, or checking. Any deficiencies noted in the members may be cause for rejection.

#### **2-5. Test Cylinders:**

During the casting of the wall and footing sections, the Contractor shall make test cylinders under the supervision of a representative of the Department. A minimum of 4 cylinders shall be taken during each production run or as ordered by the Engineer. The dimensions and type of cylinder mold shall be as specified by the Engineer. Cylinders shall be cured under the requirements of ASTM C31 and shall be used to determine the 28 day compressive strength requirements ( $f'c$ ). The Engineer also reserves the right to request and test core specimens from the sections to determine their adequacy.

**2-6. Finishing:** All fins, runs, or mortar shall be removed from the concrete surfaces which will remain exposed. Form marks on exposed surfaces shall be smoothed by grinding. All exposed, outside concrete surfaces shall be given a grout clean-down finish in accordance with Subarticle 6.01.03-21.

**2-7. Handling and Storage:** Care shall be taken during storage, transporting, hoisting and handling of all pieces to prevent damage. Sections damaged by improper storing, transporting or handling shall be repaired or replaced by the Contractor, as directed by the Engineer and at no cost to the Department. All storage and handling operations shall be as directed by the Engineer.

The pier caps shall not be shipped to the job site until the 28 day strength ( $f'_c$ ) has been attained. Prior to shipping, the location of the couplers shall be carefully measured to insure proper fit up of the pier cap onto the column reinforcement. Repairs to correct any identified misfits shall be done only after approval for such repairs is received from the Engineer.

**2-8. Repairs:** The Engineer shall evaluate the acceptability and the cause of the defects and the service condition of the pier caps. No repairs shall be done by the Contractor unless permission has been granted by the Engineer. The Contractor shall submit to the Engineer, for review, the proposed methods and materials to be used in the repair operation. All repairs shall be sound and properly finished and cured before the pier cap is delivered to the job site. The Contractor shall bear the costs of all repair work.

**3. Installation:** The installation of the precast concrete pier caps shall conform to the following requirements:

The installation of the precast concrete pier caps shall proceed as required by the sequence of construction, and the special provisions entitled "Prosecution and Progress" and "Maintenance and Protection of Traffic."

The pier caps shall be set to the line and grade indicated on the plans or as directed by the Engineer. Placement of the pier caps shall not begin until authorized by the Engineer.

**4. Grouted splice couplers:** Splices made with grouted splice coupler connections shall be made at the locations shown on the plans. The size of the bars shall be as indicated in the plans. The length of the reinforcement for the grouted splice coupler connections shall be as shown on the plans and in accordance with the requirements of the manufacturer of the coupler. The grouted splice couplers shall be installed in accordance with the Manufacturer's recommendations. All tools and equipment required to install and field inspect the connections shall be provided by the Contractor.

Grout Cubes:

Grout inside couplers: As the Contractor is filling the reinforcement couplers with the Manufacturer's recommended grout, the Contractor shall make cube specimens of the grout in accordance with ASTM C109 except that the grout cubes shall be cured under ambient conditions (not in a controlled environment such as a cylinder box). The grout cubes shall be located close to or on the footings, and protected against dirt, rain, and other contaminants. The dimensions, type, and number of the grout cubes shall be as specified by the Engineer.

Structural grout (between columns and pier cap): As the Contractor is filling the gap between the columns and pier cap with structural grout, (whether

the grout is flowed into place or used as bedding material), the Contractor shall make cube specimens of the grout in accordance with ASTM C109 except that the grout cubes shall be cured under ambient conditions (not in a controlled environment such as a cylinder box). The grout cubes shall be located close to or on the footings, and protected against dirt, rain, and other contaminants. The dimensions, type, and number of the grout cubes shall be as specified by the Engineer. If curing compound is recommended for the structural grout it shall also be applied to the grout cubes.

The grout cubes shall be tested to failure in accordance with ASTM C109 by a Certified Testing Laboratory approved by the Engineer.

Grout cubes shall also be furnished to the Engineer to allow for additional testing by the Department's Material Testing Lab.

### **Grouted Splice Coupler Connection Operations (2 Installation options)**

1. Only personnel who are fully trained in the grout procedures shall be allowed to do the work.
2. Contractor shall follow the written installation procedures of the coupler manufacturer.
3. It is recommended that the projecting column reinforcement be an extended length.
4. Determine the elevation(s) of the top of column by means of a field survey.
5. Based on the survey results, determine the required reinforcing bar extension lengths and the required shim heights.
6. Cut the projecting column reinforcement to the required lengths based on the survey and the coupler manufacturer's recommendations. Note that the coupler systems can have very tight allowable tolerances regarding bar lengths within the couplers so extreme care must be taken with both the survey and the cutting operations.

#### **Installation Option A**

7. Erect and brace the pier cap.
8. Fill area under the pier cap with a flowable structural grout (below the lower ports)
9. Install grout in couplers following the manufacturer's written procedures.

#### **Installation Option B**

7. Fill the area to just over the shim packs with a structural grout (bedding material).
8. Erect and brace the pier cap.
9. Install grout in couplers following the manufacturer's written procedures.

## **For Installation Options A and B**

10. Fill the remainder of the gaps between columns and pier cap with structural grout. Slope the grout down from the pier cap to prevent water from ponding on the grout. Maintain the integrity of the structural grout during all subsequent operations. Repair any grout that becomes displaced or develops cracks.
11. Allow the structural grout to cure and reach minimum compressive strengths as described on the approved Shop Drawings. The structural grout shall be protected against moisture, rain, dirt, and other contaminants during the cure time by methods approved in advance by the Engineer.
12. All grout within the couplers and placed between the pier cap and columns shall cure for a minimum of 36 hours, unless authorized otherwise by the Engineer.

**5. Post Tensioning:** Post tensioning shall not begin until the concrete has attained the minimum compressive strength (fci) shown on the Plans. The compressive strength shall be determined by testing standard cylinders made and cured identically with the pier cap(s). The stressing of tendons and grouting of the conduits shall be completed within fourteen (14) calendar days after the concrete has attained the minimum compressive strength (fci). The tendons shall be tensioned in such an order that lateral and vertical eccentricity of prestress will be a minimum.

The Contractor shall certify to the Engineer that a technical representative from the prestressing material supplier will be available to the Contractor to give such aid and instruction in the use of the prestressing equipment and the installation of materials as is required to obtain satisfactory results.

The technical representative shall be present during the initial placing of prestressing tendons, the stressing of the tendons, and the grouting of the conduits. The representative shall remain on the job until, the opinion of the engineer, each operation is proceeding in an acceptable manner and the workers are familiar with the work required for each operation. The Contractor shall also arrange to have the representative present at such other times as the Engineer may request.

No more than one tendon shall be threaded or mechanically locked into an interior end anchor plate. No factory preassembled tendons will be allowed.

All conduits and other components shall be tied securely into place at intervals shown on the shop drawings. Concrete shall not be deposited in the forms until the Engineer has inspected and approved the placement of the conduits, anchorages and distribution reinforcement, and has marked his approval on each conduit.

All holes, openings and indentations in the conduit shall be repaired prior to placing the concrete. Holes or openings less than 1/4" may be repaired with several wraps of waterproof tape. Holes or openings larger than 1/4" shall be repaired with a split sleeve which shall overlap itself by 3", extend at least 3" on either side of the hole, be secured to the conduit and be sealed with waterproof tape. Indentations which cannot be repaired shall be cut out and repaired as required above for holes greater than 1/4". All repairs are subject to the approval of the Engineer.

After installation in the forms, the ends of the conduits shall be covered as necessary at all times to prevent the entry of water or debris.

After each pour of the concrete which comes in contact with the conduit and before the initial set of the concrete occurs, an elastomeric plug, 1/4" smaller in diameter than the inside diameter of the conduit, shall be passed through each conduit to ensure that there is not a blockage. If a blockage is indicated, it shall be located and removed.

The tendons shall be stressed in the order indicated on the shop drawings so that lateral and vertical eccentricity of the prestress will be a minimum.

The Contractor is instructed that special handling is required of all prestressing steel and related components. Any tendon, or component thereof, that becomes kinked, deformed or otherwise damaged will be rejected. Tools which would mar or damage the tendons shall not be used. The prestressing components shall be free from corrosion when installed, and the Contractor shall take the appropriate measures to prevent corrosion of the tendons after installation. Welding to or near the prestressing steel is not permitted because of the possibility of arcing. If arcing causes damage to the prestressing steel the steel shall be rejected. The conduit, tendons, and other components shall be completely free from oil, grease and other foreign material. Any cleaning required must be done in a manner approved by the Engineer.

Prestressing shall be done with approved hydraulic jacking equipment. All jacks shall be equipped with accurate pressure gages. All combinations of jacks and jags shall have been calibrated by an approved testing agency immediately prior to the start of the prestressing operations. After being six calendar months on the same project, all combinations of jacks and gages shall be recalibrated. The Contractor shall furnish the Engineer certified and notarized calibration charts and tables for each combination of jack and gage.

The prestressing forces shall be measured by calibrated pressure gages. An initial force, sufficient to remove any slack from the tendon shall be applied. The strain between the initial force and the total required force will be measured. A record shall be kept of gage pressures and elongations at all times and shall be submitted to the Engineer. Before beginning of post tensioning operations the Contractor shall submit his proposed record format to the Engineer for approval. If the measured strain varies by more than 5% from the calculated strain, the Contractor shall carefully check his operation to find and correct the source of error before the operation is allowed to continue.

The protruding ends of tendons shall be cut after prestressing, in a manner prescribed by the Engineer, or as noted on the plans. A projection of at least 1", preferably more, beyond the anchorage wedge or the nut must remain. If the tendons are burned off, the cut must be made as quickly as possible in order to reduce heat penetration in the tendons.

Drilling of the pier caps or the use of powder actuated tools on the pier caps will not be allowed after prestressing has begun.

The ends of the grout tubes, vent tubes and drain tubes shall be threaded and the exposed ends fitted with valves. All grout tubes at the end of conduits shall pass through the anchor plates. Vent tubes shall be provided at high points of the conduit throughout its length at a maximum spacing of 26 feet.

Vent tubes and drain tubes which pass through exposed concrete surfaces, shall be fitted with couplings and threaded extension pipes. The coupling shall be so located that, when removed, the remaining stub will be recessed at least ½” from the face of the concrete. The grout tubes at each end of the conduit shall be threaded and shall project at least 4’ above the ends of the conduit, and shall be fitted with shutoff valves at the tops of the tubes.

All vent or grout tubes at the high points of the conduit shall have a 1” vertical tube attached to the vent tube with a reducer coupling. The 1” vertical tube shall have a minimum length of 2’ above the exposed concrete surface or a minimum volume of 10% of the grout volume in the conduit contributing to the waterflow in the grout, whichever is greater. When required by the volume, the vertical tube diameter may be increased to 1 ½” but the minimum length of the vertical tube shall remain as described above. The top elevation of all 1” or 1 ½” vertical tubes for a single conduit shall not vary more than 3” from a common level plane.

The water that may have collected in the conduits shall be blown out with oil-free compressed air before starting the grouting operations.

The temperature of the pier cap at the time of grouting shall be above 50 degrees F. and shall be forecasted to remain above 32 degrees F for at least three days after grouting.

The method of grouting shall be such as to ensure the complete filling with grout of the conduit. No external loads shall be applied to the pier cap before grouting of all tendons has been completed.

The mixer for the grout shall be a high speed mixer specifically designed for grouting of post tensioning conduits. The mixer shall be capable of producing grout which is free of lumps and undispersed cement.

The pump for the grout shall be of the positive displacement type, and shall be able to produce an outlet gage pressure of at least 150 psi.

The pump shall have seals adequate to prevent the loss of grout and also to prevent the introduction of oil, air, or other foreign substances into the grout.

The grouting equipment shall utilize gravity feed to the pump inlet.

During the grouting operation, standby water flushing equipment shall be provided. The water flushing equipment shall be in addition, and separate from the grouting equipment; shall use a different power source than the grouting equipment; shall have sufficient capacity to flush out any partially grouted enclosures when blockage or breakdown of the grouting equipment occurs and shall be capable of developing a gage pressure of at least 250 psi.

The ingredients shall be added to the mixer in the following order: (1) water, (2) cement, (3) admixture. The ingredients shall be mixed sufficiently to produce a uniform, thoroughly blended grout with a minimum of air entrapped. Excessive temperature rises due to extended mixing shall be avoided. After mixing, the grout shall be passed through a strainer into pumping equipment which provides for recirculation. No additional water shall be added to the grout after mixing. No grout shall be used more than one-half hour after mixing.

The Engineer will perform tests on the grout as specified in the "Recommended Practices for Grouting" by the Prestressed Concrete Institute. The Engineer will provide equipment and perform the testing. The Contractor shall operate his equipment and provide sample as required.

Grouting operations shall not start before the post-tensioning operation is complete for the entire pier cap.

Unless otherwise noted on the plans, the grout shall be injected into the grout tubes from one end of the pier cap.

The valves on all outlet tubes (drain, vent and grout tubes) shall be closed except for the outlet tube closest to the grouting end of the conduit, which shall be open. The initial pump gage pressure shall be less than 40 psi. and shall gradually be increased until a steady stream of grout, free of air and diluted grout, flows from the outlet tube. The outlet tube shall be closed and simultaneously, the next outlet tube, in the direction of flow of grout, shall be opened.

This process shall be repeated for each of the outlet tubes until the grout tube at the far end of the conduit becomes an outlet tube. Pumping shall continue until the flow from the outlet tube becomes uniform and free from air and diluted grout.

At the completion of the grouting, all valves shall remain closed until the grout has cured, except that the grout tube at each end of the conduit and at the high points of the conduit, which shall remain opened during the curing of the grout.

An online device to limit the grout pumping gage pressure shall be set at a maximum of 150 psi. If the grout reaches the limiting pressure, the grouting operation shall be stopped and the grout flushed from the entire conduit. The grouting operation shall not resume until the restriction is located and corrected by the Contractor.

**Method of Measurement:**

This item will be measured for payment by the number of precast pier caps installed and accepted.

**Basis of Payment:**

Payment will be full compensation for the manufacturing, furnishing, and placement of each pier cap, including the post tensioning. All items required to assemble each pier cap into a precast

concrete pier per the plans, including labor, materials and equipment, shall be considered incidental to this item and will not be paid for separately.

The cost of furnishing and installing the reinforcement that projects up from the pier cap into the concrete keeper blocks shall be paid for separately under pay item “Construct Concrete Keeper Blocks”.

## **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 by hydro-demolition methods, and replacement with fast setting patching material 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 reinforcing bar wire ties and vertical supports on inadequately supported and/or vibrating reinforcing steel within deck patch areas, as ordered by the Engineer.

**Materials:** The materials shall conform to the following requirements:

1) Patching Material: The patching material shall be a concrete composed of a quick setting cement, fine aggregate, coarse aggregate and water. This concrete shall harden within 40 minutes, and develop minimum compressive strengths of 1,000 psi within one hour after set and 3,000 psi within three days.

The Contractor shall design and submit a quick setting mix to the engineer for approval. The mix proportions and method of application shall be in accordance with the manufacturer's recommendations. Sources of supply of all the materials shall be clearly indicated.

Fine aggregate shall conform to the requirements of Subarticle M.03.01-2.

The coarse aggregate shall conform to the requirements of Subarticle M.03.01-1. The required grading shall be obtained by using 100 percent of No. 67 size coarse aggregate. Grading of the aggregate shall conform to the gradation table of Article M.01.01.

Water shall conform to the requirements of Subarticle M.03.01-4.

Unless otherwise approved by the Engineer, the quick setting cement shall be one of the following materials:

### Cementitious Based Materials:

Emaco T-415  
Master Builders, Inc.  
23700 Chagrin Blvd.  
Cleveland, OH 44122  
800-628-7378

Perma-Patch  
Dayton Superior Corporation  
PO Box 355  
Oregon, IL 61061  
800-745-3707

Rapid Set DOT Cement

Speed Crete Green Line

CTS Cement Manufacturing  
1023 Dogwood Lane  
West Chester, PA 19382  
215-429-4956

Tamms Industries  
730 Casey Ave.  
Wilkes-Barre, PA 18702  
800-218-2667

Fastcrete  
Silpro Corporation  
2 New England Way  
Ayer, MA 01432  
508-772-4444

Note: Gypsum based materials will not be allowed.

2) Epoxy Resin: The epoxy resin shall be a two component system. The base polymer shall be a thermosetting resin of the epoxy type. The epoxy resin shall be composed of 100% reactive constituents, which are a condensation product of the reaction of epichlorohydrin with bisphenol ether of bisphenol A, containing no more than trace amounts of hydrolyzable chloride. The epoxy resin shall have an epoxide equivalent between 465 and 530.

The reacting system shall consist of a blend of condensation polymers of dimerized and trimerized unsaturated fatty acids and an aliphatic polyamine.

Unless otherwise specified, pigmentation shall be required in the system so that the cured coating shall conform to the Federal Color Standard 595, No. 16357.

a) Physical Requirements of (Mixed) Epoxy Resin System:

A mixture of both components in the proportions recommended by the manufacturer shall conform to the following requirements:

Viscosity - 500 to 800 centipoises at 77°F  
Pot life - 7 hours minimum at 75°F  
Minimum solids content - 48%

The cured system shall not exhibit amine blushing or sweating.

When testing for abrasion by ASTM Designation D968, the pigmented finish coats shall require a minimum of 50 liters of sand to abrade a one mil thickness of coating.

A 2 ½ mil dry film thickness of the coating tested according to ASTM Designation D522 shall pass a 1/8 inch diameter mandrel test without splitting the film or causing loss of bond.

b) Sampling:

A representative sample of each component sufficient for the test specified shall be taken by a Department representative either from a well-blended bulk lot prior to packaging or by withdrawing 3 fluid ounce samples from no less than 5 percent by random selection of the containers comprising the lot or shipment. Unless the samples of the same component taken from containers show evidence of variability, they may be blended into a single composite sample to represent that component. The entire lot of both components may be rejected if samples submitted for test fail to meet any requirements of this specification.

c) Packaging and Marking:

The two components of the epoxy resin system furnished under these specifications shall be supplied in separate containers, which are non-reactive with the materials contained therein. The size of the container shall be such that the recommended proportions of the final mixture can be obtained by combining one container of one component with one or more whole containers of the other component.

Containers shall be identified as base polymer and reacting system, and shall show the mixing directions and usable temperature range as defined by these specifications. Each container shall be marked with the name of the manufacturer, the lot or batch number, the date of packaging, pigmentation if any, and the quantity contained therein in pounds and gallons.

Printed instructions from the manufacturer for mixing and applying the material shall be included.

Potential hazards shall be so stated on the package in accordance with the Federal Hazardous Products Labeling Act.

d) Control of Materials:

A Materials Certificate will be required in accordance with Article 1.06.07, certifying the conformance of the epoxy resin to the requirements set forth in this specification.

**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 systems, 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.

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) Hydro-Demolition Water and Equipment: All hydro-demolition equipment should be capable of selectively removing spalled, delaminated or otherwise deteriorated concrete and cleaning the existing reinforcing steel of all rust and corrosion products by use of high-velocity water jets acting under continuous automatic control.

The hydro-demolition equipment shall consist of filtering and pumping units operating in conjunction with a remote-controlled robotics device

All hydro-demolition equipment shall be equipped with an angled and rotating water nozzle to prevent interference of the existing reinforcing steel with the removal of concrete.

The maximum allowable noise level caused by equipment used for the removal of deck concrete shall not exceed ninety (90) decibels on the "A" weighted scale, as measured at the nearest residence or occupied building. The Contractor shall demonstrate, to the satisfaction of the Engineer, that his equipment will meet this requirement before the use of such equipment will be allowed.

The make and model numbers of hydro-demolition equipment shall be submitted for approval by the Engineer. No hydro-demolition work shall be initiated until approval by the Engineer is granted.

The Contractor shall provide structurally adequate shields approved by the Engineer for protection of adjacent traffic lanes in the vicinity of the removal and cleanup operations.

Water used for the hydro-demolition shall be potable.

The Contractor is advised that the withdrawal of more than 50,000 gallons of water per day from a single source other than from a municipal water system shall require a diversion permit issued by the Department of Environmental Protection, Water Resources Unit, in accordance with the Connecticut Water Diversion Policy Act PA 84-402, CGS Sections 22a-365 through 22a-378.

3) Hammer Demolition and Hydro-Demolition Drainage Runoff Control: At least two weeks prior to the planned initiation of hydro-demolition operations, the Contractor shall submit to the Engineer for approval a comprehensive plan for the containment, filtration and disposal of hydro-demolition runoff water and concrete debris.

The plan shall ensure that all concrete debris and particulant matter will be removed from hydro-demolition runoff water prior to its release to the environment.

The plan shall include provision for the concurrent vacuuming of all runoff water at the immediate vicinity of the hydro-demolition operation. Runoff water shall be completely contained and vacuumed into a suitably sized water tight mobile tank for transport to a disposal site sedimentation basin approved by the Engineer.

Hydro-demolition operations shall proceed only with the simultaneous operation of a runoff water vacuum pickup in the immediate area of the hydro-demolition operation. Runoff water shall not be allowed to flow across adjacent travel lanes, across bridge joints nor through any existing bridge drainage system.

The size and location of the disposal site sedimentation basin shall be detailed in the containment, filtration and disposal plan. The sedimentation basin shall be properly sized so that uncontrolled overflow does not occur. At the conclusion of hydro-demolition operations, the sedimentation basin and all concrete debris shall be removed and the area restored to its original condition.

This plan shall include the following:

- a. Equipment
- b. Containment
- c. Filtration for Hydro-demolition runoff
- d. Location of Trail Areas
- e. Disposal of Hydro-demolition runoff and concrete debris disposal in conformance with the following specifications:
  - a. Section 1.10 Environmental Compliance of the Standard Specification.

The approval by the Engineer of the runoff containment, filtration and disposal plan shall in no way relieve the Contractor of any responsibility for its safe and effective performance.

4) Calibration and Testing of Hydro-Demolition Equipment: A trial area shall be designated by the Engineer to demonstrate that the equipment, personnel and methods of operation are capable of producing results satisfactory to the Engineer. The trial area shall consist of two patches, each of approximately 20 square feet, one area deteriorated and/or defective concrete and one area of “sound” concrete as determined by the Engineer.

Area of sound concrete is defined as: An area free from chemical defects, delamination, spalling, cracks, etc.

In the “sound area of concrete”, the equipment shall be programmed to remove concrete to a depth 1 inch  $\pm$  1/4 inch below the top reinforcing steel mat.

After completion of the above test area, the equipment shall be located over the deteriorated and/or defective concrete and using the same parameters for sound concrete removal, remove all deteriorated and/or defective concrete. If a satisfactory result is obtained, these parameters may be used as a basis for the production removal.

If, after calibrating the hydro-demolition equipment and beginning removal operations in a particular zone or area, insufficient removal of concrete is being obtained in the opinion of the Engineer, the Contractor shall recalibrate the hydro-demolition equipment for that zone or area to the satisfaction of the Engineer.

5) 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 powersaw 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 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 or hydro-demolition methods except under the following circumstances where pneumatic hammers may be used when approved by the Engineer:

- a) The removal of any remaining thin concrete ridges or “shadows” directly beneath reinforcing bars.
- b) When necessary to achieve required clearance around lap splices in the repair of deteriorated or damaged reinforcing steel.
- c) In areas inaccessible to hydro-demolition.

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 hydro-demolition shall be at least 1 inch below the top reinforcing steel mat 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.

Within one hour following the initiation of a hydro-demolition operation in any patch area, all loose concrete debris should be removed, followed by water flushing of the existing concrete bonding surface to completely remove all traces of concrete debris and cement residue so that rebonding to the surface of the remaining sound concrete will be prevented. If it is not convenient to clean and flush the patch area within this time framework, all steel reinforcing and concrete bonding surfaces shall be cleaned subsequently by high pressure water blasting at a nozzle pressure not less than 3,000 psi with a sufficient volume to completely remove all rebonded debris and laitance.

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 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.

6) 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 either sandblasted or water blasted, 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.

If the patch area was not cleaned and flushed with clean water immediately following hydro-demolition, or if run-off from a nearby hydro-demolition operation was allowed to travel through the previously cleaned and flushed patch surface, all affected concrete and steel reinforcing bonding surfaces shall be water blast cleaned at a nozzle pressure not less than 3,000 psi as directed by the Engineer, to assure that all remaining bond inhibiting laitance is completely removed.

The entire concrete surface to be patched shall be dampened. All free water shall be removed from the patch area.

7) 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.

8) Tolerances in Finished Patched 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.

9) 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.

10) 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 1800 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 and equipment shall conform to ASTM C39.

Note: This compression machine must be calibrated in accordance with the provisions of Section 5, ASTM C39.

11) Time Schedule: Work under this item begun on any specific bridge during a construction season shall be completed, at least, to include this item, membrane waterproofing and placing of first course of 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 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 number of cubic feet of patching material used in acceptable concrete deck patches, except where the Engineer determines that the Contractor has unnecessarily removed sound concrete. Where sound concrete has been unnecessarily removed, the replacement concrete 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 reinforcing bar wire ties and vertical supports for inadequately supported existing reinforcing steel, all materials, equipment, including the portable compression testing machine required for the testing of the repair material, tools, labor, inspection access and work incidental thereto.

Pay Item

Partial Depth Patch

Pay Unit

C.F.

## **ITEM #0601548A – CONCRETE PEDESTALS**

Work under this item shall conform to the pertinent requirements of Section 6.01 supplemented and amended as follows:

**Description:** is supplemented by the following:

This item consists of furnishing and placing high performance concrete for the pedestals located on the piers and abutments of Bridge No. 02368A (Site No. 4), including all necessary materials and equipment to complete the work, and the design of the concrete mix. Special care as specified below shall be taken in the finishing of high performance concrete. The inclusion of microsilica and low water/cement ratio decreases bleeding rates and may cause faster set times. High performance concrete shall be finished as soon as possible after placement and during finishing particular measures shall be taken to prevent water loss from the surface of the concrete. These include: (1) strict adherence to specifications regarding evaporation rates and cessation of concrete placement if relative humidity is low and temperature and wind speed are high; (2) expediting finishing of concrete and use of fog sprays during finishing; (3) use of evaporation retarding agents during and immediately after finishing; and (4) initiation of wet curing as soon as possible after finishing. The Contractor is encouraged to work closely with the microsilica manufacturer or their technical representative in developing their finishing techniques.

### **Materials:**

Materials from this work shall conform to the requirements of Article M.03.01 amended as follows:

Concrete: The concrete shall consist of a homogeneous mixture of Portland cement, fly ash, microsilica, fine and coarse aggregate, air entraining agent, admixtures and water. The air-entraining features shall be obtained by the use of an approved air-entraining admixture.

The consistency shall be determined by the AASHTO Method T119. A uniform consistency shall be continuously maintained. The slump shall be of 5" to 7". Slumps greater than indicated may be used only when approved by the Engineer.

The Contractor shall submit a concrete mix design for approval by the Engineer.

The mix design shall generally conform to the following requirements:

28-day Minimum Compressive Strength	(5 ksi) (required minimum)
Water/Cementitious Material Ratio	0.40 (maximum)

Fly Ash	Used to replace approximately 20% of the cement by weight
Microsilica	Used to replace approximately 6% of the cement by weight
Entrained Air Content	5-8% by volume
Coarse Aggregate	Utilize a nominal maximum size of No. 6 aggregate
Calcium Chloride	Not Permitted

The mix design submitted for Engineer's approval shall contain the following information:

- Compressive Strength
- Amount of Cement (including pozzolan additives)
- Amount of Coarse Aggregate
- Air Content
- Water/Cement Ratio
- Chemical Additives (types, brand name, dosage ranges)
- Laboratory Test Results (Strength, Air Content, W/C ratio, Slump, Coarse Aggregate Gradation)

Water-Reducing Admixture: The microsilica admixture shall be in accordance with ASTM C 1240 and approved by the Department. Only one brand shall be allowed for any structural element. The manufacturer shall provide written certification that the supplied material meets the requirements of the specification.

If the microsilica admixture is supplied in the slurry form, the slurry shall be maintained in storage above the temperature of 32° F. Slurries exposed to temperatures of 32° F or less shall be removed and replaced at no cost to the Department. The slurry shall be homogeneous and agitated as necessary to prevent separation. The slurry shall be added using proportioning equipment approved by the Engineer.

If the microsilica admixture is supplied in the densified powder form, the mass of the densified powder shall be measured cumulatively with the cement and fly ash. The densified powder shall be last in the measuring sequence and the tolerance for each material draw mass shall be based

upon the total mass of cement plus fly ash plus densified powder. The batching tolerance for the cement plus fly ash plus densified powder shall be  $\pm 1/2\%$  by mass.

**Special Mixing Requirements for Densified Microsilica:** Densified microsilica requires enhanced mixing to ensure full dispersion. Mix requirements shall conform to the recommendations of the microsilica manufacturer.

**Construction Methods:** is amended and supplemented by the following:

**Cylinders for Compressive Strength Testing:** The concrete necessary to cast cylinders for compressive-strength determinations shall be furnished by the Contractor from each pour. The necessary personnel and forms for casting these specimens will be furnished by the Department and the number of specimens required will be specified by the Engineer.

The concrete shall be vibrated. Both internal and external vibration shall be used when ordered by the Engineer. The vibrating shall be performed with care in such a manner as to avoid displacement of reinforcing steel or other components. Concrete shall be carefully placed in the forms and vibrated sufficiently to produce a surface free from imperfections such as honeycomb, segregation, cracking or checking.

Any deficiency such as honeycomb or segregation may be cause for rejection.

The Contractor shall submit procedures to demonstrate compliance with ACI 308 "Standard Practice for Curing Concrete", ACI 306 "Standard Practice for Cold Weather Concreting", and ACI 305 "Hot Weather Concreting".

During finishing, the evaporation rate shall not exceed 0.1 lb. per square foot of exposed concrete per hour. Possible procedures may include cooling ingredients prior to mixing, use of temporary windbreaks, sun shades, and fog nozzles.

The concrete for each pour sequence shall be kept constantly moist and protected against any drying action and cured for no less than seven (7) days after the placing of the concrete. Curing shall be accomplished in the following manner:

**Fog Spray:**

Curing of the concrete shall begin by the application of a water fog spray immediately after the initial set. Fog spray shall continue until such time as the moist cotton mats are placed. The amount of fog spray shall be strictly controlled so that accumulations of standing or flowing water on the surface of the concrete shall not occur. There shall be a sufficient amount of spray to keep up with the placing operations.

Should atmospheric conditions render the use of fog spray impractical, the Contractor shall use plastic covers of suitable thickness and securely fastened down, but not directly in contact with the concrete. The covers shall be used only until the initial set has taken place, whereupon moist cotton mats shall be placed immediately thereafter and kept wet for the duration of the curing period.

On the windward side of the pedestal being cured, the Contractor shall erect barriers of suitable height, when necessary, to protect the curing concrete from the direct force of the wind.

**Moist Curing:**

When the concrete has set sufficiently, moist curing shall be substituted for the fog spray.

Cotton mats shall be prewetted and ready to place on the newly finished concrete surface as soon as placement, consolidation, and finishing of concrete are complete. The time between initial exposure of the finished concrete to the environment and the application of soaked mats shall not exceed 10 minutes. The mats shall then be covered with plastic sheeting to prevent evaporation of the curing water. Additional curing water shall be applied through soaker hoses running under the protective plastic sheeting so that the mats are kept constantly wet throughout the period of cure.

**Method of Measurement:** is supplemented with the following:

This work will be measured for payment by the actual number of concrete pedestals, of high performance concrete, completed and accepted in place, in accordance with the plans or as ordered by the Engineer.

**Basis of Payment:** is supplemented with the following:

Payment for this work will be made at the contract unit price each for "Concrete Pedestals", complete in place, which price shall include all materials, equipment, tools, labor and work incidental thereto, including heating and cooling, curing and all admixtures.

**ITEM #0601788A – STAIN PROTECTION (SITE NO. 4)**

**Description:** Work under this item shall consist of furnishing and installing catchments as shown on the plans; furnishing, installing and maintaining temporary coverings required to protect surface of abutments, piers, and other areas from rust staining, and the removal of rust stains as directed by the Engineer.

**Materials:** Fiberglass reinforced plastic shall be used in the manufacture of the catchments. The resin, monomer, catalyst, filler, pigment and other additives in the resin mix shall produce a general purpose polyester resin resulting in a product meeting the requirements listed below when reinforced with fiberglass in a form suitable for the purpose.

The epoxy glaze used with fiberglass catchments shall be manufactured for use with fiberglass and concrete.

The silicone rubber sealant used with the fiberglass catchments shall be clear and manufactured for use with fiberglass and concrete.

Temporary covering of reinforced polyethylene film shall be used in areas requiring temporary protection from staining. The film shall have a minimum thickness of 4 mils. Tie wires and attachment devices used to hold and fasten the temporary coverings in place shall be manufactured from non-staining material.

Rust stain remover shall effectively remove rust stains and shall not harm or discolor concrete, steel or other materials with which it may come in contact.

**Construction Methods:**

Shop Drawings: before fabricating any materials, 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: complete details of the methods and materials to be used in the manufacture of catchments. Such details shall give complete specification for the material and procedures to be used in the fabricating operation.

The catchments shall be manufactured by either the hand lay-up or spray-up process. Nominal thickness shall be three-sixteenths (3/16"). The interior surface shall be gel coated. Reinforcement content shall be determined by the strength requirements for each unit. Corners and edges shall be rounded. The color and shade of the catchments shall be compatible with weathered steel and shall be as approved by the Engineer. The final fabricated unit shall present a neat appearance.

The manufacturer shall furnish notarized certification that the catchment materials will be identical to those which have exhibited a useful performance life after installation of at least five (5) years.

The catchments shall be installed at the time of the structural steel erection and bearing installation.

Catchments shall be sloped to allow proper drainage. Shim as necessary with neoprene strips.

All materials shall be fabricated and installed in a workmanlike manner. Catchments damaged or otherwise made inoperative before the structure is completed and accepted shall be replaced, or repaired at the Contractor's expense.

Temporary covering shall be installed where shown on the plans or as directed by the Engineer, and shall be securely fastened into place by tie wires or attachment devices at all times. Damaged coverings shall be repaired immediately. The installation of the temporary coverings shall be approved by the engineer prior to erection of any structural steel and shall not be removed until after all deck joints in the superstructure have been complete or sealed as shown on the plans.

All staining or discoloration shall be removed from the concrete in a workmanlike manner to the satisfaction of the Engineer.

**Method of Measurement:** This work, being paid for on a lump sum basis, will not be measured for payment.

**Basis of Payment:** This work will be paid for at the contract lump sum price for "Stain Protection (Site No. 4)", which price shall include all materials, equipment, tools and labor incidental thereto.

## **ITEM #0601923A – SAWCUTTING CONCRETE**

**Description:** This item shall consist of vertically saw cutting the outside surfaces of reinforced concrete wingwall stems and backwalls where indicated in the Plans and as directed by the Engineer.

**Materials:** None required under this item

### **Construction Methods:**

Prior to the saw cutting the Contractor shall mark in the field the exact locations of the saw cutting. The locations will be reviewed and accepted by the Engineer prior to doing the work.

The saw cutting shall extend through the entire thickness of the wingwall/backwall stem.

All saw cutting shall be as straight as possible with absolutely minimal breakage or damage to portions of concrete that are to remain. The Contractor may elect to also saw cut the inside surfaces of wingwall/backwall stems; however, care shall be taken to insure that that the inside and outside cut lines will be aligned within ¼” of each other.

The footing, and any other portions of the substructure that are to remain, shall not be damaged by the saw cutting operations. Areas of concrete adjacent to the footing that cannot be removed by saw cutting shall be removed in a manner acceptable to the Engineer at no extra cost to the State.

**Method of Measurement:** This work will be measured for payment by the actual number of linear feet of outside surfaces of existing wingwall and backwall stems that are saw cut and accepted. Optional saw cutting of inside surfaces of wingwall/backwall stems will not be measured for payment.

**Basis of Payment:** This work will be paid for at the contract unit price for "Sawcutting Concrete", which price shall include all equipment, tools and labor incidental thereto.

**ITEM #0602865A - # 5 MECHANICAL COUPLERS**

**ITEM #0602867A - #6 MECHANICAL COUPLERS**

**ITEM #0602871A - #10 MECHANICAL COUPLERS**

Work under this item shall comply with Section 6.02 of the Standard Specifications, modified as follows:

**Article 6.02.03 – Construction Methods:** Add the following to section 5 – Splicing of Bars:

Reinforcing steel shall be spliced using mechanical couplers where noted on the Contract plans. Mechanical couplers shall be mechanical butt splice type and shall be installed in accordance with the manufacturer’s recommendations. The outside diameter of mechanical couplers shall be limited to 2.5 times the diameter of the largest bar being joined by the coupler. Set screw type couplers shall be installed with the screws alignment away from the face of concrete in areas where required concrete cover would otherwise be reduced.

**Article 6.02.04 – Method of Measurement:** Add the following:

This work will be measured for payment by the number of mechanical couplers, of the type specified, installed and accepted at the required locations.

**Article 6.02.05 - Basis of Payment:** Add the following:

Work under this item shall be paid for at the contract unit price each for “#5 Mechanical Couplers”, “#6 Mechanical Couplers”, or “#10 Mechanical Couplers”, which price shall include furnishing and installing mechanical couplers and all materials, equipment, tools and labor incidental thereto. Where the plans identify the need for epoxy coated couplers, such coating shall also be included.

## **ITEM #0602910A - DRILLING HOLES AND GROUTING DOWELS**

**06.02.01 - Description:** Work under this item shall consist of drilling holes and grouting bars 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.

**06.02.02 - Materials:** The chemical anchor material shall be a resin compound specially formulated to anchor steel bars in holes drilled into concrete for the purpose of resisting tension pull-out. The chemical anchor material shall conform to Subarticle M.03.01-15 of the Standard Specifications and be selected from the Department's Qualified Products List.

**06.02.03 - Construction Methods:** Before fabricating any materials, the Contractor shall submit the manufacturer's specifications and installation for the chemical anchoring material to the Engineer for review in accordance with Article 1.05.02. This shall include, but not be limited, to the type of drill, diameter of bit, method of cleaning holes and method of placement of the chemical anchoring material.

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 bars are encountered during the drilling operation, the hole shall be relocated to clear the existing reinforcing as directed by the Engineer. Uncompleted holes shall be filled with the chemical anchor material and finished smooth to the contour of the surrounding concrete surface. Care shall be taken not to damage exposed reinforcing bars.

Each hole shall be drilled. 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.

Due precaution shall be taken to ensure that drilling methods do not cause spalling, cracking, or other damage to the existing concrete. The weight of the drill shall not exceed 20 pounds unless otherwise noted in the plans. 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 traffic. 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.

**06.02.04 - Method of Measurement:** This work will be measured for payment by the actual number of drilled holes in which dowels are embedded and accepted.

**06.02.05 - 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.

Pay Item

Drilling Holes and Grouting Dowels

Pay Unit

EA

## **ITEM #0602971A – DEBRIS SHIELD**

Work under this item shall conform to the requirements of Section 9.71 supplemented and amended as follows:

**Article 5.03.01 – Description:** Add the following:

**Description:** Work under this item shall consist of the means and methods for safe removal and satisfactory disposal of the superstructure components including the deck, parapets, and haunches. The Contractor shall design, furnish and install protective shielding on the underside of the bridge to prevent unexpected fall of debris.

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. The debris shield shall not be installed at an elevation lower than the posted clearance height of 14'-9".

**Construction Methods:** 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 the "Maintenance and Protection of Traffic" special provision and the "Prosecution and Progress", contained elsewhere in these Specifications.

The debris shield shall not result in damage to any permanent construction (new or existing) or to adjoining property. If any damage does occur 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 working drawings, computations, and written procedures for the debris shield to the Engineer for review. Acceptance of the Contractor's plans shall not be considered as relieving the Contractor of any responsibility.

**Method of Measurement:** This work, being paid for on a lump sum basis, will not be measured for payment.

**Basis of Payment:** This work will be paid for at the contract lump sum price for "Debris Shield", which price shall include the safe removal and satisfactory disposal of the superstructure components, the design, installation and removal of the debris shield, and all equipment, tools and labor incidental thereto.

Pay Item  
Removal of Superstructure

Pay Unit  
L.S.

ITEM #0602971A

## **ITEM #0603064A – STRUCTURAL STEEL (SITE NO. 4)**

**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 #0603468A – TEMPORARY SLAB SUPPORT (SITE NO. 2)**

**Description:** Work under this item shall consist of the design, fabrication, installation, and removal of temporary slab supports as shown on the plans, as directed by the Engineer, and in accordance with these specifications.

**Materials:** Materials for this work shall be of satisfactory quality for the purpose intended and shall be approved by the Engineer prior to their use. Timber, aluminum, steel or other material intended for use in the temporary slab supports shall be sound and capable of safely carrying the specified loads.

**Construction Methods:** The temporary slab support shall be constructed along the full length of the deck slab at the link slab. Installation of the temporary slab support shall be complete in place to the satisfaction of the Engineer prior to sawcutting and removal of concrete deck slab.

The temporary slab support shall be designed in accordance with the applicable provisions of the AASHTO LRFD Bridge Design Specifications, Customary U.S. Units, 6th Edition, including 2013 Interim Revisions, the requirements shown on the plans, and the following:

Design Live Load: Temporary slab support shall be designed for HL-93 live loading including a dynamic loading allowance as described in AASHTO Section 3.

Concrete Barrier Loading: Temporary slab support shall be capable of resisting the TL-2 design forces for traffic railings as described in AASHTO Section 13.

Lateral bending of the girder bottom flange to which the temporary slab support is attached shall also be evaluated and addressed if applicable, dependent on the support geometry and design.

The Contractor shall take all necessary field measurements for proper installation of the temporary slab support.

The temporary slab support shall not adversely impact the existing or proposed superstructure such that it can no longer safely carry traffic.

The Contractor shall prepare and submit working drawings and calculations for the Temporary Slab Support for the review of the Engineer. Drawings and calculations shall address the design of the temporary slab support, any proposed loadings on and affects resulting to the existing or proposed bridge structures due to temporary slab support and its design loadings. Working drawings and calculations shall be prepared by, and signed and sealed by a licensed Professional Engineer in the State of Connecticut. Preparation and submittal of working drawings shall conform to the requirements of Section 1.05.02-2. An installation plan shall be submitted including the design of the temporary slab support system and identification of areas that may require localized paint removal and touch up painting due to the installation of the temporary slab support system. Fabrication of the temporary slab support shall not begin until the working drawings have been reviewed and all comments have been addressed to the satisfaction of the Engineer.

Any structural steel to be specifically fabricated for the supports shall be fabricated in accordance with Subarticles 6.03.03-5 and 13. Steel shall be delivered, stored, erected and assembled in accordance with Subarticles 6.03.03-10, 11, 13 and 17. The field assembly of bolted connections shall conform to Subarticle 6.03.03-19. The surface preparation and welding details, procedures, and testing methods shall conform to the ANSI/AASHTO/AWS D1.5-95 Bridge Welding Code as supplemented by the Connecticut Department of Transportation Steel Construction Manual and Subarticles 6.03.03-6 and 6.03.03-21. Welding to the tension flanges shall not be permitted. Welding adjacent to the fillets of the girders shall be avoided.

The Contractor shall maintain the slab supports until their removal. Any materials that have become worn or damaged shall be repaired or replaced by the Contractor.

The Contractor shall remove and dispose of the temporary supports when they are no longer required. All material shall remain the property of the Contractor.

As directed by the Engineer, the Contractor shall take adequate precaution to prevent damage to any portion of the permanent structure or property below. Damages that may occur shall be repaired as directed by the Engineer. All costs shall be borne by the Contractor.

The Contractor shall completely coordinate his operations, including lane closures on I-84, and local road lane closures and/or detours, with the Department, the City and all applicable utilities and agencies.

All work shall be performed in accordance with the special provisions "Maintenance and Protection of Traffic" and "Prosecution and Progress". The coordination of the work is the responsibility of the Contractor.

The temporary slab support shall be fully removed once the supporting deck has been removed and the support is no longer required.

**Method of Measurement:** This item, being paid for on a lump sum basis will not be measured for payment.

**Basis of Payment:** This work will be paid for at the contract lump sum price for "Temporary Slab Support" complete in place, which price shall include the design, fabrication, installation, and removal of the temporary slab supports, including all materials, tools, equipment and labor incidental thereto. A schedule of values for payment shall be submitted to the Department for review and comment prior to payment.

Pay Item  
Temporary Slab Support

Pay Unit  
L.S.

ITEM #0603468A

## **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 affected 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

Carbomastic 90  
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

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 times 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 will not be permitted. Abrasive blast cleaning is permitted in conjunction with a negative air containment system.

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 cloths 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 manufacturer’s 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 dew point 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 square foot 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 #0702081A– BITUMINOUS COATING FOR STEEL PILES**

**Description:** Work under this item shall consist of furnishing and applying bituminous coating to steel piles. This work shall be performed as hereinafter specified, to the dimensions indicated on the plans, or as directed by the Engineer. This work shall also include field applied touch ups to coating damaged during shipping and handling.

**Materials:** Provide bituminous coating for all piles. Bituminous coating shall consist of canal liner bituminous in accordance with ASTM D 2521. It shall have a softening point of 190°F to 200°F a penetration of 56 to 61 at 77°F and a ductility in excess of 1.38 in. at 77°F. Primer shall be in accordance with AASHTO M 116.

### **Construction Methods:**

- A. All surfaces to be coated with bituminous shall be dry and thoroughly cleaned of dust and loose materials.
- B. Primer or bituminous shall not be applied in wet weather, nor when the ambient temperature is below 65°F.
- C. Application of the prime coat shall be with a brush or other approved means and in a manner which thoroughly coats the surface of the piling with a continuous film of primer. The primer shall have set thoroughly before the bituminous coating is applied. The bituminous shall be heated to 300°F and applied at a temperature between 200° and 300°F by means of one or more mop coats or other approved means.
- D. The average coating thickness shall be 1/16”.
- E. Whitewashing of the coating may be required during hot weather as directed to prevent running or sagging of the asphalt coating prior to driving of the pile.
- F. Bituminous coated piles shall be protected from sunlight or heat immediately after the coating is applied.
- G. The bituminous coating shall not be exposed to damage or contamination during storage, hauling, or handling. Once the bituminous coating has been applied, dragging the piles on the ground or the use of cable wraps around the piles during handling will not be permitted. Pad eyes, or other suitable devices, shall be attached to the piles to be used for lifting and handling.
- H. Where Field splices are required the bituminous coating shall be removed in the splice area. After completing the field splice, the splice area shall be brush coated or mop coated with a minimum of one coat of bituminous material as directed.

**Method of Measurement:** Bituminous coating will be measured per linear foot of pile coated.

**Basis of Payment:** Payment shall be made at the contract unit price per linear foot of pile coated. This price shall be full compensation for furnishing all materials, for preparing and placing these materials, and for all labor, equipment tools, and incidentals necessary to complete

**ITEM #0702109A – PRE-AUGERING OF PILES****ITEM #0702111A – DRIVING STEEL PILES**

Work under this item shall conform to the requirements of Section 7.02 of Form 816 as replaced by the special provision for Section 7.02 in this contract, amended as follows:

**7.02.01 - Description:** Add the following:

Work under this Item includes pre-augering for piles as indicated on the Plans or as ordered by the Engineer.

**7.02.03.2(a) - Construction Methods – Pile Driving Equipment – Hammers:** Replace the second paragraph with the following:

The size of hammer shall be adapted to the type and size of piles and the driving conditions. Unless otherwise specified, the minimum rated striking energy per blow for hammers used shall be 26,000-foot pounds (35,000 joules) for driving steel piles. The hammer model used for the driving of test piles shall be used for the driving of service or production piles, unless a change is authorized by the Engineer in writing. Hammers delivering an energy which the Engineer considers detrimental to the piles shall not be used.

**7.02.03.2(7) - Construction Methods – Pile Driving Equipment – Pre-Augering:** Add the following:

The following apply when pre-auguring is done for piles with bituminous coating:

The pre-augered hole is to continue to the top of the clay layer or to the depths shown on the plans or as directed by the Engineer. The pre-augered hole diameter shall be at least the diagonal dimension of the pile, or as directed by the Engineer. All obstructions which could interfere with the driving of piles within the depth of pre-augering are to be removed as part of the pre-auguring work.

The Contractor shall provide temporary casing to maintain the pre-augured dimension of the hole. Upon completion of pile driving, the annulus between the pile and outer hole diameter shall be filled with clean sand and any temporary casing will be removed.

**7.02.05.11 - Basis of Payment – Pre-Augering of Piles:** Add the following:

This work shall also include obstruction removal, casing, and sand backfill

**ITEM #0707009A – MEMBRANE WATERPROOFING (COLD LIQUID ELASTOMERIC)**

**7.07.01 - Description:** Work under this section includes furnishing and installation of a seamless elastomeric waterproofing membrane system to the concrete deck as shown on the plans, in accordance with this specification and as directed by the Engineer.

The completed membrane system shall be comprised of three separate layers at a minimum total thickness of 0.120 inch resulting from two equal spray applications over a primer.

**7.07.02 - Materials:**

The membrane waterproofing system shall be one of the following or approved equal:

1. Eliminator  
Manufacturer: Stirling Lloyd Products, Inc.  
152 Rockwell Road, Building A Newington, CT 06111  
Tel: 860-666-5008
  
2. Bridge Deck Membrane System  
Manufacturer: Bridge Preservation, LLC  
87 Shawnee Ave.  
Kansas City, Kansas 66105  
Tel: 913-321-9006

The membrane system shall meet the following requirements set forth in this specification:

1. Primer

The primer shall be a 100% reactive, acrylic based, two component, spray applied resin capable of full cure in 40 minutes at 200C (680F).

2. Membrane

The membrane shall be 100% solvent free reactive, acrylic based, two component, spray-applied material.

The membrane shall meet or exceed the following properties as related to laboratory prepared samples tested at 68 degrees F and 24 hour cure where applicable:

<u>PROPERTY</u>	<u>TEST METHOD</u>	<u>UNITS</u>
Gel Time		6-11 minutes
Cure Time		30 minutes
Water Vapor Transmission	ASTM E96	0.3 Perms or less
Adhesion	ASTM D4541	100 psi or failure in Concrete
Minimum Tensile Strength	ASTM D638, Method A, Die C	940 psi
Minimum Elongation at Break	ASTM D638, Method A, Die C	80%
Crack Bridging	ASTM C836	Pass @ 24 cycles, 0.0625 inch -15 degrees F
Ballast Impact	SNCF Test Method	No Damage

Materials Certificate: The Contractor shall submit to the Engineer a Materials Certificate for the primer and membrane in accordance with the requirements of Article 1.06.07.

### **7.07.03 - Construction Methods:**

A Manufacturer's representative shall be present on-site immediately prior to and during application of the membrane. The representative shall inspect and approve the surface prior to priming, the handling, mixing and addition of components and application of the primer and membrane. The representative shall remain on-site until the membrane has fully cured.

The system shall be applied to the prepared area(s) as defined in the plans strictly in accordance with the Manufacturer's recommendations.

#### 1) Job Conditions

##### A. Environmental Requirements

Application can proceed while air and substrate temperatures are between 32 degrees F and 104 degrees F providing the substrate is above the dew point. Outside of this range, the Manufacturer shall be consulted.

The Applicator shall be provided with adequate disposal facilities for non-hazardous waste generated during installation of the System. The applicator shall follow safety instructions regarding respirators and safety equipment.

#### B. Safety Requirements

All open flames and spark producing equipment shall be removed from the work area prior to commencement of application.

“No Smoking” signs shall be visibly posted at the job site during application of the membrane waterproofing.

Non-related personnel in the work area shall be kept to a minimum.

### 2) Delivery, Storage and Handling

#### A. Packaging and Shipping

All components of the System shall be delivered to the site in the Manufacturer’s packaging, clearly identified with the products type and batch number.

#### B. Storage and Protection

The Applicator shall be provided with a storage area for all components. The area shall be cool, dry and out of direct sunlight and in accordance with the Manufacturer’s recommendations and relevant health and safety regulations.

Copies of Material Safety Data Sheets (MSDS) for all components shall be kept on site for review by the Engineer or other personnel.

#### C. Shelf Life - Membrane Components

Packaging of all membrane components shall include a shelf life date sealed by the Manufacturer. No membrane components whose shelf life has expired shall be used.

### 3) Inspection

Prior to priming of the surface, the Engineer, Applicator and Manufacturer’s representative shall inspect and approve the prepared substrate.

Random tests for adequate tensile bond strength shall be conducted on the substrate by the Applicator at the job site using an Elcometer Adhesion Tester in accordance with the requirements of ASTM D4541. The minimum test frequency shall be one per 5,000 square feet, but no less than three adhesion tests per bridge.

Adequate surface preparation will be indicated by tensile bond strengths of primer to the substrate greater than or equal to 100 psi or failure in the concrete.

If the tensile bond strength is lower than the minimum specified, the Engineer may request additional substrate preparation. Any primer not adequately applied will be removed and a new application effected at the Contractor's expense as directed by Engineer.

Cracks and joints shall be treated in accordance with the Manufacturer's recommendations as approved or directed by the Engineer.

#### 4) Preparation

##### A. Protection

The Applicator shall be responsible for the protection of equipment and adjacent areas from over spray or other contamination. Parapets and bridge joints shall be masked prior to application of the materials.

##### B. Surface Preparation

The concrete deck shall have cured for a minimum of seven days in accordance with applicable provisions of Section 6.01.03 of the Standard Specifications.

Surfaces shall be free of oil, grease, curing compounds, loose particles, moss, algae, growth, laitance, friable matter, dirt, bituminous products, and previous waterproofing materials. If required, degreasing shall be performed via detergent washing in accordance with ASTM D4258.

The surface shall be abrasively cleaned in accordance with ASTM D4259 to provide a sound substrate free from laitance.

The substrate shall be inspected after excavation and all spalls repaired prior to placement of the prime coat. Spalls shall be repaired with rapid cure concrete patch materials per the Engineer's and Manufacturer's recommendations.

Voids and blow holes on vertical surfaces shall be repaired in the same manner. The surface profile of prepared substrate is not to exceed 1/4 inch (peak to valley) and areas of minor surface deterioration of 1/2 inch and greater in depth shall also be repaired. The extent and location of then surface patches shall require the approval of the Engineer before the System is applied.

There shall be no visible moisture present on the surface at the time of the application of the System. Compressed oil-free air and/or a light passing of a propane torch may be used to dry the substrate.

All steel components to receive membrane waterproofing shall be blast cleaned in accordance with SSPC SP6 and coated with the membrane waterproofing system within the same work shift.

5. Application

A. The Contractor shall retain an Applicator who is fully trained and licensed by the membrane manufacturer who has successfully completed at least three spray membrane projects in the past 5 years. The Contractor shall furnish the Engineer with a list of references including contact persons along with addresses and phone numbers of persons who supervised these projects. This information shall be submitted to the Engineer prior to the start of construction. The Engineer shall have sole authority to determine the adequacy and compliance of the submitted information. Inadequate proof of ability to perform the work will be grounds to reject proposed applicators.

B. The System shall be applied in three distinct steps as listed below:

- Substrate preparation
- Priming
- Membrane application

C. Immediately prior to the application of any components of the System, the surface shall be dry and any remaining dust or loose particles shall be removed using clean, dry oil free compressed air or industrial vacuum.

D. Where the area to be treated is bound by a vertical surface (e.g. curb or wall), the System may be continued up the vertical as necessary.

E. The handling, mixing and addition of components shall be performed in a safe manner to achieve the desired results in accordance with the Manufacturer's recommendations or as approved or directed by the Engineer.

F. A neat finish with well-defined boundaries and straight edges shall be provided by the Applicator.

G. Primer

The primer shall consist of one coat with an overall coverage rate of 125-175 square feet per gallon unless otherwise recommended in the manufacturer's written instructions.

All components shall be measured and mixed in accordance with the Manufacturer's recommendations.

The primer shall be spray applied using a single component spray system approved for use by the Manufacturer. If required by site conditions, brush or roller application shall be allowed.

The primer shall be allowed to cure tack-free for a minimum of 30 minutes or as required by the Manufacturer's instructions, whichever time is greater, prior to application of the first lift of waterproofing membrane.

Porous concrete (brick) may require a second coat of primer should the first coat be absorbed.

#### H. Membrane

The waterproofing membrane shall consist of two coats with a film thickness of 60 mils per coat and a total of 120 mils to achieve an overall coverage rate of 13.0 square feet per gallon. The waterproofing membrane shall consist of two coats of contrasting colors to aid in quality assurance and inspection.

The membrane shall be comprised of two liquid Components A and B and a hardener powder which is to be added to Component B in accordance with the Manufacturer's recommendations.

The substrate shall be coated in a methodical manner. Checks for wet film thickness shall be carried out typically once every 100 square feet, where product gel time allows.

#### I. Repairs

If an area is left untreated or the membrane becomes damaged, a patch repair shall be carried out to restore the integrity of the system. The damaged areas shall be cut back to sound materials and wiped with solvent (e.g. acetone) up to a width of at least 4 inches on the periphery, removing any contaminants unless otherwise recommended by the manufacturer. The substrate shall be primed as necessary, followed by the membrane. A continuous layer shall be obtained over the substrate with a 4 inches overlap onto existing membrane.

Where the membrane is to be joined to existing cured material, the new application shall overlap the existing one by at least 4 inches. Cleaning and surface preparation on areas to be lapped shall be as recommended in the manufacturer's written instructions.

#### J. Application of Tack Coat

- 1) A polymer-modified bitumen hot melt adhesive bond tack coat shall be provided by the waterproof membrane Manufacturer and be fully compatible with the liquid membrane. The tack coat shall be applied as per the Manufacturer's recommendations with all the guidelines regarding surfacing strictly adhered to.
- 2) The membrane to be coated shall be clean and free from loose debris, moisture, or other contaminants. Oil, diesel fuel, or grease shall be removed with solvent approved by the Manufacturer.

#### 6. Field Quality Control

The following tests shall be conducted by the Applicator or Manufacturer's representative and recorded on a form to be submitted to the Engineer. The testing equipment shall be furnished by the Contractor.

Temperature: Air, substrate temperatures and dew point.

Adhesion Tests: Adhesion tests of the cured membrane to the substrate shall be checked as per Section 3.

Membrane Thickness: Wet film thickness shall be checked every 100 square feet using a gauge pin or standard comb type thickness gauge during application where membrane gel time permits. Ultrasonic testing, calibrated point-penetrating (destructive) testing, or other methods approved by the Engineer, shall be employed for determination of dry film thickness in the event that rapid set time of the membrane does not allow for the use of wet film thickness testing methods. Repair of the membrane system following destructive testing shall be in accordance with the manufacturer's recommendations.

Coverage Rates: Rates for all layers shall be monitored by checking quantity of material used against the area covered.

#### 7. Final Review

The Engineer and the Applicator shall jointly review the area(s) over which the completed System has been installed. Any irregularities or other items that do not meet the requirements of the Engineer shall be addressed at this time.

#### **7.07.04 - Method of Measurement:**

The quantity to be paid for under this item shall be the number of square yards of waterproofed surface completed and accepted.

**7.07.05 - Basis of Payment:**

This item will be paid for at the contract unit price per square yard of “Membrane Waterproofing (Cold Liquid Elastomeric)”, complete in place, which price shall include all surface preparation, furnishing and applying the system, quality control tests, and any necessary repairs and remediation work as well as all materials, equipment, tools, labor incidental to this work.

Pay Item

Membrane Waterproofing  
(Cold Liquid Elastomeric)

Pay Unit

S.Y.

**ITEM #0707200A – GEOGRID****Description:**

This work shall consist of furnishing, installing, and removing temporary geocell walls at the locations indicated in the plans. The Plans indicate approximate lengths of the geocell walls. The height of the walls shall be determined by the Contractor to fit the field conditions and to improve the size of his working areas. The geocell walls shall be high-density polyethylene, black, green or tan color, hexagonal or diamond type, perforated three-dimensional geocellular confinement system, including anchoring systems and in accordance with these specifications, as shown on the plans or as directed by the Engineer.

**Materials:**

The geocell product shall be constructed of UV protected high density polyethylene. Its structure shall be dimensionally stable and able to retain its geometry under manufacture, transport and installation. The polymer shall meet the requirements of all test methods and standards per the manufacturer and in conformance of Section 1.06. Materials incidental to and necessary for the installation of the geocell, such as, but not limited to a tendoning system for anchoring, rebar anchors, j-bars, clips shall also conform to the requirements of the Manufacturer of the geocell. The Contractor shall ensure that the geocell is delivered to the site in the Manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and Manufacturer. The geocell shall be stored in accordance with the Manufacturer's instructions and out of direct sunlight.

**Construction Methods:**

The temporary geocell walls shall be installed in accordance with the Manufacturer's instructions, and to the lines, grades and dimensions shown on the plans or as directed by the Engineer.

At the close of construction the geocell walls shall be removed from the site.

**Method of Measurement:**

This work will be measured for payment by the actual number of square yards of geocell wall installed as indicated on the plans or authorized by the Engineer.

**Basis of Payment:**

This work will be paid for at the contract unit price of "GEOGRID", complete in place, which price shall include all methods of anchoring the geocell to the ground, including j-hooks, tendons, rebar, anchor clips, etc. The price for "GEOGRID" will also include all materials, labor, tools and equipment incidental and necessary for the installation of the "GEOGRID".

04/01/10

Pay Item  
GEOGRID

Pay Unit  
S.Y.

## **ITEM #0712010A - REINFORCED SOIL SLOPE**

**Description:** This work shall consist of furnishing material for and constructing a reinforced soil slope, reinforced with geosynthetic soil reinforcement, 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

1 - Geosynthetic Reinforcement Material - The geosynthetic reinforcement shall consist of a geogrid or geotextile that can develop sufficient mechanical interaction with the surrounding soil or rock. The geosynthetic reinforcement structure shall be dimensionally stable, able to retain its geometry under construction stresses, and shall have high resistance to damage during construction, to ultraviolet degradation, and to all forms of chemical and biological degradation encountered in the soil being reinforced. The permeability of the geosynthetic reinforcement shall be greater than the permeability of the reinforced fill soil.

Geogrid used as geosynthetic reinforcement shall be a regular network of integrally connected polymer tensile elements consisting of either polypropylene (PP), polyethylene (HDPE), or polyester (PET). The geogrid shall have certified properties as shown in Table 1.

Geotextile used as geosynthetic reinforcement may be woven or nonwoven but no "slit-film" woven fabrics will be permitted. The geotextile shall have certified properties as shown in Table 2. All property values represent Minimum Average Roll Value (MARV) in the weakest principal direction and shall meet or exceed the values stated below.

The Contractor shall submit a manufacturer's certification that the geosynthetic supplied meets the requirements as shown in the respective table, 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.

The geosynthetic 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 geosynthetic reinforcement 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 tests shall be considered as applicable for an acceptable QA/QC program: Wide Width Tensile (ASTM D-4595 for geotextiles and ASTM D-6637 for geogrids); Specific Gravity (HDPE only, ASTM D-1505); Melt Flow Index (HDPE and PP only, ASTM D-1238); Intrinsic Viscosity (PET only, ASTM D-4603); Carboxyl End Group (PET only, ASTM D-2455); and Single Rib Tensile (Geogrid only, ASTM D-6637). Sampling and conformance testing shall be in accordance with ASTM D-4354. Conformance testing procedures shall be established as noted in the specification. Geosynthetic 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).

**Table 1**

<b>Geogrid Type</b>	<b>Property</b>	<b>Test Method</b>	<b>Criteria</b>
All Polymers	Long Term Allowable Tensile Strength ( $T_{all}$ )	GRI:GG4, where $T_{all} = T_{ult} / (RF_{CR} * RF_{ID} * RF_D)$	Min. 1000 lbs./ft. (Machine Direction) Min. 220lbs./ft. (Cross-machine Direction)
Polyester	Geogrid Rib Tensile Strength ( $T_{ult}$ )	ASTM D6637	Min. 2420 lbs./ft.
Polypropylene	Geogrid Rib Tensile Strength ( $T_{ult}$ )	ASTM D6637	Min. 4840 lbs./ft.
Polyethylene	Geogrid Rib Tensile Strength ( $T_{ult}$ )	ASTM D6637	Min. 3025 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
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

**Table 2**

Property	Test Method	Elongation	
		<50% <sup>A</sup>	≥50% <sup>A</sup>
Grab Strength -lbs	ASTM D4632	315	202
Sewn Seam Strength <sup>B</sup> -lbs	ASTM D4632	283	182
Tear Strength -lbs	ASTM D4533	112	79
Puncture Strength - lbs	ASTM D6241	618	433
Ultimate Strength (T <sub>ult</sub> ) -lbs/ft	ASTM D4595	Min. 2530	
Long Term Allowable Tensile Strength (T <sub>all</sub> ) - lbs/ft	FHWA <sup>C</sup>	Min. 1000	

<sup>A</sup> As determined in accordance with ASTM D4632. The strengths specified in the columns labeled “<50%” and “≥50%” refer to the elongation at which the geotextile material was tested. For example; if a fabric is tested at 15% elongation, then it must meet or exceed the minimum strength shown in the “<50%” column. Submittals must include the percent elongation at which the material was tested.

<sup>B</sup> When sewn seams are required.

<sup>C</sup> The Long Term Allowable Tensile Strength shall be determined by applying appropriate reduction factors to the Ultimate Tensile Strength of the geotextile to account for installation damage, survivability, creep, durability and degradation. A 100-year design life shall be used in determining the long term allowable tensile strength. The FHWA methodology (FHWA NHI-00-043 (Elias et al., 2001)) shall be used for this computation. Proposed strength and reduction factors are subject to approval. Minimum durability reduction factor is 1.15. Minimum installation damage factor is 1.10. The creep reduction factor should be developed from creep tests performed in accordance with ASTM D5262 and is subject to the minimums presented in Table 1 for the respective material.

2 - Compacted Granular Fill - Compacted Granular Fill shall conform to the requirements of Article M.02.01.

3 - Turf Establishment with Erosion Control Matting - The materials for this work shall conform to the requirements of Article M.13. The Erosion Control Matting shall be Class 1, Type D. Anchors for the Erosion Control Matting shall be a 9 gage-U Shaped Staple, with a minimum dimension of 12"x1"x12".

**Construction Methods:** The Contractor shall insure that during all periods of shipment and storage, the geosynthetic material is protected from mud, dirt, all deleterious materials that might become affixed to it, and temperatures greater than 140°F. Follow manufacturer's recommendations with regards to protection from direct sunlight. At the time of installation, the geosynthetic 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 geosynthetic 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 deleterious materials, loose soil, topsoil, organic soils, frozen soil, or any other unsuitable material. Prior to placement of geosynthetic reinforcement, subgrade shall be proof-rolled to provide a uniform and firm surface. Any soft areas, as determined by the Engineer, shall be excavated and replaced with suitable compacted soils. The foundation surface shall be inspected and approved by the Engineer prior to placement of geosynthetic and Compacted Granular Fill. 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 geosynthetic shall be installed in accordance with the plans, specifications, and manufacturer's recommendation. The geosynthetic reinforcement shall be placed within the layers of the Compacted Granular Fill as shown on the plans, or as directed by the Engineer.

The primary geosynthetic reinforcement shall be placed in continuous, longitudinal strips in the direction of main reinforcement. The secondary geosynthetic reinforcement may be placed with the cross-machine (weak) direction placed perpendicular to the roadway. If the Contractor is unable to complete a required length with a single continuous length of geogrid, a joint may be made with the Engineer's approval. Only one joint per length of geogrid shall be allowed. This joint shall be made for the full width of the strip by using a similar material with similar strength. Joints in geogrid reinforcement shall be pulled and held taut during placement of Compacted Granular Fill. The minimum length of geogrid placed shall be 6 feet. For primary geogrids, joints shall not be placed within 6 feet of the slope face. Adjacent, overlying, and underlying rolls of geogrid shall not have a joint within 6 feet of each other. Joints shall not be permitted with geotextiles.

Horizontal coverage of less than 100% shall not be allowed. Adjacent strips of geosynthetic need not be overlapped as long as 100% coverage is maintained.

Place only that amount of geosynthetic reinforcement required for immediately pending work to prevent undue damage. After a layer of geosynthetic reinforcement has been placed, the next succeeding layer of soil shall be placed and compacted as appropriate. After the specified

soil layer has been placed, the next geogrid reinforcing layer shall be installed. The process shall be repeated for each subsequent layer of geogrid reinforcement and soil.

Geosynthetic reinforcement shall be placed to lay flat and pulled tight prior to backfilling. After a layer of geosynthetic reinforcement has been placed, suitable means, such as pins or small piles of soil, shall be used to hold the geosynthetic reinforcement in position until the subsequent soil layer can be placed.

During construction, the surface of the fill should be kept approximately horizontal. Geosynthetic reinforcement shall be placed directly on the Compacted Granular Fill surface. Geosynthetic 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 geosynthetic reinforcement.

Compacted Granular Fill shall be placed and compacted as specified in Article 2.14, with the following amendments. The Contractor shall be allowed a maximum lift of 12 inches. In addition, the Compacted Granular Fill shall be placed, spread, and compacted in such a manner to minimize the development of wrinkles and/or displacement of the geosynthetic reinforcement. The Compacted Granular Fill shall be graded away from the slope crest and rolled at the end of each work day to prevent ponding of water or erosion on the surface of the reinforced soil mass.

Tracked construction equipment shall not be operated directly upon the geosynthetic reinforcement. A minimum fill thickness of 6 inches is required prior to operation of tracked vehicles over the geosynthetic reinforcement. Turning of tracked vehicles should be kept to a minimum to prevent tracks from displacing the fill and the geosynthetic reinforcement.

The Engineer may allow rubber tired equipment to pass over the geosynthetic reinforcement at speeds less than 10mph. Sudden braking and sharp turning shall be avoided.

Turf Establishment with Erosion Control Matting shall be placed as specified in Article 9.50. Seeding and/or mulch shall be placed prior to placement of Erosion Control Matting. The Turf Establishment with Erosion Control Matting shall be performed immediately upon completion of each 5 foot vertical section of geosynthetic reinforcement and Compacted Granular Fill. Anchors shall be placed and spaced such that there is 1 anchor per 2 square feet of matting. The Erosion Control Matting shall be placed horizontal along the face of the slope with the upper matting overlapping the lower matting by 12". Anchors shall be placed in the center of the overlap with 1 foot spacing.

The Contractor shall begin construction of the reinforced soil slope no earlier than March 15<sup>th</sup>, and have the reinforced slope constructed, seeded, and Erosion Control Matting installed by October 15<sup>th</sup> of the same calendar year. Out of season seeding will not be permitted.

The Contractor shall construct and maintain the temporary soil berm as shown on the plans. The temporary soil berm shall be placed immediately upon completion of the placement of all the geogrid reinforcement and Compacted Granular Fill. It shall remain in place and be maintained by the Contractor until placement of the pavement and barrier curb on top of the slope, as shown on the plans, has been completed.

**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 price for “Reinforced Soil Slope”, complete in place, which price shall include all work shown within the pay limits shown on the contract drawings for the reinforced soil slope including but not limited to the following: supply and installation of Geosynthetic reinforcement; Compacted Granular Fill; Slope Underdrain; Outlet for Underdrain; Turf Establishment with Erosion Control Matting; temporary soil berm and outlet; and earth excavation. The price shall also include all tools, labor, equipment, and material incidental thereto. If boulders in excess of 1 cubic yard are encountered in the excavation, the boulder(s) shall be removed and paid for in accordance with Article 2.02, “Rock Excavation”.

Pay Item	Pay Unit
Reinforced Soil Slope	L. S.

## **ITEM #0714050A – TEMPORARY EARTH RETAINING SYSTEM**

**7.14.01 - Description:** For purposes of this specification, 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.

**7.14.02 - Materials:** Materials of steel sheet piling shall conform to the requirement of ASTM A328. 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.

**7.14.03 - Construction Methods:** Temporary earth retaining system shall be safely designed and carried to adequate depths and braced as necessary for proper performance of the work. The design shall be in accordance with the latest edition of the applicable AASHTO design specifications. The support system shall provide an approximately plumb face at the plan location and grades, and shall support all loads imposed by the embankment including hydrostatic forces as applicable; live load surcharge from vehicular traffic and construction equipment; and lateral forces from temporary or permanent highway railing systems located on supported earthen sections. The support system shall be designed and detailed to interface with substructure units as required to retain the earthen material. The design and details of the temporary earth retaining system shall be compatible with all construction staging requirements including highway railing systems, removal of existing retaining walls, and shall be detailed to not interfere with the staged construction of approach slabs.

Construction of the earth retaining system shall be such as to permit excavation or fill as required. Interior dimensions shall be such as to give sufficient clearance for the required construction including the installation of both plumb and battered piles and the placement of forms. Movement 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.

**7.14.04 - 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 by the Engineer. 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.

The Contractor may propose earth retaining system limits beyond the payment limits shown on the plans, subject to the approval of the Engineer. At locations where such expanded limits are approved by the Engineer, the payment limit will not be increased beyond the maximum limit shown on the plans. No additional payment will be made to the Contractor for the area of earth retaining system beyond the stated payment limits.

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 the Item "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 feet for "Earth Retaining System Left in Place."

**7.14.05 - Basis of Payment:** Payment for this work will be made at the contract unit price per square feet 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 for staged construction will be measured for payment only once.

At locations where the Contractor proposes and is allowed to leave all or parts of the earth retaining system in place, no additional payment will be made to the Contractor when such material left in place is encountered in subsequent construction activities including, but not limited to trench excavation in areas of soil nail walls.

<u>Pay Item</u>	<u>Pay Unit</u>
Temporary Earth Retaining System	SF

## **ITEM #0715050A - EARTH RETAINING SYSTEM LEFT IN PLACE**

### **Description:**

This specification covers only that portion of the temporary earth retaining system that may be ordered left in place by the Engineer or designated in the plans to be left in place.

### **Materials:**

Vacant

### **Construction Methods:**

The Contractor shall submit to the Engineer for approval, plans showing the proposed method of construction prior to the start of such construction.

### **Method of Measurement:**

Earth retaining system material left in place will be measured for payment by the square foot. This area will be measured or computed from the horizontal and vertical payment limits 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 ordered or designated in the plans to be left in place, and the vertical limit will correspond to the method of measurement of the temporary earth retaining system.

Temporary earth retaining system left in place solely at the Contractor's option, and with the Engineer's permission, will not be measured for payment.

### **Basis of Payment:**

Payment for this work will be made as follows:

That portion of the temporary earth retaining system ordered or designated in the plans to be left in place will be paid for at the contract unit price per square foot for "Earth Retaining System Left in Place," applying to one or more structures or portions of structures, which price shall include only the cost of material left in place. All other expenses shall be paid for under the item for "Temporary Earth Retaining System."

Pay Item

Earth Retaining System Left in Place

Pay Unit

s.f.

**ITEM #0821189A – CONCRETE BARRIER TRANSITION SECTION**

**ITEM #0821995A – PRECAST CONCRETE END-BLOCK**

**Description:** Under this item, the Contractor shall furnish and install concrete barrier transition section and a precast concrete end-block in the locations shown on the plans, or as directed by the Engineer.

**Materials:** Materials for the above items shall conform to all the requirements of Section 8.21.02

**Construction Methods:** The contract items listed above may be precast and follow the methods of Article 8.21.03 or cast-in-place in accordance with Article 6.01.03. The items shall be coated with a penetrating sealer protective compound that meets the requirements of Article M.03.09.

**Method of Measurement:**

1. The Concrete Barrier Transition Section shall be measured for payment along the centerline of the top of the item being measured and will be the actual number of linear feet of the item installed and accepted.
2. The Precast Concrete End-Block will be measured for payment by the number of units installed and accepted.

**Basis of Payment:**

1. The work for "Concrete Barrier Transition Section," will be paid for at the contract unit price per linear foot of the size specified, complete in place, which price shall include all backfill, sand backfill, joint seal, materials, reinforcing steel, dowels, penetrating sealer protective compound, transportation, equipment, tools and labor incidental thereto.
2. The work for "Precast Concrete End-Block," will be paid for at the contract unit price each for "Precast Concrete End-Block", complete in place, which price shall include all backfill, joint seal, materials, reinforcing steel, dowels, penetrating sealer protective compound, transportation, equipment, tools and labor incidental thereto.
3. Backfill placed between a double row of concrete barrier curb and/or concrete barrier transition section shall be paid for under the item "Compacted Granular Fill."
4. The concrete cap shall be paid for under the item "Class 'A' Concrete."

Pay Item  
Concrete Barrier Transition Section  
Precast Concrete End-Block

Pay Unit  
L.F.  
EA.

ITEM #0821189A  
ITEM #0821995A

**ITEM #0822005A – TEMPORARY PRECAST CONCRETE BARRIER CURB (STRUCTURE)**

**ITEM #0822006A – RELOCATED TEMPORARY PRECAST CONCRETE BARRIER CURB (STRUCTURE)**

**Article 8.22.01 – Description:**

Work under this item shall consist of furnishing, installing, relocating and removing temporary precast concrete barrier curb, suitable for attachment to bridge decks, as shown on the plans or as directed by the Engineer. This work shall also include the drilling, grouting and later removal of anchor bolts, and the cleaning and subsequent grouting and sealing of anchor bolt holes after the barrier is removed.

**Article 8.22.02 – Materials:**

1. Concrete shall conform to the requirements of Subarticle M.14.01-1 amended as follows:
  - a. Concrete shall have a minimum 28 day strength (f'c) of 4000 psi.
  - b. Coarse Aggregate shall conform to the requirements of Subarticle M.03.01-1 and to the grading requirements of Class "F".
  - c. Fine Aggregate shall be Light in color and shall conform in color and type to the samples on file at the Laboratory of the Department of Transportation located in Rocky Hill, Connecticut.
  - d. Cement for light concrete shall be Type III or Type IIIA Portland cement or light colored cement approved by the Engineer.
  - e. The entrained air content shall not be less than 5% or more than 7%.
  - f. Manufacturer identification and date of manufacture shall be permanently marked on the barrier curb in the location shown on the plans.
2. Reinforcing steel shall conform to the requirements of ASTM A615, Grade 60.
3. Lifting hooks, keys, bolts, devices and attachments shall be of the size indicated on the plans or of a design satisfactory for the purpose intended as approved by the Engineer.
4. Removable anchor bolts shall conform to "KELIBOND/KELIBOND ANCHORS coated with KELISLIP" as manufactured by Kelken-Gold. Inc., 3220 Bordentown Ave., Parlin,

New Jersey 08859, or approved equal. Anchor bolts shall conform to the requirements of ASTM A325.

5. Galvanizing shall conform to the requirements of ASTM A123.
6. The grout used in patching the remaining holes in the concrete deck after the removal of the temporary barrier shall be non-shrink grout conforming to Subarticle M.03.01-12.
7. The pourable sealant used in patching the remaining holes in the overlay after the removal of the temporary barrier shall be a cold-applied bituminous sealer conforming to the requirements of Subarticle M.08.01-18.
8. The delineators shall be fabricated of aluminum, steel, plastic or of a material approved by the Engineer. The reflective sheeting shall be encapsulated lens sheeting conforming to Article M.18.09.01. Delineator fastening hardware or adhesive shall be suitable for the purpose intended.

**Article 8.22.03 – Construction Methods:**

1. Precast Units: Concrete barrier units shall be precast in an approved plant in conformance with the applicable requirements of Subarticles 5.14.03-4, 6, 7, 8 and 15, supplemented as follows:

Forms for precast concrete barrier units shall be of substantial construction, so as to produce a smooth dense surface with a uniform appearance. Form oil shall be a non-staining type. Pockets for anchor bolts shall be formed as shown on the plans. Air holes on exposed surfaces shall be filled immediately, after removal of the forms to the satisfaction of the Engineer.

2. Installation: Temporary precast concrete barrier units shall be placed as shown on the plans or as directed by the Engineer, on a firm even surface as to produce a smooth continuous barrier curb.

Anchor bolts shall be installed in properly drilled holes of the size and depth shown on the plans in strict accordance with the Manufacturer's directions. Care shall be taken not to drill holes into or through existing structural steel.

The Contractor shall submit the following to the Engineer for approval: type of drill, diameter of bit, method of cleaning holes, and method of placement of adhesive bonding material. Specifications and recommendations for the aforementioned may be obtained from the Manufacturer of the adhesive bonding material. The weight of the drill shall not exceed 20 pounds.

Drilling methods shall not cause spalling, cracking, or other damage to the concrete. 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.

The Contractor shall take necessary precautions to prevent any materials from falling onto the roadway or into the watercourse below.

For the adhesive bonding material, a Materials Certificate will be required in accordance with Article 1.06.07, confirming the conformance of the adhesive bonding material to the requirements set forth in these specifications.

The temporary concrete barrier shall be maintained by the Contractor during all stages of construction. Any damaged material shall be removed and replaced by the Contractor at his expense.

When the temporary barrier is no longer required, it shall be removed from the work site and become the property of the Contractor.

3. Patching Holes: After removal of the concrete barriers, the holes in the new concrete deck shall be blown clean with an air jet. The grout shall then be mixed and placed as shown on the plans and in strict accordance with the Manufacturer's direction. Allow grout to cure for a minimum of 24 hours before placing the pourable sealant in the remaining hole in the bituminous wearing surface.
4. Delineators: The delineators shall be installed in the center on top of the barrier at the locations designated on the plans. They may be fastened by hardware or adhesive and must be maintained in good condition at all times.

DE-7 delineators shall be used when the barriers are on the right side of traffic or dividing traffic in the same direction. DE-7A delineators shall be used when the barriers are on the left side of traffic. DE-7B delineators shall be used when the barriers divide opposing traffic lanes. DE-7C delineators shall be used with the yellow side on the left side of traffic when traffic is alternated.

**Article 8.22.04 – Method of Measurement:**

This work will be measured for payment along the centerline of the top of the concrete barrier and will be the actual number of linear feet of temporary concrete barrier furnished, installed and accepted.

Relocated temporary concrete barrier will be measured along the centerline of the top of the concrete barrier each time the barrier has been relocated as directed by the Engineer, including to and from the storage area. Storage of concrete barrier curb will not be measured for payment.

Delineators will be measured in accordance with Article 12.05.04.

**Article 8.22.05 – Basis of Payment:**

This work will be paid for at the contract unit price, per linear foot, for "Temporary Precast Concrete Barrier Curb (Structure)", complete in place, which price shall include all furnishing, transportation, storage, materials, including concrete, reinforcing steel connecting rods, removable anchor bolts conforming to the "KELIBOND/KELIBOND ANCHORS coated with KELISLIP" or approved equal, drilling holes in existing deck, initial installation, removal and also including hardware and incidental materials, equipment, tools, and labor incidental thereto. Any temporary barriers that become lost, damaged or defaced shall be replaced by the Contractor at no cost to the State.

The relocation of the temporary precast concrete barrier curb will be paid for at the contract unit price, per linear foot, for "Relocated Temporary Precast Concrete Barrier Curb (Structure)", complete in place, which price shall include all; transportation, materials, drilling holes in the deck, installation, removal and also including; hardware and incidental materials, equipment, tools, and labor incidental thereto.

Delineators will be paid for in accordance with Article 12.05.05.

<u>Pay Item</u>	<u>Pay Unit</u>
Temporary Precast Concrete Barrier Curb (Structure)	L.F.
Relocated Temporary Precast Concrete Barrier Curb (Structure)	L.F.

**ITEM #0822014A – RELOCATE STATE-OWNED TEMPORARY  
PRECAST CONCRETE BARRIER CURB PC/MI**

Work under this item shall conform to the requirements of Section 8.22 of the Standard specifications Form 816, supplemented and amended as follows:

**8.22.01 Description:** Work under this item shall consist of relocating existing State owned precast concrete barrier curb present on the existing bridge to a designated State facility.

**8.22.04 Method of Measurement:** This work will be measured for payment by the Haul required to relocate all the existing barrier to the State facility designated in the Notice to Contractors. Storage of concrete barrier curb will not be measured for Payment.

**9.50.05 Basis of Payment:** This work will be paid for at the contract unit price for the Haul, which price shall include removal, transportation, and placement of the barrier curb and all materials, maintenance, equipment, tools, labor, and work incidental thereto.

<u>Pay Item</u>	<u>Pay Unit</u>
Relocate State-Owned Temporary Precast Concrete Barrier Curb PC/MI	Haul

## **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 (244 m). The entire sign will be visible for 800 ft (244 m) measured from the center of the left-travel lane approaching the sign, as viewed from a 3.5 ft (1.1 m) 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 #0969000A - PROJECT COORDINATOR**

*Section 1.05.08 of the Standard Specifications is hereby deleted and replaced with the following:*

**Description:** Under this item the Contractor shall furnish the services of an administrative employee, entitled the Project Coordinator, for this project to coordinate and expedite all phases of the work required for the project and to ensure that the construction schedule is maintained.

The minimum lump sum bid for this item shall be equal to 0.5% of the Contractor's total bid. Failure of the Contractor to bid at least the minimum amount will result in the Department adjusting the Contractor's bid to include the minimum bid amount for this item.

The Project Coordinator shall be submitted for approval by name, in writing, with a resume of his qualifications, within seven (7) calendar days of the award of the Contract, but not later than the Preconstruction Meeting, and shall not be changed without prior written notice to the Department.

This resume must demonstrate the Project Coordinator is experienced and versatile in the preparation, interpretation and modification of Critical Path Method (CPM) construction schedules. This must include successful completion of at least three (3) construction projects of similar complexity, where he served in a lead scheduling capacity. If the Contractor does not have a person in their company that has these skills, then the Contractor shall engage the services of a Consultant, subject to the approval of the Engineer, for the scheduling work required. If a Consultant is engaged, they shall be present at the first meeting, along with the Project Contractor, prepared to discuss, in detail, the methods and techniques he proposes to use. Thereafter, the Project Coordinator or the Consultant responsible for updating the CPM Schedule shall attend all meetings between the Contractor, its Subcontractors, and any other meetings, which will affect the CPM schedule. The Contractor shall prepare CPM Schedules utilizing the latest version of Primavera Project Planner software as described more fully hereinafter.

If the Contract includes Article 1.20 the following requirement shall also apply:

The Project Coordinator shall have, in addition to the above noted requirements, a minimum of eight (8) years' experience related to commercial/industrial building construction as a Project Coordinator performing duties similar to those required herein.

The Project Coordinator shall have knowledge of all trades involved in the construction, including civil/site work, environmental work, concrete work, masonry work, steel work, wood work, electrical work, and mechanical work.

Other combinations of experience and education totaling ten (10) years in commercial building construction will be considered subject to the approval of the Engineer.

**Computer Software and Printer:** The Contractor shall provide the following equipment with all the required maintenance and repairs (to include labor and parts) throughout the Contract life. The Engineer reserves the right to expand or relax the specification to adapt to the software and hardware limitations and availability.

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 the software producer for the duration of the project. The Contractor shall deliver to the Engineer all supporting documentation for the software and hardware including any instructions or manuals.

- A. Software – Minimum Specification: The Contractor shall provide the Engineer with a licensed copy of the latest version of the Primavera Contractor – Deluxe Version scheduling software, registered in the Department's name, and maintain the Primavera customer support service contract over the duration of the project.
- B. HP Officejet Pro K8600 Color Printer – Minimum or equivalent (to be installed as a local printer on a computer provided under the Construction Field Office specification):

Paper – 11 in x17 in, 8.5 in x 11 in and duplex/double-side print

Resolution – 1200x1200 DPI

Print Drivers – Must support HP PCL6.

RAM – 32 MB RAM

Print speed – 10 ppm – color, 13 ppm - black

Printer cable – 6 ft (1.8 m)

The Contractor is responsible for service and repairs to all computer hardware. All repairs must be performed within 24 hours. If the repairs require more than a 24 hours then a replacement must be provided.

**Construction Methods:** The Project Coordinator shall attend all meetings between the Contractor and the Department, the Contractor and its Subcontractors, and any other meetings that affect the progress of the job. The Project Coordinator shall be knowledgeable of the status of all parts of the work throughout the length of the Contract.

The Contractor shall prepare a CPM Schedule in accordance with the pertinent provisions of "Section 1.03 - Award and Execution of Contract," "Section 1.05 - Control of the Work," and "Section 1.08 - Prosecution of Progress" of the Standard Specifications. The schedule shall incorporate the Sequence of Construction as outlined on the Plans and in the Specifications. All

Rev. Date 07/23/12

(Recommended to be included on Projects exceeding \$5,000,000  
Or Resurfacing or Safety Improvements Projects exceeding \$10,000,000)  
Delete this heading prior to inclusion into the project documents.

other limiting factors that affect construction shall also be incorporated into the schedule. All milestones or constrained dates within the schedule shall be clearly indicated.

The CPM schedule shall contain a list of activities that represent the major elements of the project. At a minimum, this list should include a breakdown by individual structure or stage, including major components of each. The schedule shall contain sufficient detail to describe the progression of the work in a comprehensive manner. As a guide, 10 to 15 activities should be provided for each \$1 million of contract value.

The following list of items is provided as an example only and is not meant to be all-inclusive (or all-applicable):

General Items Applicable to all projects

Contractual Constraints including but not limited to

- Winter shutdowns
- Environmental permits/applications time of year restrictions
- Milestones
- Third Party approvals
- Long lead time items (procurement and fabrication of major elements)
- Adjacent Projects or work by others

Award

Notice to Proceed

Signing (Construction, temporary, permanent by location)

Mobilization

Permits as required

Field Office

Utility Relocations

Submittals/shop drawings/working drawings/product data

Construction of Waste Stock pile area

Clearing and Grubbing

Earthwork (Borrow, earth excavation, rock excavation, etc.)

Traffic control items (including illumination and signalization)

Pavement markings

Roadway Construction (Breakdown into components)

Drainage (Breakdown into components)

Culverts

Final Plantings (including turf establishment)

Final Cleanup

The following additional guidelines supplement the general guidelines listed above for the specific project types indicated:

- A. For bridges and other structures, include major components such as: Abutments, wingwalls, piers, decks and retaining walls; further breakdown by footings, wall sections, parapets etc.

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Or Resurfacing or Safety Improvements Projects exceeding \$10,000,000)

Delete this heading prior to inclusion into the project documents.

Temporary Earth Retention Systems  
Cofferdam and Dewatering  
Structure Excavation  
Piles/test piles  
Temporary Structures  
Removal of Superstructure  
Bearing Pads  
Structural Steel (Breakdown by fabrication, delivery, installation, painting etc.)  
Bridge deck

- B. Multiple location projects such as traffic signal, incident management, lighting, planting and guiderail projects will be broken down first by location and then by operation. Other major activities of these types of projects should include, but are not limited to:

Installation of anchors  
Driving posts  
Foundations  
Trenching and Backfilling  
Installation of Span poles/mast arms  
Installation of luminaires  
Installation of cameras  
Installation of VMS  
Hanging heads  
Sawcut loops  
Energizing equipment

- C. Facility Projects shall reflect the same breakdown of the project as the schedule of values:

CSI Division 2 – Existing Conditions  
CSI Division 3 – Concrete  
CSI Division 4 – Masonry  
CSI Division 5 – Metals  
CSI Division 6 – Wood, Plastic, and Composites  
CSI Division 7 – Thermal and Moisture Protection  
CSI Division 8 – Openings  
CSI Division 9 – Finishes  
CSI Division 10 – Specialties  
CSI Division 11 – Equipment  
CSI Division 12 – Furnishings  
CSI Division 13 – Special Construction  
CSI Division 14 – Conveying Equipment

- CSI Division 21 – Fire Suppression
- CSI Division 22 – Plumbing
- CSI Division 23 – Heating, Ventilating, and Air Conditioning
- CSI Division 26 – Electrical
- CSI Division 27 – Communications
- CSI Division 28 – Electronic Safety and Security
- CSI Division 31 – Earthwork
- CSI Division 32 – Exterior Improvements
- CSI Division 33 – Utilities

The CPM schedule will be compiled using this list of major activities. It will be the responsibility of the contractor to detail all milestones, environmental permit “window” periods; winter shutdowns etc. and include them on their schedule under the corresponding dates.

Proper relationship between all major activities shall be indicated. Node numbers shall be coded such that the major activities shown on the Critical Path Schedule shall be easily referenced to the Detailed Project Schedule when it is developed. Break down the work covered under each Special Provision, or Division and Section of Article 1.20 of the Standard Specifications, into individual activities required and logically group related activities together within the CPM.

If the Engineer determines that additional detail is necessary, the Contractor shall provide it.

All documents, which require approval by the Department, shall be clearly identified within the schedule. The Department and any outside agency shall be allocated a minimum number of calendar days in accordance with Article 1.20-1.05.02. If Article 1.20 does not apply, then the Department shall be allocated a minimum of thirty (30) calendar days (exclusive of weekends and holidays) for review and approval of each submittal. Any submittals requiring approval by an outside Agency (ConnDEEP, Coast Guard, Army Corps of Engineers, etc.) shall be allocated a minimum of sixty (60) calendar days. The Department shall not be held responsible for any delay associated with the approval or rejection of any substitution or other revisions proposed by the Contractor.

The schedule shall indicate the logic of the work for the major elements and components of work under the Contract, such as the planned mobilization of plant and equipment, sequences of operations, procurement of materials and equipment, duration of activities, type of relationship, lag time (if any), and such other information as it is necessary to present a clear statement of the intended activities.

The Contractor is responsible to inform its subcontractor(s) and supplier(s) of the project schedule and any relevant updates.

The schedules shall consist of a network technique of planning, scheduling and control, shall be a clear statement of the logical sequence of work to be done, and shall be prepared in such a manner that the Contractor's work sequence shall be optimized between early start and late start restraints. The Contractor shall use the same criteria in a consistent manner throughout the term of the project. If, at any time, the Contractor alters logic, original durations, and descriptions, adds activities or activity codes or in any way modifies the Baseline Schedule, they must notify the Engineer of the change, in writing, presenting in detail the reasons for the change. The Engineer reserves the right to approve or reject any such change.

The critical path of the project must be identified on the CPM schedule. The critical path is the longest-duration path through the network. The significance of the critical path is that the activities that lie on it cannot be delayed without delaying the project. Because of its impact on the entire project, critical path analysis is an important aspect of project planning.

The critical path can be identified by determining the following four parameters for each activity:

- ES - earliest start time: the earliest time at which the activity can start given that its precedent activities must be completed first.
- EF - earliest finish time, equal to the earliest start time for the activity plus the time required to complete the activity.
- LF - latest finish time: the latest time at which the activity can be completed without delaying the project.
- LS - latest start time, equal to the latest finish time minus the time required to complete the activity.

The *float time* for an activity is the time between its earliest and latest start time, or between its earliest and latest finish time. Float is the amount of time that an activity can be delayed past its earliest start or earliest finish without delaying the project. Delays to activities on the critical path through the project network in which no float exists, that is, where  $ES=LS$  and  $EF=LF$  will delay the project.

Float available in the schedule, at any time shall not be considered for the exclusive use of either the State or the Contractor. During the course of contract execution, any float generated due to the efficiencies of either party is not for the sole use of the party generating the float; rather it is a shared commodity to be reasonably used by either party. Project float will be a resource available to both the State and the Contractor.

Each CPM Schedule submittal shall be in the form of an activity on node diagram (precedence diagramming method) and shall include at a minimum; an Early Start computer sort, a Total Float computer sort, an Activity Number computer sort, a Schedule Diagram in the Time Scaled

Logic format and a backup data CD-ROM which includes all Primavera project files. The diagrams shall be on 2' x 3' sheets. Additional, more detailed diagrams for important aspects or phases of the work will be required on large or complex projects.

Activity I.D. numbers shall be keyed to the item numbers assigned on the detailed estimate sheet. The first three digits (four digits for highway illumination, signing, traffic signals and utility work) of the activity I.D. number shall be identical to the first three digits of the item number in the contract. The remaining digits may be used to provide unique, orderly and sequential I.D. numbers for each activity.

Activity codes shall be added to the schedule dictionary at the direction of the Engineer. At a minimum, activity codes for responsibility (prime, subcontractor by name), location of work (bridge #, span #, sta. #, site, building, type of work, etc.) and stage or phase number should be included.

The Project Coordinator shall be required to prepare and submit the following documents:

1. Baseline Submittal Requirements: The Contractor shall be guided by the following requirements when submitting the CPM Schedules for review and approval.
  - a. Within ten (10) calendar days after award, the Contractor and their scheduler will attend a meeting to discuss the submittal requirements. Within twenty (20) calendar days after contract award, the Contractor shall prepare and submit for review and approval a detailed CPM Schedule for all work. The review and approval process may take up to 21 calendar days and is more fully described in paragraph (b) of this section.

The work shall be broken out into sufficient detail such that no activity has a duration greater than twenty (20) days, unless approved by the Engineer. As a guide, 25 to 35 activities should be provided per \$1 million of contract work. The Engineer shall be the sole judge as to whether the schedule is sufficiently detailed.

All work shall be shown in sufficient detail such that the Critical Path may be identified and the schedule shall incorporate all contract milestones. Upon approval, this schedule shall be designated the "Baseline".

Failure to submit and gain approval for the "Baseline" may result in the Contractor being found in violation of Article 1.02.02 of the Standard Specifications. All elapsed contract time prior to the approval of the "Baseline", will be considered to be accurately represented by the actual as-built schedule of that time period. No claims for delays during that period will be allowed.

The approval of a Baseline Schedule shall in no way waive the requirements of the contract nor shall it excuse the Contractor from any obligations under the contract.

In no instance will the Contractor be permitted to commence work on any significant portion of the work for which a Baseline Schedule has not been approved without prior written approval from the Department.

- b. The Contractor, represented by the Project Coordinator and/or the Consultant, shall participate with the Engineer in the review and evaluation of each schedule submitted. Any and all revisions made necessary as a result of this review shall be made by the Contractor and a revised schedule submitted within ten (10) calendar days. Any further revisions required thereafter shall also be submitted for approval within (10) calendar days.
2. Monthly Updates: Each month, as of a calendar date mutually acceptable to the Contractor and to the Engineer, the Contractor shall deliver to the Engineer three (3) prints of all required schedule diagrams and tabulations. In addition, the Contractor shall deliver one (1) copy of the project backup data CD-ROM(s), which includes all Primavera project files. The schedule shall be updated to show the work actually accomplished during the preceding months, the actual time consumed for each activity, and the estimated time remaining for any activity which has been started but not completed.

The monthly update shall also include revisions to the CPM schedule necessitated by revisions to the project, which have been directed by the Engineer (including, but not limited to extra work) during the month preceding the update. Similarly, any changes to the schedule due to Contractor influences shall also be included within the schedule.

Any changes or revisions made to the approved Baseline shall be identified in narrative form in a cover letter accompanying the monthly update. The Engineer reserves the right to approve or reject any such changes. The narrative shall also describe in general terms the progress of the work since the last schedule update and shall identify any items of special interest. If the schedule revisions extend the Contract completion date, due to extra or added work or delays beyond the control of the Contractor, the Contractor must submit a request in writing for an extension of time in accordance with Article 1.08.08. This request should be supported by the schedules submitted previously.

The Contractor shall be responsible to develop mitigation measures for all delays, regardless of responsibility, and to identify all time and cost impacts to the work associated with those mitigation measures.

Except as otherwise authorized by the Engineer, monthly submissions received after the due date are considered late.

The reports required for each monthly update shall include all reports generated for approval of the CPM Schedule for that particular portion of the work. On larger or complex projects, the Engineer may require the schedule data sorted by an activity code to better reflect the progression of the work. Summary barcharts may also be required.

3. Biweekly Schedules: Each week, the Contractor shall be required to produce and submit to the Engineer a biweekly schedule showing all activities planned for the following two week period. This short term schedule may be handwritten; however a two week "look ahead" filter from the CPM Schedule is preferred. The biweekly schedule shall clearly indicate all work planned on a crew basis for the two week period.
4. Recovery Schedules: If, in the opinion of the Engineer, the updated schedule indicates that the Project has fallen behind schedule, or that a revision in sequence of operations may be necessary for any other reason, absent a justifiable time extension, the Contractor shall immediately institute all necessary steps to improve the Project's progress and shall submit such revised network diagrams, tabulations and operational plans, as may be deemed necessary by the Engineer, to demonstrate the manner in which an acceptable rate of progress will be regained.

Should the Contractor not demonstrate an ability to regain an acceptable rate of progress, the Engineer shall require the schedule to be resource loaded with the next monthly update. No additional compensation will be allowed for resource loading the schedule.

5. As-Built Schedules: Within thirty (30) days of completion of the project, including all corrective work, the Contractor shall submit an "As-Built Schedule" showing the actual progress of work. The Contractor shall submit three prints of this final CPM Schedule and one project backup data CD-ROM which include all Primavera project files for the Engineer's exclusive use.

If the contract includes Article 1.20 the following shall also apply:

6. Daily Construction Reports: The Project Coordinator shall assist the Engineer in the preparation of a daily construction report by ensuring that each of the Contractor's employees and subcontractors working on the Project Site on a given day signs the Engineer's sign-in sheet for that day; and by keeping and providing to the Engineer its own daily list of employees and subcontractors who worked on the Project Site on that day.

**Method of Measurement:** Within ten (10) calendar days of the award of the Contract, the Contractor shall submit to the Engineer for approval a breakdown of its lump sum bid price for this item detailing:

1. The development cost to prepare the Baseline Schedule in accordance with these specifications. Development costs shall not exceed 25% of the total cost of the item and shall include costs to furnish and install all specified hardware.
2. The cost to provide the services of the Project Coordinator, including costs to prepare and submit the Monthly Updates; furnish and submit any Recovery Schedules; furnish and submit Two Week Look Ahead Schedules and maintenance of and supplies for the specified hardware noted above. A per month cost will be derived by taking this cost divided by the number of Contract months remaining from the date of acceptance of the Baseline Schedule.
3. The cost of submission and certification of the As-Built Schedule in accordance with these specifications. The submission and certification costs shall be no less than 2% of the total cost of the item.
4. Substantiation showing that the costs submitted are reasonable based on the Contractor's lump sum bid.

Upon approval of the payment schedule by the Engineer, payments for work performed will be made as follows:

1. Upon approval of the "Baseline" Schedule by the Engineer, the lump sum development cost will be certified for payment.
2. Upon receipt of each monthly update of the "Baseline" Schedule, the per month cost for the services of the Project Coordinator will be certified for payment.
3. Upon approval of the As-Built Schedule by the Engineer, the lump sum submission and certification cost will be certified for payment.

**Basis of Payment:** This service will be paid for at the contract lump sum price for "Project Coordinator" complete, which price shall include the preparation and submission of all schedules, updates, reports and submittals. The lump sum price shall also include the cost of providing a complete, licensed copy of the Primavera software which will remain the property of the Engineer, and all materials, equipment, labor and work incidental of this service.

The lump sum price will be certified for payment as described in "Method of Measurement" subject to the following conditions:

1. Any month where the monthly update of the "Baseline" CPM schedule is submitted late, without authorization from the Engineer, will result in the following actions:

(Recommended to be included on Projects exceeding \$5,000,000  
Or Resurfacing or Safety Improvements Projects exceeding \$10,000,000)

Delete this heading prior to inclusion into the project documents.

- a. The monthly payment for the Project Coordinator item shall be deferred to the next monthly payment estimate. If any monthly submittal is more than thirty (30) calendar days late, there will be no monthly payment for the services of the Project Coordinator.
  - b. The greater of 5% of the monthly payment estimate or \$25,000 shall be retained from the monthly payment estimate until such time as the Contractor submits all required reports.
  - c. If in the opinion of the Engineer, the contractor is not in compliance with this specification, the Engineer may withhold all project payments.
2. In the event the project extends beyond the original completion date by more than thirty (30) calendar days, and a time extension is granted to the Contractor, the Department may require additional CPM updates which will be paid at the per month cost for the services of the Project Coordinator.
  3. If, in the opinion of the Engineer, the contractor is not in compliance with this specification or has failed to submit a "Baseline", monthly update or Recovery Schedule for any portion of the work in accordance with this specification, it shall result in the withholding of all contract payments until the schedule is submitted to, and approved by, the Engineer.

Pay Item

Project Coordinator

Pay Unit

L.S.

**ITEM #0969066A - CONSTRUCTION FIELD OFFICE, EXTRA-LARGE**

**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.

	<b>Description:</b>
2,000 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.
15 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 a minimum of two (2) separate lavatories and toilet facilities (“men” and “women”), in separately enclosed rooms that are properly ventilated and comply with applicable sanitary codes. The Contractor shall provide each lavatory with hot and cold running water and flush-type toilets. 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:
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QTY	Description:
8 EA	Office desks (2.5 ft x 5 ft) with drawers, locks, and matching desk chairs that have pneumatic seat height adjustment and dual wheel casters on the base.
1 EA	Standard secretarial type desk and matching desk chair that has pneumatic seat height adjustment and dual wheel casters on the base.
1 EA	Conference table, 3 ft x 12 ft.
20 EA	Office Chairs.
3 EA	Fire resistant cabinets (legal size/4 drawer), locking.
4 EA	Non-fire resistant cabinets (legal size/4 drawer), locking.
2 EA	Storage racks to hold 3 ft x 5 ft display charts.
1 EA	Mail slot bin - legal size.
2 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.
1 EA	Flat file (4/drawers).
4 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.
4 EA	Electronic office type printing calculators capable of addition, subtraction, multiplication and division with memory and a supply of printing paper.
1 EA	Business telephone system for three lines with ten handsets, intercom capability, and one speaker phone for conference table.
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 - high speed, dry, plain paper with sorting capability, automatic feeder and reducing capability. The copier shall be capable of producing a minimum of 25 copies per minute. All supplies, paper and maintenance shall be provided by the Contractor.
8 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.
3 EA	Digital Camera as specified below under <u>Computer Hardware and Software</u> . All supplies and maintenance shall be provided by the Contractor.
2 EA	Wastebaskets - 30 gal., including plastic waste bags.
10 EA	Wastebaskets - 5 gal., including plastic waste bags.
2 EA	Electric pencil sharpeners.
2 EA	Electric wall clocks.
* 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	Coat rack with 20 coat capacity.
1 EA	Tables - 3 ft x 6 ft.

QTY	Description:
6 EA	Interior partitions - 6 ft x 6 ft, soundproof type, portable and freestanding.
2 EA	Vertical plan racks for 2 sets of 2 ft x 3 ft plans for each rack..
2 EA	Double door supply cabinet with 4 shelves and a lock - 6 ft x 4 ft.
1 EA	Easel/chalkboard.
2 EA	Open bookcases - 3 shelf - 3 ft long.
2 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 four (4) telephone lines: three (3) lines for phone/voice service and one (1) line dedicated for the facsimile machine. The Contractor shall pay all charges except for 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 CAT 5e LAN cables from workstations, install patch panel in data circuit demark area and terminate runs with RJ45 jacks at each computer location. Terminate runs to patch panel in LAN switch area. Each cable 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 (1) a high-speed multi-function all-in-one printer/copier/scanner/fax machines listed on the approved printer list in place of one required laser printer and fax machine, and (2) a multi-function all-in-one printer/copier/scanner/fax machine listed on the approved printer list in place of the second required laser printer and fax machine. Only one of these devices is required to be set-up to function as the one required 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 forty thousand dollars (\$40,000.00) 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 respective item "Construction Field Office, Extra-Large", 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, Extra-Large".

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, Extra-Large	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 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 #0971001A – MAINTENANCE AND PROTECTION OF TRAFFIC**

### **9.71.01 – Description:** Add the following:

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

#### **I-84/Route 2**

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 12-feet in width per lane.

The Contractor shall be allowed to halt traffic on I-84 Eastbound for a period of time not to exceed 10 minutes, for the purpose of erecting / removing overhead sign supports or structural steel and girders. 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 2 Westbound to Founders Bridge**

The Contractor shall maintain and protect existing traffic operations.

Excepted there from will be these periods, during the allowable periods, when the Contractor is actively working, at which time the Contractor shall be allowed to maintain and protected a minimum of one lane of traffic, on a paved travel path not less than 12-feet in width

The Contractor will be allowed to close the ramp supporting Route 2 Westbound (from Route 2 Westbound to the Founders Bridge) to through traffic and detour traffic as shown on the Detour Plan contained in the Contract Plans for Site No. 4.

#### **Route 44**

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 in each direction, on a paved travel path not less than 12-feet in width.

## **Ramps and Turning Roadways**

Refer to the Index Plan in Subset 1 of the Contract Plans for the following ramp locations:

- I-84 Connector (TR 833 - from Founders Bridge to I-84 Eastbound)

The Contractor shall maintain and protect existing traffic operations.

The Contractor will be allowed to close I-84 Connector (TR 833 - from Founders Bridge to I-84 Eastbound) to through traffic and detour traffic from 10:00 Friday evening to 5:00 Monday morning as shown on the Detour Plan contained in the Contract Plans for Site Nos. 1 and 4.

The Contractor shall be allowed to halt traffic for a period of time not to exceed 10 minutes, during the allowable periods, for the purpose of erecting / removing overhead sign supports or structural steel and girders. 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.

- SR 500 TR 805 from Governor Street to Route 2 Eastbound

The Contractor shall maintain and protect existing traffic operations.

The Contractor will be allowed to close SR 500 TR 805 from Governor Street to Route 2 Eastbound to through traffic and detour traffic as shown on the Detour Plan contained in the Contract Plans for Site Nos. 1 and 4. Closure for Site No. 4 work to only be allowed from 10:00 Friday evening to 5:00 Monday morning.

- TR 830 from I-84 Westbound to Route 2 Eastbound

The Contractor shall maintain and protect a paved travel path not less than 12-feet in width.

The Contractor will be allowed to close the TR 830 from I-84 Westbound to Route 2 Eastbound to through traffic and detour traffic from 10:00 Friday evening to 5:00 Monday morning as shown on the Detour Plan contained in the Contract Plans for Site No. 4.

- TR 831 from I-84 Connector to Governor Street

The Contractor shall maintain and protect a paved travel path not less than 12-feet in width.

The Contractor will be allowed to close the TR 831 from I-84 Connector to Governor Street to through traffic and detour traffic as shown on the Detour Plan contained in the Contract Plans for Site Nos. 3 and 4. Closure for Site 4 work to only be allowed from 10:00 Friday evening to 5:00 Monday morning.

- SR 500 TR 801 from Route 2 Westbound to Governor Street

The Contractor shall maintain and protect a paved travel path not less than 12-feet in width.

During Stage Construction the Contractor shall maintain and protect one lane of traffic on a paved travel path not less than 11-feet in width in accordance with the Stage Construction Plans contained in the Contract Plans for Site No. 2.

- TR 827 from Route 2 Westbound to I-84 Westbound

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.

The Contractor shall be allowed to halt traffic for a period of time not to exceed 10 minutes, during the allowable periods, for the purpose of erecting / removing overhead sign supports or structural steel and girders. 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.

- TR 829 Route 2 Westbound to I-84 Eastbound

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.

- TR 212 On-ramp from Pitkin Street to I-84 Connector (TR 833)

The Contractor shall maintain and protect existing traffic operations.

The Contractor will be allowed to close TR 212 On-ramp from Pitkin Street to I-84 Connector (TR 833) to through traffic and detour traffic as shown on the Detour Plan contained in the Contract Plans for Site Nos. 1 and 4. Closure for Site No. 1 work to only be allowed from 10:00 Friday evening to 5:00 Monday morning.

**Pitkin Street, East River Drive, Darlin Street, Black Smith Lane, Ash Street and Governor Street**

The Contractor shall maintain and protect existing traffic operations along the detour routes, as shown on the Detour Plans contained in the Contract Plans.

**All Other Roadways**

The Contractor shall maintain and protect a minimum of one lane of 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.

**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.

**9.71.03 - Construction Method:** Add the following:

**General**

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.

### Traffic Signals

Loop detectors disturbed by the Contractor's operations shall be made operational, in accordance with the special provision for Item No. 1111451A – Loop Detector Saw Cut, or temporary detection shall be provided within 24 hours of the termination of the existing loop detectors.

### Existing Signing

The Contractor shall maintain all existing overhead and side-mounted signs throughout the project limits during the duration of the project, unless called for removal within the Contract Plans. 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.

#### Pavement Markings on Town Roads While Detours are in Place

The Contractor shall install Temporary Plastic Pavement Marking Tape pavement markings along the existing pavement along the Detour Routes, as shown in the Plans and on all Town roads. These temporary pavement markings shall include centerlines, lane lines (broken lines), lane-use arrows, and stop bars; shoulder edge lines are not required. These temporary pavement markings shall be removed in a manner that does not damage the pavement once construction is complete.

#### 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 travelpath 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)

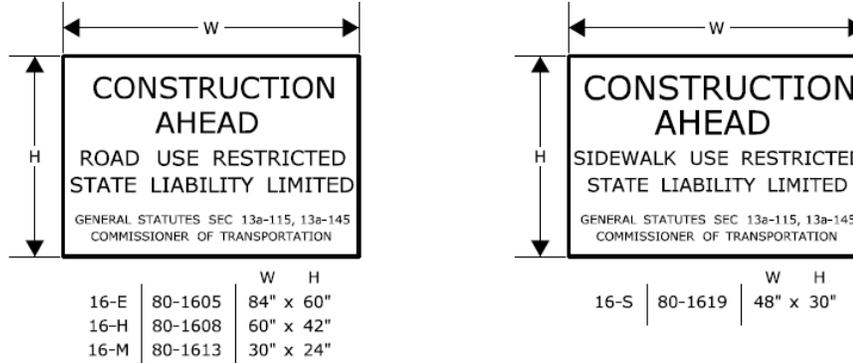
- 7.a) For lane closures on limited access roadways and interchange ramps, one CMS shall be used in advance of the traffic control pattern. Prior to installing the pattern, the CMS shall be installed and in operation, displaying the appropriate lane closure information (i.e.: Left Lane Closed - Merge 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 and interchange ramps, 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 RAMP 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 RAMP, OTHER STATE ROADWAYS, AND MAJOR TOWN/CITY ROADWAYS.

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

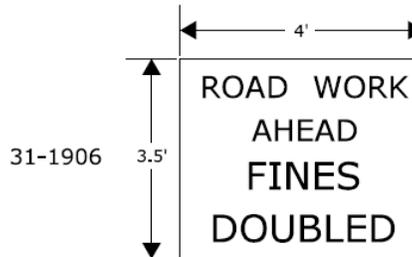
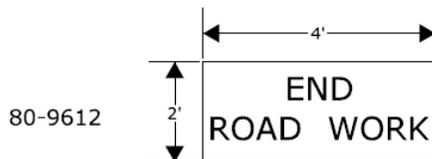
**REGULATORY SIGN "ROAD WORK AHEAD, FINES DOUBLED"**

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

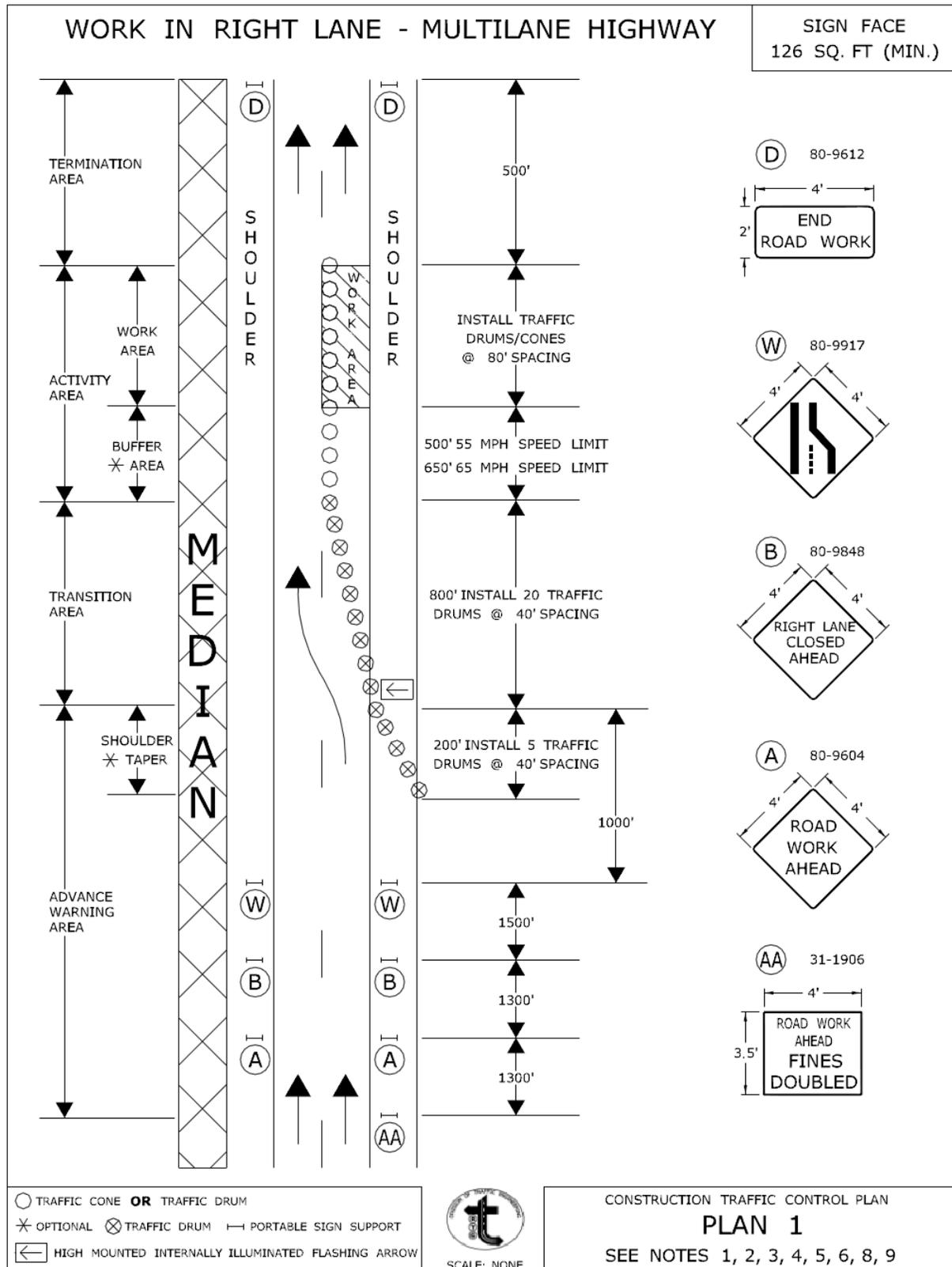
### CONSTRUCTION TRAFFIC CONTROL PLAN NOTES

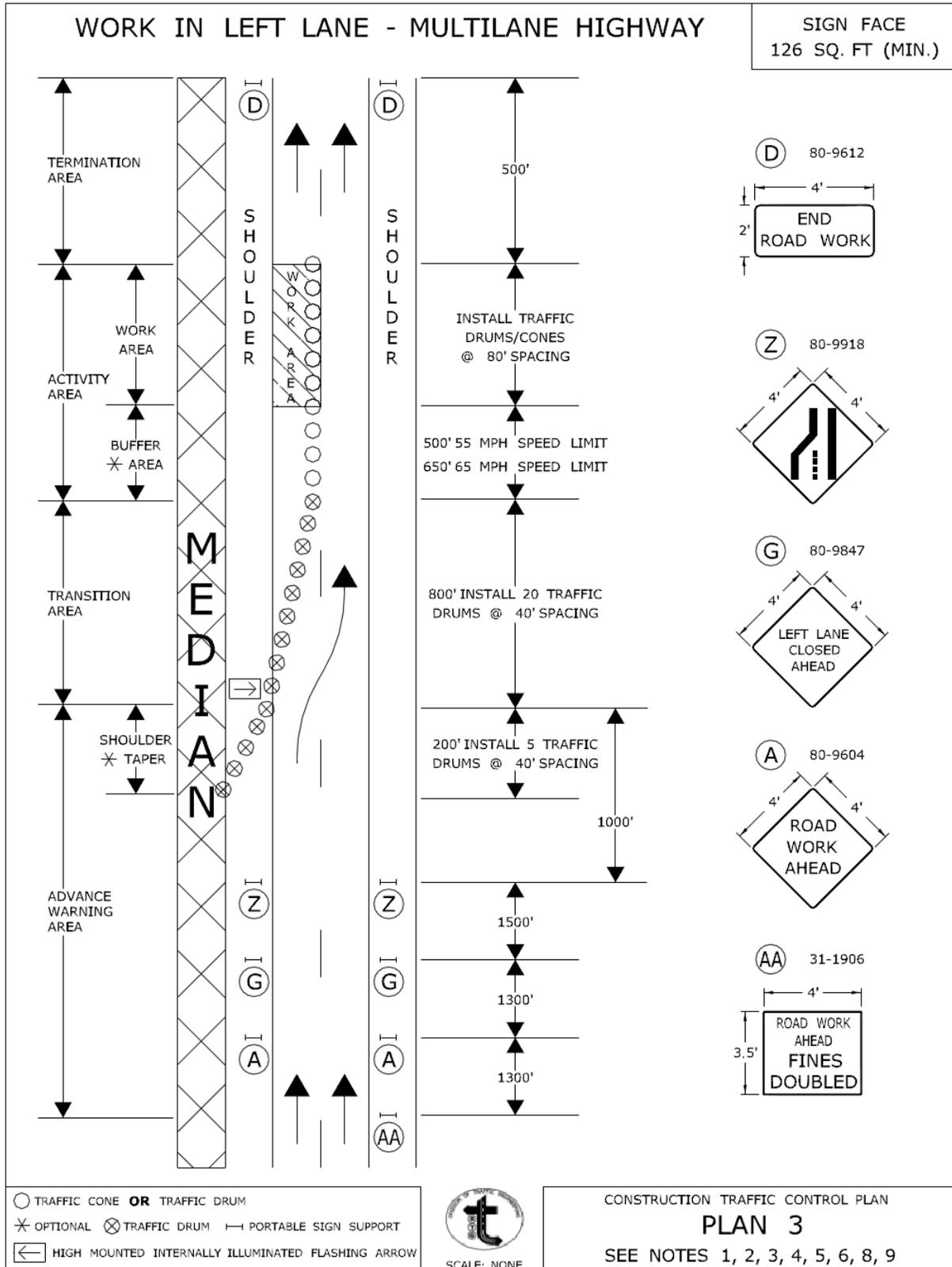
CONNECTICUT DEPARTMENT OF TRANSPORTATION  
BUREAU OF ENGINEERING & CONSTRUCTION

APPROVED

*Charles S. Harlow*  
PRINCIPAL ENGINEER

Charles S. Harlow  
2012.06.05 15:50:35-0400



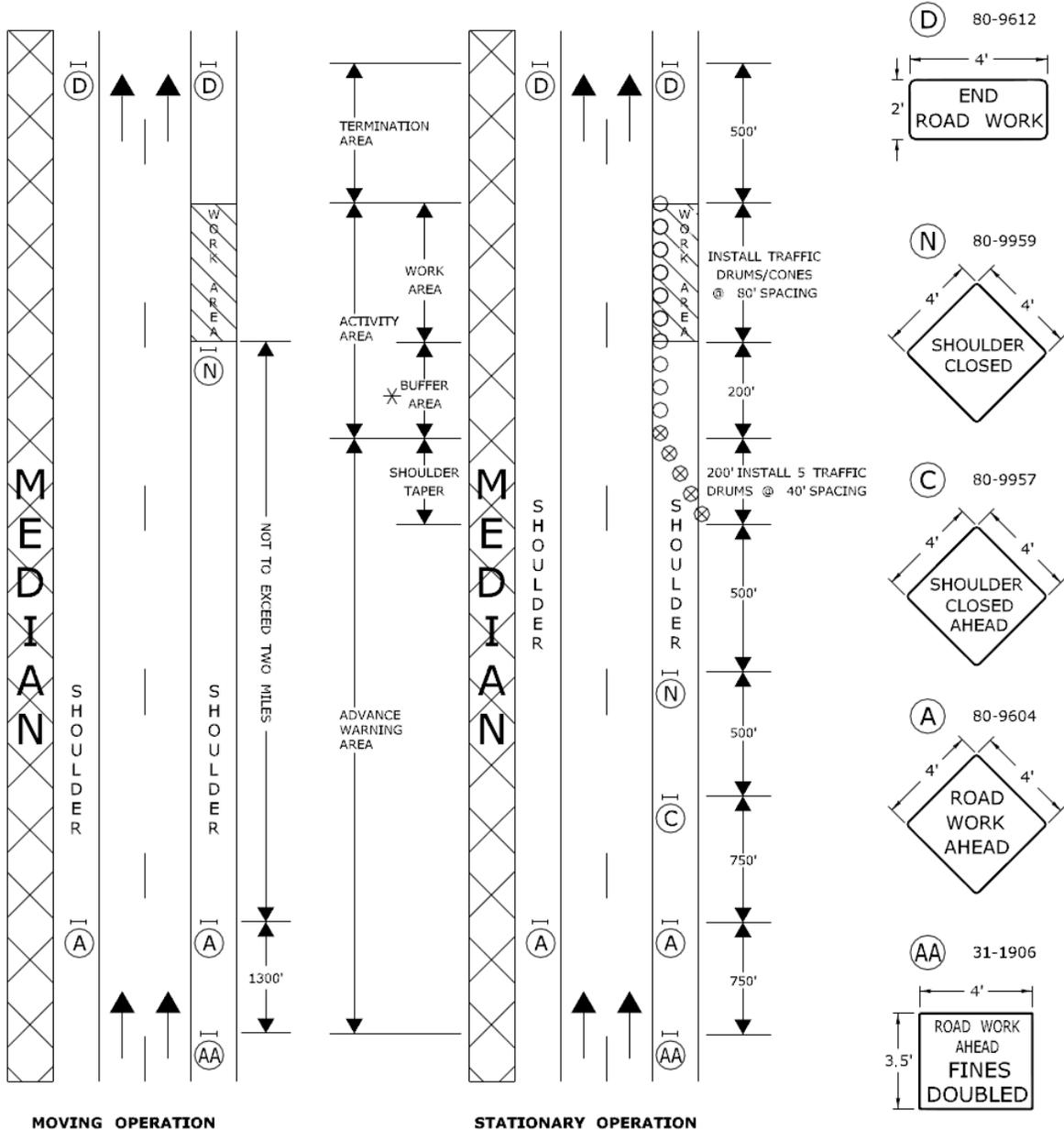


CONNECTICUT DEPARTMENT OF TRANSPORTATION  
BUREAU OF ENGINEERING & CONSTRUCTION

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

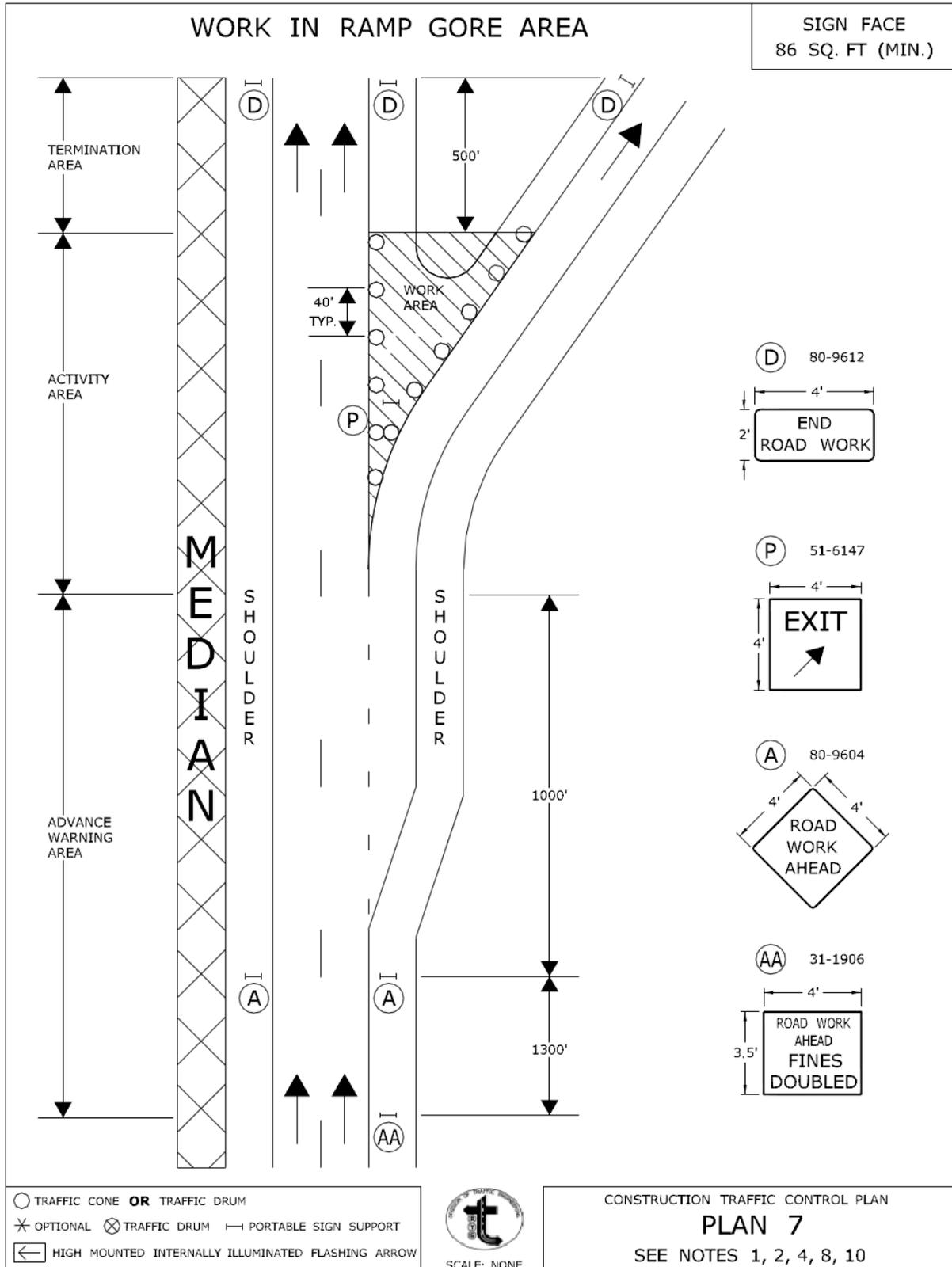
SEE NOTES 1, 2, 4, 8

CONNECTICUT DEPARTMENT OF TRANSPORTATION  
BUREAU OF ENGINEERING & CONSTRUCTION

APPROVED

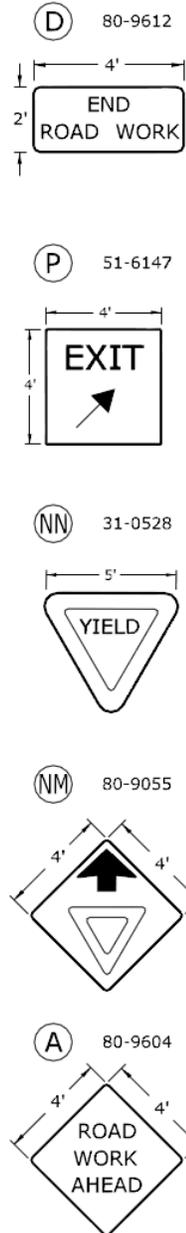
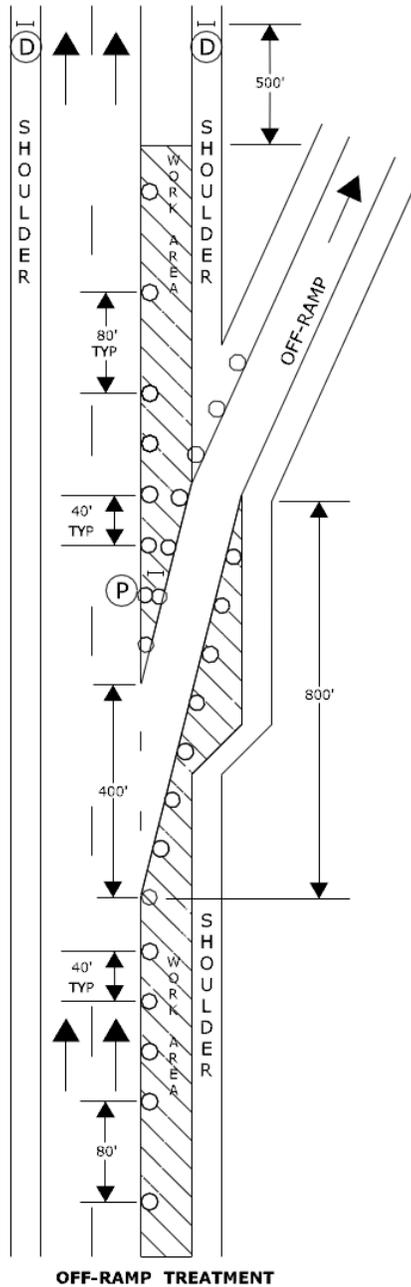
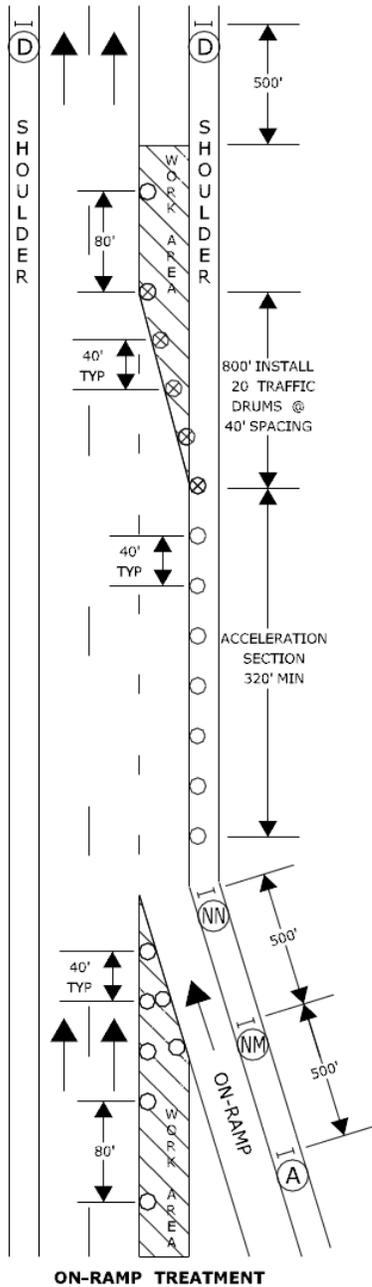
*Charles S. Harlow*  
PRINCIPAL ENGINEER

Charles S. Harlow  
2012.06.05 15:52:38-04'00"



## TYPICAL RAMP TREATMENTS FOR MAINLINE LANE CLOSURE - MULTILANE HIGHWAY

SIGN FACE  
SQ. FT. VARIES



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

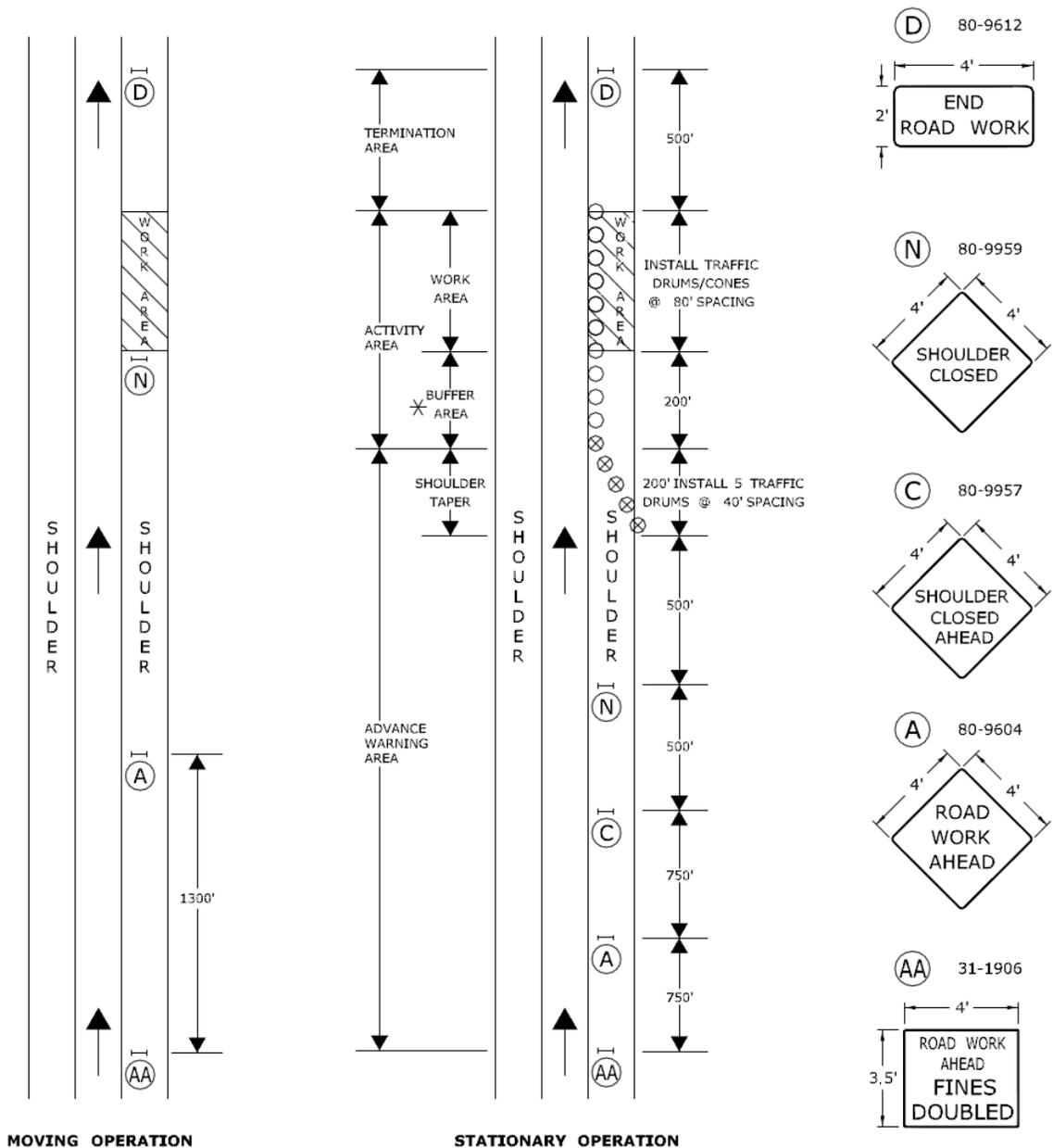
CONSTRUCTION TRAFFIC CONTROL PLAN  
**PLAN 8**  
SEE NOTES 1, 2, 3, 4, 5, 6, 8, 9, 10

CONNECTICUT DEPARTMENT OF TRANSPORTATION  
BUREAU OF ENGINEERING & CONSTRUCTION

APPROVED *Charles S. Harlow*  
PRINCIPAL ENGINEER  
Charles S. Harlow  
2012.06.05 15:53:31-0400

WORK IN SHOULDER AREA - TURNING ROADWAYS / RAMPS

SIGN FACE  
70 SQ. FT (MIN.)



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



SCALE: NONE

CONSTRUCTION TRAFFIC CONTROL PLAN

PLAN 9

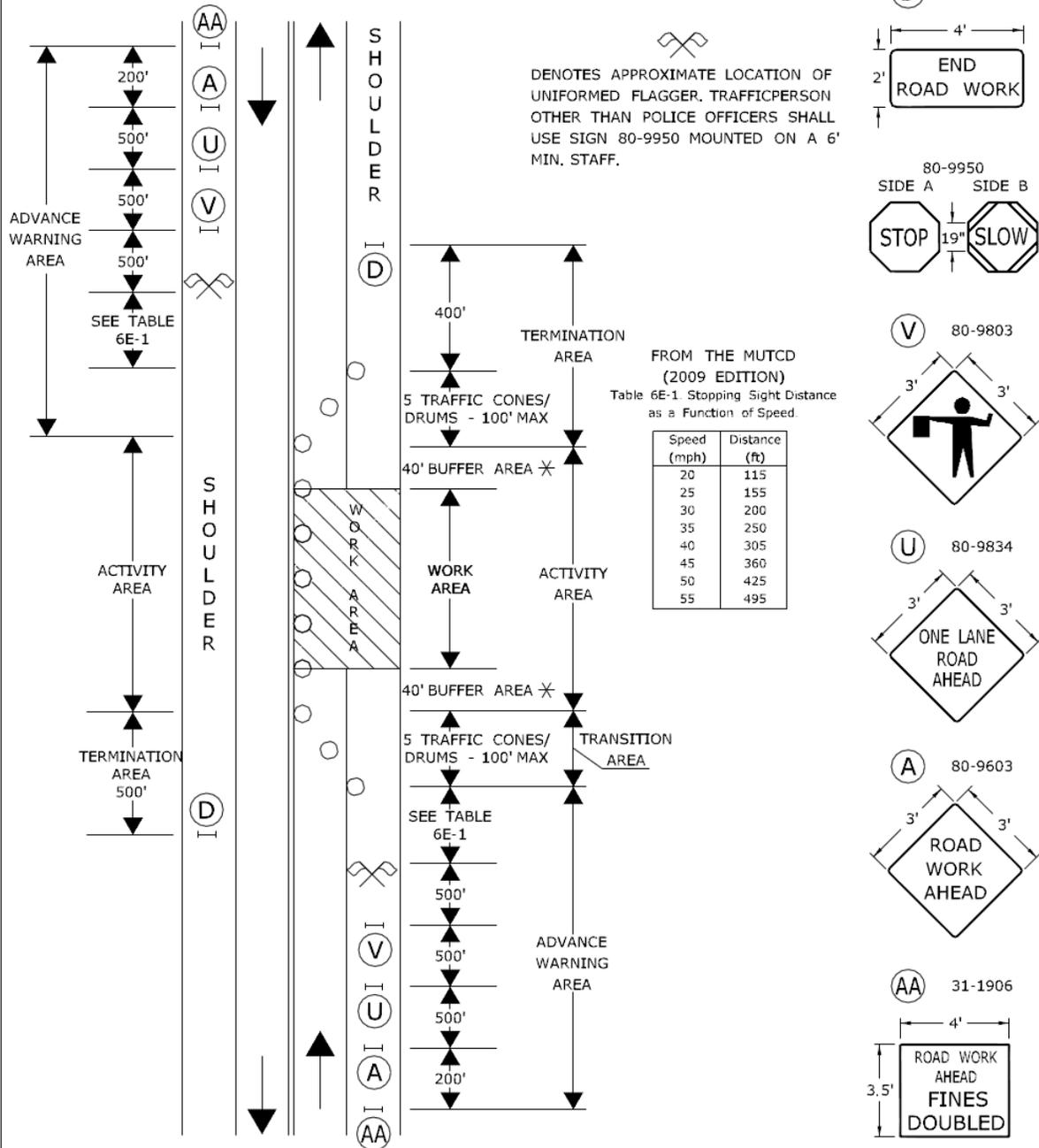
SEE NOTES 1, 2, 4, 8

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BUREAU OF ENGINEERING & CONSTRUCTION

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

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

SIGN FACE  
108 SQ. FT (MIN.)



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



SCALE: NONE

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

CONNECTICUT DEPARTMENT OF TRANSPORTATION  
BUREAU OF ENGINEERING & CONSTRUCTION

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

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

SIGN FACE  
108 SQ. FT (MIN.)

## HAND SIGNAL METHODS TO BE USED BY UNIFORMED FLAGGERS

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

**A. TO STOP TRAFFIC**

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



**B. TO DIRECT TRAFFIC TO PROCEED**

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



**C. TO ALERT OR SLOW TRAFFIC**

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



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

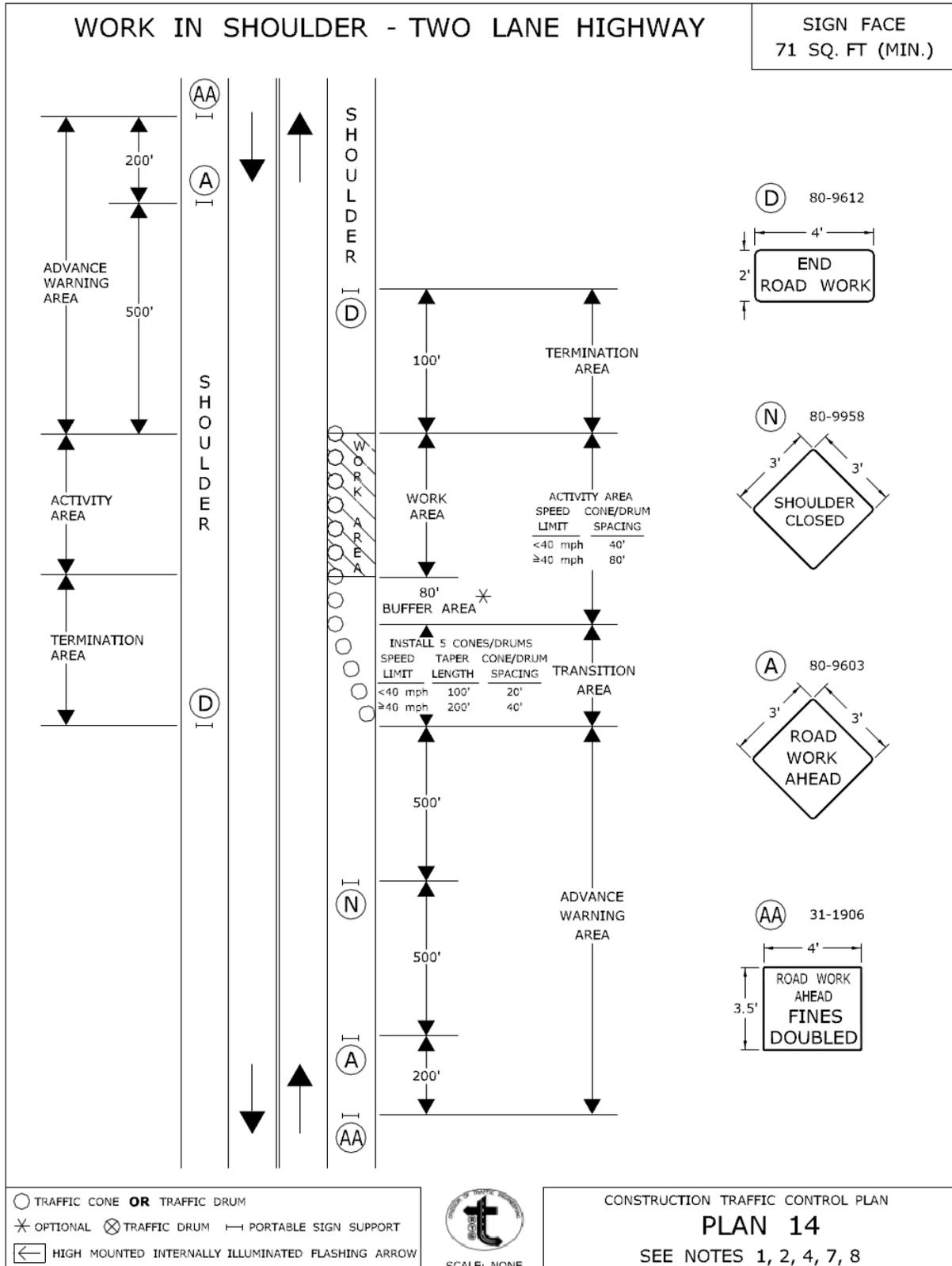


SCALE: NONE

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

CONNECTICUT DEPARTMENT OF TRANSPORTATION  
BUREAU OF ENGINEERING & CONSTRUCTION

APPROVED *Charles S. Harlow*  
PRINCIPAL ENGINEER Charles S. Harlow  
2012.06.05 15:55:45-04'00'



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



SCALE: NONE

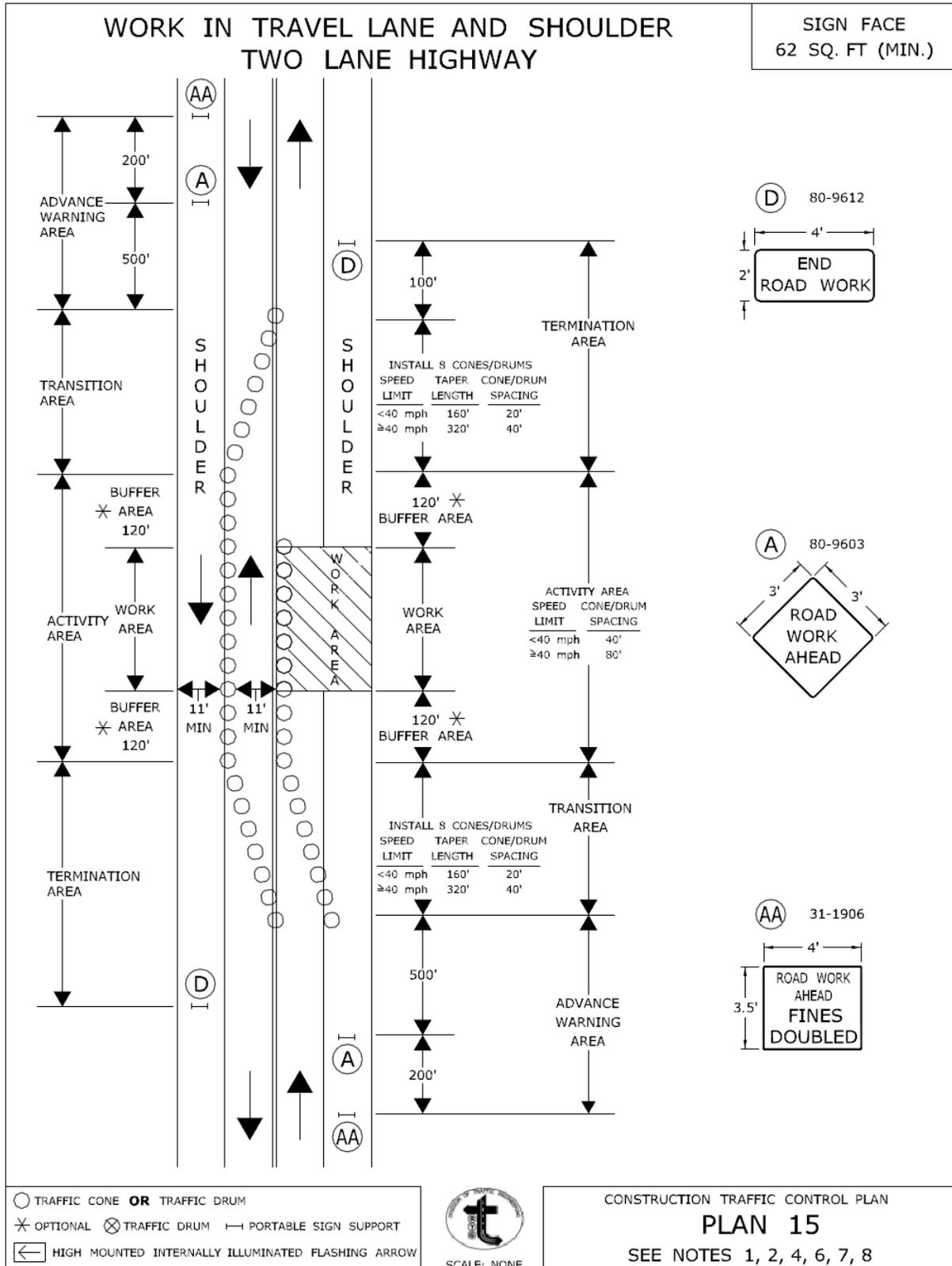
CONSTRUCTION TRAFFIC CONTROL PLAN

### PLAN 14

SEE NOTES 1, 2, 4, 7, 8

CONNECTICUT DEPARTMENT OF TRANSPORTATION  
 BUREAU OF ENGINEERING & CONSTRUCTION

APPROVED *Charles S. Harlow* Charles S. Harlow  
 2012.08.05 15:56:09-04'00"  
 PRINCIPAL ENGINEER



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



SCALE: NONE

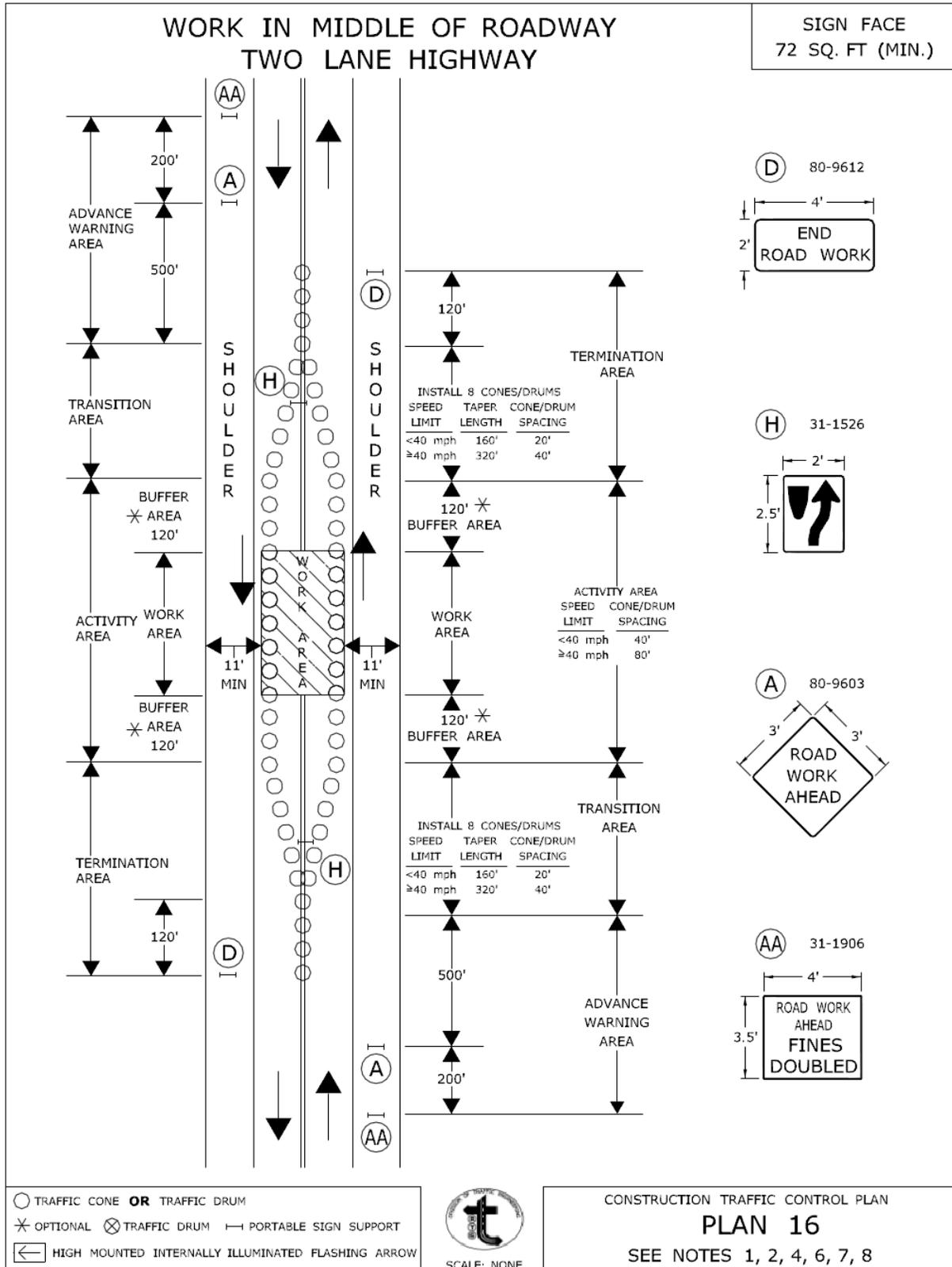
CONSTRUCTION TRAFFIC CONTROL PLAN

### PLAN 15

SEE NOTES 1, 2, 4, 6, 7, 8

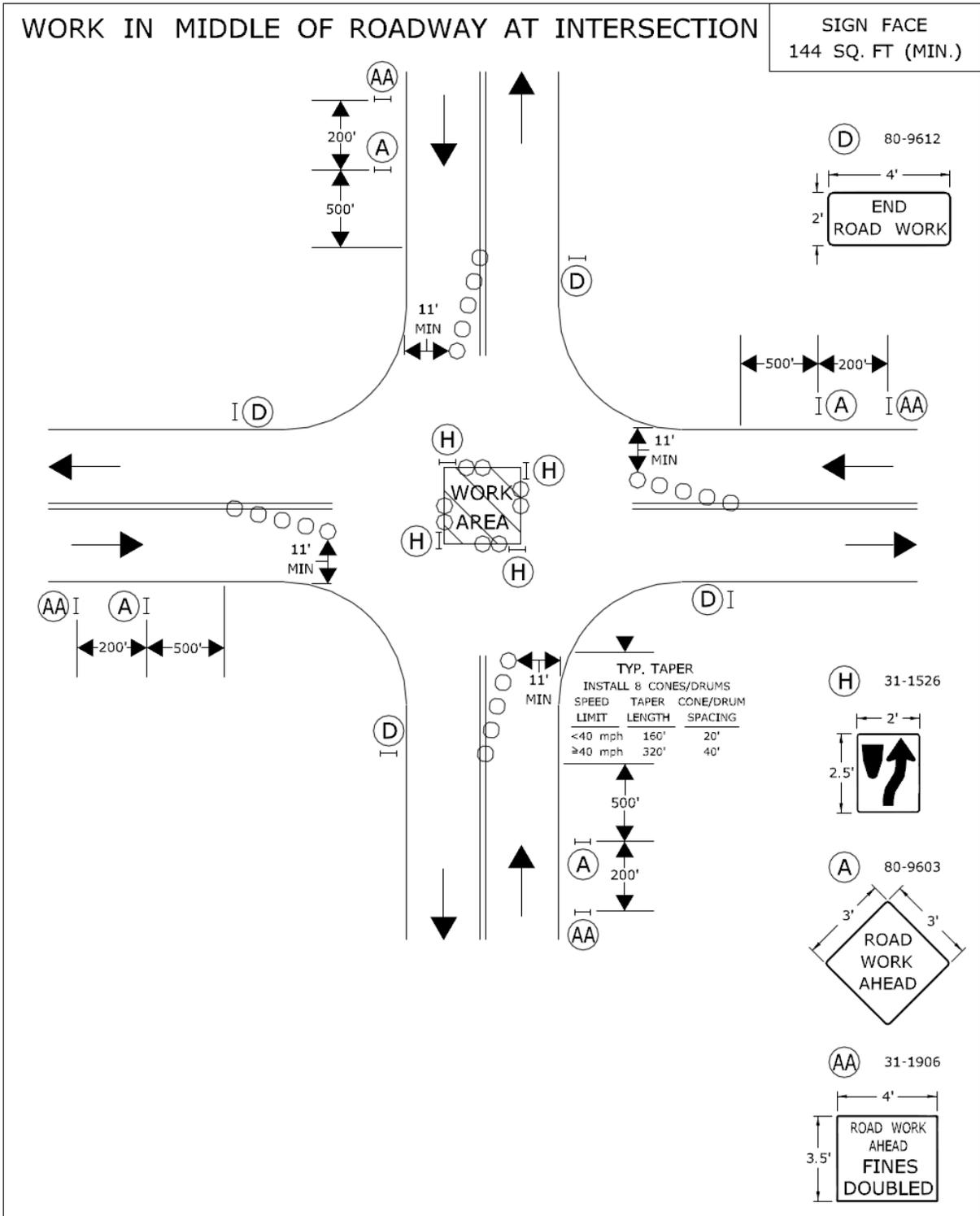
CONNECTICUT DEPARTMENT OF TRANSPORTATION  
BUREAU OF ENGINEERING & CONSTRUCTION

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



APPROVED *Charles S. Harlow*  
 Charles S. Harlow  
 2012.08.05 15:56:51-04'00"  
 PRINCIPAL ENGINEER

CONNECTICUT DEPARTMENT OF TRANSPORTATION  
 BUREAU OF ENGINEERING & CONSTRUCTION



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



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

CONNECTICUT DEPARTMENT OF TRANSPORTATION  
 BUREAU OF ENGINEERING & CONSTRUCTION

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

**9.71.05 – Basis of Payment:** Add 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 #0974001A - REMOVAL OF EXISTING MASONRY**

**9.74.01 - Description:** Work under this item shall conform to the requirements of Section 9.74 amended as follows:

**9.74.02 - Construction Methods:** Add the following:

The concrete shall be removed to the limits shown on the plans. The concrete shall be saw cut to delineate the removal limits. Pneumatic hammers or any other method approved by the Engineer may be used to remove the concrete. Maximum 30 pound hammers shall be used for general removal while maximum 15 pound hammers shall be used near reinforcing steel that is to remain. Pneumatic tools shall not be placed in direct contact with the reinforcing steel that is to remain.

Reinforcing steel and anchor bolts shall be cut and removed as shown on the plans. Loose and small concrete fragments shall be cleaned from the reinforcing steel required to be left in place.

The Contractor shall take necessary precautions to prevent any damage to the portions of the structure to remain. Any damage shall be repaired by the Contractor, as directed by the Engineer, and at no cost to the State.

When removing the concrete and reinforcing steel, the Contractor shall take necessary precautions to prevent debris from dropping to areas below the structure onto the roadway below or onto adjacent traffic lanes.

All debris shall be disposed of, from the site, by the Contractor.

**9.74.05 - Basis of Payment:** Delete in its entirety and replace with the following:

This work will be paid for at the contract unit price per cubic yard for "Removal of Existing Masonry", which price shall include all equipment, tools and labor incidental thereto.

The work, materials, tools, equipment and labor incidental to the saw cutting of concrete is included in the item and will not be measured for payment.

<u>Pay Item</u>	<u>Pay Unit</u>
Removal of Existing Masonry	C.Y.

## **ITEM #0974099A - REMOVAL OF DETERIORATED CONCRETE**

### **Description:**

This item shall consist of surveying the existing reinforced concrete piers as directed by the Engineer. The Contractor, under the direction of the Engineer, shall locate and remove loose concrete, deteriorated concrete, spalled and scaled areas and concrete overlaying hollow areas as well as any other concrete designated for removal under this item in accordance with these specifications and to the satisfaction of the Engineer.

This work shall also include sandblasting and cleaning these areas and any exposed reinforcing. Exposed reinforcing shall have a zinc primer applied prior to placing new concrete.

The Contractor shall not perform any repair work without prior approval of the Engineer for locations, limits and types of repairs.

### **Materials:**

The single component coating shall be one of the zinc rich primers listed in the latest Product Reference List noted in Section M.07.02. The color of the coating shall be FS 26270 (Medium Gray).

### **Construction Methods:**

A survey of the existing structure shall be performed by the Contractor, under the direction and to the satisfaction of the Engineer, to determine the exact limits and locations of all areas to be removed under this item.

The perimeter of each deteriorated area shall be delineated with a 1/2" deep sawcut. When sawcutting the concrete, care shall be taken not to cut existing reinforcing.

Loose and deteriorated concrete shall be chipped away back to sound concrete. The exposed surfaces shall be thoroughly sandblasted and vacuumed immediately prior to forming.

Hollow areas in the existing concrete shall be completely exposed by chipping away back to sound concrete and thoroughly sandblasted and vacuumed immediately prior to forming.

Spalled and scaled areas shall be cleaned of all loose deteriorated concrete. The exposed surfaces shall be thoroughly sandblasted and vacuumed immediately prior to forming.

Removal of unsound concrete material shall be such as to facilitate uniform placement of fresh concrete. All upper areas of excavated voids shall slope evenly out to within one inch (1") of the face of the concrete to preclude entrapping air and forming hollow spots in the freshly placed

concrete. Within one inch (1") of the surface, the outline shall be essentially normal (perpendicular) to the surface.

All surfaces of exposed concrete and reinforcing steel shall be free of oil, solvent, grease, dirt, dust, bitumen, rust, loose particles and foreign matter. Prior to sandblasting of concrete and steel surfaces, all petroleum contamination on these surfaces shall be removed by appropriate solvent or detergent cleaning operations. All compressed air equipment used in cleaning shall have properly sized and designed oil separators, attached and functional, to assure the delivery of oil free air to the nozzle.

Extreme care shall be taken where reinforcing steel is uncovered not to damage the steel or its bond in the surrounding concrete. Pneumatic tools shall not be placed in directed contact with reinforcing steel. Maximum 15 lb. size hammers shall be used for general chipping and removal. Exposed reinforcing shall remain in place except where specifically indicated for removal by direction of the Engineer. Exposed reinforcing steel shall be sandblasted in accordance with SSPC-SP-6, Commercial Blast Cleaning, to remove all contaminants, rust and rust scale.

In areas where reinforcing steel is found to be surrounded by deteriorated concrete or has at least one-half of its surface area exposed or has less than 1" cover, the depth of removal shall be such as to include all deteriorated concrete but not less than 3/4" below or behind the reinforcing steel.

Where the existing reinforcing steel is severely corroded or damaged, it shall be cut out and replaced with new reinforcing steel of the same size with a minimum length for lap splices as directed by the Engineer. Concrete shall be removed to a minimum depth of 3/4" behind the new steel.

When existing steel is determined by the Engineer to have insufficient cover, it shall be either replaced or adjusted as directed. Concrete shall be removed to a minimum depth of 3/4" behind the existing steel.

When using sandblasting equipment, all work shall be shielded and contained for the protection of the public and the environment.

The exposed blast cleaned reinforcing steel shall be coated with the single component zinc primer by brush. All application of the zinc primer shall be in accordance with the manufacturer's printed instructions.

### **Basis of Payment:**

This work will be paid for at the contract unit price per cubic foot for "Removal of Deteriorated Concrete", complete in place. The price shall include locating and removal of deteriorated concrete, any required sawcutting, sandblasting, cleaning and surface preparation within the removal limits and zinc primer placed on reinforcing steel. It shall also include all equipment, tools, labor and incidentals necessary to complete the work and proper disposal of all debris generated during the removal process.

There will be no direct payment for the cost of furnishing and placing replacement reinforcing steel, but the cost of this work shall be considered as included in the general cost of the work.

<u>Pay Item</u>	<u>Pay Unit</u>
Removal of Deteriorated Concrete	c.f.

## **ITEM #0974105A – CONCRETE HAUNCH REMOVAL**

**Description:** Work under this item shall consist of removing a portion of concrete beam haunch from the underside of the bridge deck slab along the edge of all beams.

### **Materials:**

Epoxy Resin: The epoxy resin shall be a two component system. The base polymer shall be a thermosetting resin of the epoxy type. The epoxy resin shall be composed of 100% reactive constituents, which are a condensation product of the reaction of epichlorohydrin with bisphenol ether of bisphenol A, containing no more than trace amounts of hydrolyzable chloride. The epoxy resin shall have an epoxide equivalent between 465 and 530.

The reacting system shall consist of a blend of condensation polymers of dimerized and trimerized unsaturated fatty acids and an aliphatic polyamine.

Unless otherwise specified, pigmentation shall be required in the system so that the cured coating shall conform to the Federal Color Standard 595, No. 16357.

#### a) Physical Requirements of (Mixed) Epoxy Resin System:

A mixture of both components in the proportions recommended by the manufacturer shall conform to the following requirements:

Viscosity - 500 to 800 centipoises at 77°F

Pot life - 7 hours minimum at 75°F

Minimum solids content - 48%

The cured system shall not exhibit amine blushing or sweating.

When testing for abrasion by ASTM Designation D968, the pigmented finish coats shall require a minimum of 50 liters of sand to abrade a one mil thickness of coating.

A 2½ mil dry film thickness of the coating tested according to ASTM Designation D522 shall pass a 1/8" diameter mandrel test without splitting the film or causing loss of bond.

#### b) Sampling:

A representative sample of each component sufficient for the test specified shall be taken by a Department representative either from a well-blended bulk lot prior to packaging or by withdrawing 3 fluid ounce samples from no less than 5 percent by random selection of the containers comprising the lot or shipment. Unless the samples of the same component taken from containers show evidence of variability, they may be blended into a single composite sample to represent that component. The entire lot of both components may be rejected if samples submitted for test fail to meet any requirements of this specification.

c) Packaging and Marking:

The two components of the epoxy resin system furnished under these specifications shall be supplied in separate containers which are non-reactive with the materials contained therein. The size of the container shall be such that the recommended proportions of the final mixture can be obtained by combining one container of one component with one or more whole containers of the other component.

Containers shall be identified as base polymer and reacting system, and shall show the mixing directions and usable temperature range as defined by these specifications. Each container shall be marked with the name of the manufacturer, the lot or batch number, the date of packaging, pigmentation if any, and the quantity contained therein in pounds and gallons.

Printed instructions from the manufacturer for mixing and applying the material shall be included.

Potential hazards shall be so stated on the package in accordance with the Federal Hazardous Products Labeling Act.

d) Control of Materials:

A Materials Certificate will be required in accordance with Article 1.06.07, certifying the conformance of the epoxy resin to the requirements set forth in this specification.

**Construction Methods:** The Contractor shall remove a portion of the concrete beam haunch located directly over underpass roadways and sidewalks in accordance with details and limits shown on the plans and as directed by the Engineer.

Concrete shall be removed by saw-cut and pneumatic hammer methods specified herein which do not damage the sound concrete in the bottom of the bridge deck, the adjacent steel beam, and portion of the beam haunch to remain.

A three (3) inch deep saw-cut shall be made into the haunch, as shown on the plans, using a concrete saw guided on a fixed track system for exact control of saw cut alignment and depth of cut, except at locations above bridge beam diaphragms or other obstructions having insufficient vertical clearance for saw-cutting equipment. Following the completion of the saw-cut, the portion of the haunch to be removed shall be broken away by percussive methods.

At haunch removal locations over bridge beam diaphragms or other obstructions having insufficient clearance for track guided concrete saw equipment, pneumatic hammers may be used to remove a portion of the beam haunch as shown on the plans. The maximum weight of pneumatic hammers used in the removal shall be 30 pounds.

The Engineer shall examine the underside of the bridge deck for popouts caused by the removal of haunches. The surface area of popouts 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 popouts extend beyond the bottom layer of reinforcing steel, the popouts shall be repaired as directed by the Engineer.

Contractor shall take adequate measures to prevent concrete chips, concrete sawing slurry, tools and materials from accumulating on the bridge structure and dropping onto the travel lanes below the structure. All debris shielding will be paid under item 602971A.

All debris shall be promptly swept up, removed, and satisfactorily disposed of by the Contractor from the site.

**Method of Measurement:** This work will be measured for payment by the number of linear feet of concrete beam haunch removed in accordance with the plans and accepted by the Engineer.

**Basis of Payment:** This work will be paid for at the contract unit price per linear foot for "Concrete Haunch Removal", which price shall include the removal of a portion of the concrete haunch along each edge of a beam, furnishing and application of epoxy resin, disposal of removed concrete, and all materials, equipment, tools and labor incidental thereto.

Pay Item

Concrete Haunch Removal

Pay Unit

L.F.

**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.

<u>Pay Item</u>	<u>Pay Unit</u>
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 in National Cooperative Highway Research Program (NCHRP) Report 350 or the AASHTO Manual for Assessing Safety Hardware (MASH) 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 have been crash tested and have 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 appropriate.

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.

<b>Pay Item</b>	<b>Pay Unit</b>
Construction Barricade Type III	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 #1001001A – TRENCHING AND BACKFILLING**

The work under the item Trenching and Backfilling shall conform to Section 10.01 of the Standard Specifications amended as follows:

**Construction Methods:** Article 10.01.03 – Construction Methods, add the following:

All cuts in roadways shall be done in a neat and workmanlike manner, so as to cause the least possible injury to all other improvements. The Contractor should provide protection to all slopes, roadways, guide rails, drainage structures, illumination conduit and appurtenances, utilities, etc. as may be necessary or as required by the Engineer. Any property damage caused by excavation shall be repaired as directed by, and to the satisfaction of, the Engineer at no additional compensation. Excavating shall not be performed until immediately before installation of conduit and other appurtenances. The material from the excavation shall be placed where directed by the Engineer and in a position where the least damage and obstruction to vehicular traffic and the least interference with the surface drainage will occur.

All excavations shall be closed at the end of each day.

All pavement cutting required for this item, regardless of the type, shall be included as work under this item.

Where possible, communication conduit and electrical conduit shall be installed in the same trench and shall be paid for under this item as one. Payment shall not be made for separate trenching and backfilling where electrical and communication conduit may be installed in the same trench, but have been installed separately by the Contractor.

When trenching occurs in roadways, neat lines shall be drawn on the surface and the roadway shall be saw cut and removed to neat lines as indicated on the plans or as directed by the Engineer.

### **Temporary Pavement Repair**

#### **Description:**

Temporary pavement repair consists of replacing pavement that has been removed for the installation of conduits. The Contractor shall repair the pavement immediately upon completion of the trench backfilling and compaction in accordance with these specifications and to the dimensions on the contract drawings or as directed by the Engineer.

#### **Materials:**

Superpave 12.5 mm and Superpave 9.5 mm shall conform to the requirements of Article M.04 of the Standard Specifications.

**Construction Methods:**

Temporary pavement replacement shall be constructed in accordance with the details shown on the plans.

**Permanent Pavement Repair**

**Description:**

After the temporary pavement has been in place for 30 days and within 3 months of placing the temporary pavement, the Contractor shall make permanent pavement repairs. Where trenching occurs across bituminous concrete overlaid concrete pavement, immediate permanent pavement repairs shall take place. These repairs shall include filling the trench with high-early concrete fill and upon curing, permanent surface pavement repairs.

**Materials:**

Concrete fill for restoration of bituminous concrete overlaid concrete pavement shall conform to the requirements of Article M.03.01 of the Standard Specifications and shall be capable of achieving 3000 psi within 12 hours. The Contractor shall submit a design mix to the Engineer for approval.

Processed Aggregate Base shall conform to the requirements of Article M.05.01 of the Standard Specifications.

Superpave 12.5 mm and Superpave 9.5 mm shall conform to the requirements of Article M.04 of the Standard Specifications.

Joint Seal shall conform to the requirements of Article M.04.02 of the standard specifications.

Reinforcement shall conform to the requirements of ASTM A615, Grade 60.

**Unpaved Areas**

**Description:**

Unpaved areas disturbed during construction shall be restored with a minimum of 50 MM of topsoil and established turf.

**Materials:**

Topsoil shall conform to the requirements of Article M.13.01-1 of the standard specifications. Turf Establishment materials shall conform to Article M.13 of the Standard Specifications.

**Construction Methods:**

Topsoil shall be provided in conformance to Section 9.44.03 of the standard specifications. Turf Establishment shall conform to Section 9.50.03 of the Standard Specifications.

**Method of Measurement:** Article 10.01.04 – Method of Measurement: Add the following:

There shall be no separate measurement for sawcutting, temporary pavement repair, concrete fill, joint sealing, permanent pavement repair, sidewalk repair, cutting reinforcement, reinforcement, topsoil and turf establishment.

**Basis of Payment:**

Article 10.01.05 -- Basis of Payment: Replace the second paragraph with the following:

It shall also include all sand encasement, backfilling, grading, seeding, fertilizing, mulching, disposal of surplus material, as well as furnishing and installing concrete fill, topsoil or pavement as the case may be.

## **ITEM #1008901A – REMOVE CONDUIT**

**Description:** This item shall consist of removing existing conduit from handholes and in parapets where indicated on the plans. All removed conduit, conductors and hardware shall remain the property of the Contractor.

**Construction Methods:** The Contractor shall remove existing conduit from handholes and parapets with associated hardware were indicated on the plans. The Contractor shall disconnect and remove existing conductors along with conduit to be removed. All removed conduit, conductors and hardware shall be properly disposed of by the Contractor.

**Method of Measurement:** This work will be measured for payment by the number of linear feet of conduit removed and disposed of, complete and accepted.

**Basis of Payment:** This work will be paid for at the contract unit price per linear foot for "Remove Conduit" complete, which price shall include removal and disposal of conduit, conductors, fittings, and all associated hardware, and all equipment, materials, tools, labor and work incidental thereto.

## **ITEM #1008907A - CLEANING EXISTING CONDUIT**

### **Description:**

The work under this item shall consist of cleaning existing conduit, as required, as shown on the plans or as directed by the Engineer to facilitate installation of new cable.

### **Construction Methods:**

The Contractor shall remove all existing cable from conduit that will be reused. The contractor will be directed to clean the conduit which has obstructions or is found to be impassable. This cleaning process shall be by one of the following methods:

- 1) Rodding
- 2) A high pressure jet spray, or air pressure
- 3) By pulling a mandrel or ball through the conduit.

The Contractor shall submit in writing his anticipated method of cleaning the conduit to the Engineer for approval prior to cleaning any conduit.

If the conduit is found to be damaged to any extent that the cleaning process will not clear the obstruction, it will be the judgment of the Engineer whether to replace the entire conduit run or excavate the damaged section for repair.

### **Method of Measurement:**

This work shall be measured for payment on an hourly basis.

### **Basis of Payment:**

The work under the Item "Cleaning Existing Conduit" shall be paid for at the contract unit price per hourly basis, which price shall include all cleaning, material, tools, equipment, all labor, and work incidental thereto.

## **ITEM #1010051A - GALVANIZED STEEL HANDHOLE COVER**

**DESCRIPTION:** This work shall consist of furnishing and installing a new galvanized steel handhole cover, on an existing concrete handhole, at the location as shown on the plans, and in accordance with this specification. This item shall also include all work required to locate and expose the existing handhole

**MATERIALS:** The steel handhole cover shall be hot-dip galvanized, non skid floor plate steel which will have a minimum tensile strength of fifty thousand (50,000) lbs. The cover shall be overlap type with dimensions as indicated in the electrical details.

**CONSTRUCTION METHODS:** The Contractor shall locate the existing concrete handhole and excavate all material (dirt, sand, road debris) from the top of the handhole. The Contractor shall install the galvanized steel handhole cover on the existing concrete handhole at the location as shown on the plans. The existing recessed type cover shall be disposed of by the Contractor. The new cover shall be connected to the No. 8 ground wire as indicated on the plans.

The Contractor shall also grade around the existing handhole, so that finished grade is set 1-1/2" below the top of the handhole.

Prior to ordering, the Contractor shall verify that the cover as dimensioned in the details will fit on the existing handhole.

**METHOD OF MEASUREMENT:** This work will be measured for payment by the number of galvanized steel handhole covers installed, complete and accepted in place.

**BASIS OF PAYMENT:** This work will be paid for at the contract unit price each for "Galvanized Steel Handhole Cover" complete and accepted in place, which price shall include cover, removal and disposal of existing cover, locating, excavation, grounding, grading, seeding, and all materials, tools, equipment and labor incidental thereto.

## **ITEM #1010905A – RESET CONCRETE HANDHOLE**

### **Description:**

Work under this item shall consist of resetting a concrete handhole at the location shown on the plans or as directed by the Engineer and in conformity with these specifications.

### **Materials:**

The Contractor shall be responsible for damage to all equipment and materials incurred during resetting of the concrete handhole. All repairs or replacements due to damage or loss by the Contractor shall be made at the Contractor's expense.

### **Construction Methods:**

The concrete handhole shall be reset where shown on the plans or directed by the Engineer.

The Contractor shall raise or lower the existing concrete handhole so that the top of the handhole is 1 1/2" above finished grade. When raising of the handhole is required, the following exception shall apply: The handhole shall not be raised past the limits of the existing conduit entering the handhole. The final placement of the handhole shall be such that the conduit ends are left within the limits of the wiring compartment of the handhole.

No disruption in nighttime illumination will be allowed to carry out this work.

### **Method of Measurement:**

This work will be measured for payment by the number of concrete handholes reset, complete and accepted.

### **Basis of Payment:**

This work will be paid for at the contract unit price each for "Reset Concrete Handhole" which price shall include all equipment, labor, delivery and incidentals thereto.

<u>Pay Item</u>	<u>Pay Unit</u>
Reset Concrete Handhole	ea.

## **ITEM #1014901A - REMOVE CABLE**

**Description:** This item shall consist of removing conductors and cables from existing cabinets, conduit and handholes where indicated in the plans or as directed by the Engineer and in accordance with these specifications. The removed conductors and cables shall remain the property of the Contractor.

**Construction Method:** The Contractor shall remove all conductors and cables from existing cabinets, conduit and handholes at the location where new conductors and cables are to be installed when alternate circuit provisions are in place. Prior to installing the new conductors and cables, all existing conductors and cables shall have been removed, neatly coiled, tied and the conduit reamed cleaned. The removed conductors and cables shall be disposed of by the Contractor.

Removal of existing cables shall be coordinated with the installation of new or temporary cables to maintain uninterrupted operation of existing circuits.

Nighttime illumination shall not be interrupted by this work.

**Method of Measurement:** This work shall be measured for payment by the actual number of linear feet of conduit from which all conductors are removed, also including the length of handholes, junction boxes, and cabinets.

**Basis of Payment:** This work will be paid for at the contract unit price per linear foot for "Remove Cable" which price shall include the removal of all conductors and cables, the cleaning of conduit, the proper disposal of the removed conductors and cables, and all equipment, labor and work incidental thereto.

Pay Item  
Remove Cable

Pay Unit  
L.F.

## **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. 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. 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 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 250 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 the mounting height as called for on the illumination plans (See contractor "Notes" section). 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 #1113601A - OPTICAL FIBER CABLE – SINGLE MODE, LOOSE BUFFER TUBE CABLE, 2FIBER**

**Description:**

This Item specifies the requirements for furnishing, installing in conduit, splicing, and connectorizing fiber optic cables. As part of this item, the Contractor shall install a pull tape in all of the innerducts within the contract limits of work, as necessary to install the fiber optic cable and future fiber optic cable.

**Materials:**

A. General

1. The fiber optic cable supplied in this project shall be completely compatible with the existing cable supplied under Project 63-548/42-288. The cable shall be compatible with Fitel/Lucent single jacket loose tube fiber optic cable with DryBlock Core. The Contractor shall provide proof of compatibility to the Department with the appropriate shop drawings and catalog cut submittals.
2. Outdoor fiber optic cable shall be installed in conduit, spliced as required and terminated in Camera-Hub Cabinets and Mini-Hub Cabinets, as shown on the Drawings.
3. Plenum-rated indoor fiber optic cable shall be installed inside the State Transportation Building within existing conduits, spliced as required and terminated at the fiber optic patch panel, as shown on the Drawings.
4. The fiber optic cable, splices, connectors and interconnect panels shall meet all requirements stated in this Specification.
5. All optical fiber cables used in this project shall be from the same manufacturer. That manufacturer shall be regularly engaged in the production of fiber optic cables. Each optical fiber cable for this project shall be dielectric, loose tube, duct-type.

B. Applicable Publications

1. Publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation. All Fiber Optic Communication System hardware shall be compliant with the following specifications:

Electronics Industries Association (EIA):

- a. EIA-310-C Racks, Panels, and Associated Equipment.
  - b. EIA-359-A Colors for Color Identification and Coding.
  - c. EIA-422-A Electrical Characteristics of Balanced Voltage Digital Interface Circuits.
  - d. EIA-TIA-455-A Standard Test Procedures for Fiber Optic Fibers, Cable Transducer Sensors, Connecting and Terminating Devices and Other Fiber Optic Components.
  - e. EIA-455-6B Cable Retention Test Procedure for Fiber Optic Cable Interconnecting Devices.
  - f. EIA-485 Standard for Electrical Characteristics of Generators and Receivers for use in Balanced Digital Multipoint Systems.
  - g. TIA/EIA-598-A Optical Fiber Cable Color Coding.
2. USDA Rural Utilities Service (RUS) 7 CFR 1755.900.
  3. ANSI/ICEA Standard for Fiber Optic Outside Plant Communications Cable, ANSI/ICEA S-87-640-1992.
  4. UL-listed OFNR
  5. CSA-listed FT-4
- C. Outdoor Fiber Optic Cable Requirements
1. The cable shall be an accepted product of the United States Department of Agriculture Rural Utilities Service (RUS) 7 CFR 1755.900 and meet the requirements of the ANSI-ICEA Standard for Fiber Optic Outside Plant Communications Cable, ANSI/ICEA S-87-640-1992.
  2. The Outdoor Fiber Optic Cable shall be stranded loose tube cable with the required number of fibers as shown in the Contract Drawings. The buffer tubes shall contain 12 fibers per tube unless otherwise noted in the Contract.
  3. The Contractor shall provide manufacturer's documentation certifying that the Outdoor Fiber Optic Cable complies with the following performance requirements:

- a. When tested in accordance with FOTP-3, "Procedure to Measure Temperature Cycling Effects on Optical Fibers, Optical Cable, and Other Passive Fiber Optic Components," the change in attenuation at extreme operational temperatures -40°F and +158°F (-40°C and +70°C) shall not exceed 0.2 dB/km at 1550 nm for single-mode fiber.
- b. When tested in accordance with FOTP-82, "Fluid Penetration Test for Fluid-Blocked Fiber Optic Cable." a one meter length of unaged cable shall withstand a one meter static head or equivalent continuous pressure of water for cable end.
- c. When tested in accordance with FOTP-81, "Compound Flow (Drip) Test for Filled Fiber Optic Cable", the cable shall exhibit no flow (drip or leak) of filling and/or flooding material at 149°F (65°C).
- d. When tested in accordance with FOTP-41, "Compressive Loading Resistance of Fiber Optic Cables," the cable shall withstand a minimum compressive load of 220 N/cm (125 lbf/in) applied uniformly over the length of the sample. The load shall be applied at the rate of 1/10 in to 3/4 in (3 mm to 20 mm) per minute and maintained for ten minutes. The change in attenuation shall not exceed 0.4 dB during loading and 0.2 dB after loading at 1550 nm for single-mode fiber.
- e. When tested in accordance with FOTP-104, "Fiber Optic Cable Cyclic Flexing Test," the cable shall withstand 25 mechanical flexing cycles around a sheave diameter not greater than 20 times the cable diameter. The change in attenuation shall not exceed 0.1 dB at 1550 nm for single-mode fiber.
- f. When tested in accordance with FOTP-25, "Repeated Impact Testing of Fiber Optic Cables and Cable Assemblies," the cable shall withstand 25 impact cycles. The change in attenuation shall not exceed 0.2 dB at 1550 nm for single-mode fiber.
- g. When tested in accordance with FOTP-33, "Fiber Optic Cable Tensile Loading and Bending Test," using a maximum mandrel and sheave diameter of 22 in (560 mm), the cable shall withstand a tensile load of 608 lbf (2700 N). The change in attenuation shall not exceed 0.2 dB during loading and 0.1 dB after loading at 1550 nm for single-mode fiber.

- h. When tested in accordance with FOTP-85, "Fiber Optic Cable Twist Test," a length of cable no greater than 13 feet (4 meters) shall withstand 10 cycles of mechanical twisting. The change in attenuation shall not exceed 0.1 dB at 1550 nm for single-mode fiber.
  - i. When tested in accordance with FOTP-181, "Lightning Damage Susceptibility Test for Optic Cables with Metallic Components," the cable shall withstand a simulated lightning strike with a peak value of the current pulse equal to 105 kA without loss of fiber continuity. A damped oscillatory test current shall be used with a maximum time-to-peak value of 15  $\mu$ s (which corresponds to a minimum frequency of 16.7 kHz) and a maximum frequency of 1800000 rpm (30 kHz). The time to half-value of the waveform envelope shall be from 40 - 70  $\mu$ s.
  - j. When tested in accordance with FOTP-37, "Low or High Temperature Bend Test for Fiber Optic Cable", the cable shall withstand four full turns around a mandrel of  $\leq 10$  times the cable diameter for non-armored cables and  $\leq 20$  times the cable diameter for armored cables after conditioning for four hours at test temperatures of -22°F and +140°F (-30°C and +60°C). Neither the inner or outer surfaces of the jacket shall exhibit visible cracks, splits, tears or other openings. Optical continuity shall be maintained throughout the test.
4. All optical fibers, coatings, tubes, metals and jackets shall be free of roughness, porosity, blisters, splits and voids in accordance with good manufacturing practice.
  5. The color coding and position of fibers / buffer tubes within the cable shall be in accordance with TIA/EIA-598-A "Optical Fiber Cable Color Coding". Fibers shall be colored with ultraviolet curable ink. In buffer tubes containing multiple fibers, the colors shall be stable across the specified storage and operating temperature range and not subject to fading or smearing onto adjacent fibers or into the gel filing material. Color materials shall not cause fibers to stick together.
  6. The buffer tubes shall be resistant to external forces and shall meet the buffer tube cold bend and shrinkback requirements of 7 CFR 1755.900.
  7. The cable shall be suitable for operation over a temperature range of -22°F to +158°F (-30°C to +70°C) and shall be suitable for installation in outdoor ducts.
  8. The cable shall provide mechanical support and protection for the specified number of fibers.
  9. The central anti-buckling member shall consist of a dielectric, glass reinforced plastic (GRP) rod. The GRP rod shall be coated with a black colored thermoplastic when required to achieve dimensional sizing to accommodate buffer tubes/fillers.

10. All interstices within the cable outer jacket and within each buffer tube shall be filled with a compound to prevent the ingress and migration of water. The compound shall be a non-hygroscopic, non-nutritive to fungus, electrically non-conductive, homogeneous gel that is nontoxic and dermatologically safe. The gel shall be free from dirt and foreign matter. Some leakage of the compound is permitted, however, there shall be no bulk flow of compound out of the cable over the specified operating temperature range which could impact on the waterproofness of the cable. The gel shall be readily removable with conventional nontoxic solvents.
11. Buffer tubes shall be stranded around the dielectric central member using the reverse oscillation, or "S-Z", stranding process. Water blocking yarn(s) shall be applied longitudinally along the central member during stranding.
12. A water blocking tape shall be applied longitudinally around the outside of the stranded tubes/fillers. The tape shall be held in place by a single polyester binder yarn. The water blocking tape shall be non-nutritive to fungus and electrically non-conductive.
13. The cable shall be able to withstand a maximum pulling tension of 607lbf (2700 N) during installation without any resulting damage. Tensile strength shall be provided by dielectric yarns. The high tensile strength dielectric yarns shall be helically stranded evenly around the cable core.
14. The outer jacket of the cable shall be constructed of medium or high density polyethylene. The minimum nominal jacket thickness shall be 1/20 inch (1.4 mm). Jacketing material shall be applied directly over the tensile strength members and water blocking tape. The polyethylene shall contain carbon black to provide ultraviolet light protection and shall not promote the growth of fungus. MDPE jacket material shall be as defined by ASTM D1248, Type II, Class C and Grades J4, E7 and E8.
15. The cable shall contain at least one ripcord under the sheath (outer cable jacket) for easy sheath removal of all-dielectric cable.
16. The cable jacket shall be marked with manufacturer's name, sequential meter or foot markings, month, year or quarter year of manufacture, and a telecommunications handset symbol, as required by Section 350G of the National Electrical Safety Code. The actual length of the cable shall be within 1% of the length markings.
17. Materials used in the cable shall not produce hydrogen in a concentration large enough to cause any degradation in the transmission performance of the optical fibers.
18. Materials used in the cable shall not support galvanic action.

D. Single Mode Optical Fibers

1. The Single Mode fiber shall consist of a doped silica core surrounded by a concentric silica cladding. The fiber shall be matched clad design.
2. The dispersion un-shifted or dispersion flattened single mode fiber shall conform to the following specifications:
  - a. The Single Mode fiber core shall have a diameter of between 8.3 to 9  $\mu\text{m}$  inclusive with a tolerance of  $\pm 1.3 \mu\text{m}$ .
  - b. The Single Mode fiber cladding shall have an outer diameter of 125  $\mu\text{m}$  with a tolerance of  $\pm 1.0 \mu\text{m}$ .
  - c. The core-to-cladding offset shall not be greater than 0.6  $\mu\text{m}$ .
  - d. The cladding Non-Circularity shall not be greater than 1.0% defined as:  
(1- Minimum Cladding Diameter/Maximum Cladding Diameter) x 100
  - e. The Single Mode fiber shall be coated with a protective polymer to preserve the strength of the fiber. The coating shall be removable by mechanical or chemical means. The coating shall retain its color when subject to the manufacturer's recommended fiber cleaning and splicing preparation methods.
  - f. The SM fiber shall have attenuation and bandwidth specified at two wavelength windows.
    - i. The first wavelength window shall be at and around 1310 nm.
    - ii. The second wavelength window shall be at and around 1550 nm.
3. The mean optical attenuation at 1310 nm shall not be greater than 0.4 dB/km with a standard deviation not greater than 0.05 dB/km. The maximum attenuation of any continuous length of SM fiber at 1310 nm shall not exceed 0.45 dB/km.
4. The mean optical attenuation at 1550 nm shall not be greater than 0.3 dB/km with a standard deviation not greater than 0.06 dB/km. The maximum attenuation of any continuous length of SM fiber shall not exceed 0.36 dB/km.
5. The fiber attenuation shall not vary more than 0.2 dB/km over the specified cable operational temperature range.

6. The fiber optical bandwidth at 1310 nm or 1550 nm shall be equal to or greater than 1000 MHz-Km.
7. The zero dispersion wavelength shall be at a wavelength of  $1310 \pm 10$  nm.
8. The maximum dispersion at 1550 nm shall not exceed 18 ps / (nm-km).
9. The maximum dispersion in the wavelength range of 1285 to 1330 nm shall not exceed 3.2 ps / (nm-km).

E. Fiber Optic Distribution Cable

1. This item consists of furnishing and installing optical fiber cables and connectors of the size and type specified at the locations shown on the Drawings or as indicated by the Engineer, in accordance with these Specifications.
2. The Contractor shall provide multiple fiber, stranded, loose tube cable with single mode fiber that shall be suitable for placement in an underground environment as shown in the Drawings.
3. The optical fiber capacity of the fiber optic distribution cables to be supplied and installed under this Contract will vary in capacity according to network topology and traffic requirements. The current minimum requirements are for distribution cable to be of the following capacities: 72 SM **Refer to Drawing**, Fiber Optic Cable Plant. (Note SM refers to the number of Single Mode fibers within a cable segment.)
4. The Contractor shall provide a manufacturer's certification that the offered cable complies with all optical and mechanical requirements set forth in this Specification. Any deviation of the offered cable from the specifications set forth herein shall be clearly noted in the Contractor's proposal.
5. All optical fiber distribution cable used on this project shall be from the same manufacturer. Each optical fiber cable shall be all dielectric, duct type, loose tube and shall conform to these Specifications.

F. Fiber Optic Drop Cables

1. Drop cables are used for connecting Camera cabinets, Camera Mini-Hub cabinets and the VMS cabinets to the fiber optic distribution (trunk) cable.
2. The Drop Cable shall consist of single mode fibers housed in a protective jacket. The end of the fiber installed at the Camera, Mini-Hub or VMS cabinet shall be connectorized. The other end of the drop cable shall be spliced into a fiber optic distribution cable at an underground Splice Closure within an adjacent pull box.

3. The exact number of Drop Cables at each Splice Closure shall be in accordance with the Contract. The Contractor shall employ the most efficient means of meeting the Drop Cable requirements, as approved by the Engineer.
4. The attenuation of Drop Cable after installation, not including the connector loss, shall not exceed 0.1 dB measured at 1310 nm and 1550 nm.

G. Fiber Optic Connectors

1. The ST connector shall have a ceramic ferrule with a nickel plated nut and body. SC connectors shall have a ceramic insert.
2. The connector shall be of the ST-type or SC-type and fully compatible with the fiber optic cable utilized and the mating jacks to which they will be attached.
3. The connector shall be compatible with a physical contact (PC) finish. All connectors shall be polished to a PC finish such that the return loss per mated pair of connectors is at least 25 dB. The return loss when the connector is mated with previously installed connectors shall be at least 18 dB.
4. The connector mean loss shall not be greater than 0.2 dB with a standard deviation of not greater than 0.1 dB.
5. Index matching fluids or gels shall not be used.
6. The connector loss shall not vary more than 0.1 dB after 500 repeated matings.
7. The connector shall withstand an axial load of 30 lb (135 N).
8. The connectors shall be attached in accordance with the manufacturer's recommended materials, equipment and practices.
9. The connector shall be suitable for the intended environment and shall meet the following environmental conditions.
  - a. Operating Temperature: -4°F to +122°F (-20 to +50o C)
  - b. Storage Temperature: -22°F to +140°F (-30 to +60o C)
  - c. The connector loss shall not vary more than 0.2 dB over the operating temperature range.

- d. Connectors shall be protected by a suitably installed waterproof protection cap.

#### H. Pull Tape

1. Pull tape, to be installed in specific areas of the project as described elsewhere in this specification, shall consist of polyethylene or PVC jacket woven into the polyester tape. The recommended pull tape is NEPTCO Part No. DP1250P, or approved equal. The pull tape shall not “burn in” to the innerducts under normal pulling conditions or as specified herein.

The pull tape shall have the following properties:

- a. 1250 lb (5560 N) tensile strength
- b. flat, not round construction
- c. printed foot markings
- d. Pre-lubricated
- e. Moisture resistant

#### I. Fiber Optic Cable Fabrication

##### 1. Packing and Shipment

- a. The cable shall be supplied on reels. Top and bottom end of the cable shall be available for testing. Both ends of the cable shall be sealed to prevent ingress of moisture.
- b. The optical cable shall be in one continuous length per reel with no factory splices in the fiber. Each reel shall be marked to indicate the direction the reel should be rolled to prevent loosening of the cable. Installation procedures and technical support shall be furnished upon request.
- c. Each reel shall have the following information clearly labeled on it:
  - i. Customer
  - ii. Customer order number
  - iii. Reel number
  - iv. Destination
  - v. Ship date
  - vi. Manufactured date
  - vii. Manufacturer's name
  - viii. Cable code

ix. Length of cable

J. Warranty

1. All equipment supplied for this shall be warranted for parts and labor by the vendor against defects and failures, which may occur through normal use for a period of one (1) year from the date of installation. A copy of the warranty must be presented to the Engineer before installation of the equipment.

K. Quality Assurance

1. The Contractor shall have a Quality Assurance Program in place.
2. A minimum of ten (10) year's experience in the design, manufacture, and testing of Fiber Optic Cable and Connectors is required. The cable and connectors shall be designed and manufactured according to world class quality standards. The manufacturer shall be ISO 9001 certified.

**Construction Methods:**

A. Submittals

1. Submit:
  - a. Functional block diagrams, cabling diagrams, and point to point cabling details, including locations of all distribution cable splice points (both drop cable splices and reel-end splices).
  - b. As built drawings including a cable route diagram indicating the actual cable route and "meter marks" for all interchanges, intersections, directional change points in the cable routing, and all termination points. The Contractor shall record these points during cable installation. Cable system "as-built" drawings showing the exact cable route shall be provided by the Contractor to ConnDOT. Information such as the location of slack cable and its quantity shall also be recorded in the cable route diagram.
  - c. Product data, manufacturer's test certifications, installation manuals, materials, system configuration options and features, and accessories.
  - d. Shop Drawings shall be completely dimensioned and shall indicate the intended installation method and details.
  - e. Specifications of cable, connectors, and fiber splice kits.
  - f. Operating and maintenance manuals for all equipment.
  - g. Vendor Optical Time Domain Reflectometer (OTDR) certification for each reel of fiber optic cable listing each specification compliant fiber by fiber color code and group color code.

B. Delivery, Storage, and Handling

1. The Contractor shall deliver, store, handle and install all materials and equipment in such a manner as not to degrade quality, serviceability or appearance.
2. The Contractor shall be responsible for storage of the materials and equipment prior to installation in a clean, dry location free from construction dust, precipitation and excess moisture.
3. Contractor shall be required to replace any damaged materials and equipment, as determined by the Engineer, at no additional cost to the owner.
4. Cable shall be transported to site using cable reel trailers.
5. Care shall be taken at all times to avoid scraping, denting, or otherwise damaging the cable before, during or after installation. Damaged cable shall be replaced by the Contractor without additional compensation.
6. Sufficient slack shall be pulled to allow cable cutting and connection to communications equipment.

C. Installation in Ducts

1. Cable shall be installed in innerduct, duct or conduit in the field in accordance with the Contract Drawings.
2. Fiber Optic Distribution Cable shall be installed in the lowest innerduct (relative to ground level). Where more than one cable is to be installed in a conduit, the mid-level innerduct shall be used, and the highest level innerduct shall be reserved.
3. The Contractor shall install pull tape in the existing innerducts as necessary to install the fiber optic cable. A 6.5 ft (2.0 m) length of pull tape shall be left coiled, tied, and accessible in each cabinet, vault, maintenance hole and junction box. The pull tape shall be installed according to manufacturer recommendations and shall be “free” and NOT helical about communications cables.
4. The Contractor shall install cables in innerducts consistently throughout the project; crossover of a cable from one innerduct to another is not allowed.
5. Duct ends shall have all rough ends smoothed to prevent scraping the cable.
6. Where cable will be installed directly in conduit with no innerduct, a stiff bristle brush shall be pulled through each section of duct before pulling cable.

7. The Contractor shall not exceed the manufacturer's recommended safe pulling tension and minimum bending radius during delivery and installation.
8. A manufacturer's recommended lubricant shall be applied to the cable to reduce friction between the cable and the duct.
9. A cable grip shall be attached to the cables so that no direct force is applied to the optical fiber. The cable grip shall have a ball bearing swivel to prevent the cable from twisting during pulling.
10. Cable rollers and feeders and winch cable blocks shall be used to guide the cable freely into the duct and at maintenance hole locations.
11. Mechanical aids and pulling cable or ropes shall be used as required.
12. The Contractor shall employ personnel at as many pull points as need be to achieve the longest continuous cable segment as possible to reduce the need for excessive main-line splices.
13. Personnel equipped with two-way radios shall be stationed at each maintenance hole, cabinet and communications vault at which the cable is to be pulled to observe and lubricate the cable.
14. Where mechanical pulling is required (i.e. all runs greater than 164 ft (50 m)), a dynamometer shall be used to record installation tension and a tension limiting device shall be used to prevent exceeding the maximum pulling tension as defined by the cable manufacturer. The maximum pulling tension shall be recorded for each run of cable. The cable shall be taken up at intermediate pulling points with an intermediate cable take-up device as approved by the Engineer to prevent over tension on the cable. Cable pulls shall be continuous and steady between pull points and shall not be interrupted until the entire run of cable has been pulled.
15. Trunk fiber cable segment lengths shall be the maximum tolerable length within the maximum pulling tension defined by the manufacturer. The number of trunk cable reel-end splices shall be minimized. The Contractor shall provide a plan to the Engineer showing the reel-end splice point locations following a field investigation of the conduit and shall not install cable until receiving the Engineer's approval of the reel-end splice location plan. The Contractor shall obtain the Engineer's approval for all required changes to the reel-end splice point location plans. Cable segments installed with reel-end splices not approved by the Engineer will be replaced by the Contractor at no additional cost to the Department.
16. The Contractor shall be responsible for ensuring the cable length is sufficient to allow for connection between the communication equipment and the splice enclosures

- including provision for slack, vertical runs, cable necessary for splicing, wastage and cable to allow for the removal of the splice enclosure for future splicing.
17. Drop Cables shall be of length suitably long to be connected to the rack mounted fiber optic transmission equipment within the Camera Hub and the rack-mounted Splice Closure in the Mini-Hub. Sufficient slack shall be left at each end to allow removal of the Splice Closure and tray, and relocation of the equipment anywhere within the cabinet.
  18. Drop Cable fibers in the Camera Hub Cabinets shall be connectorized and the Active Fiber connected directly to the Optical Video/Data Transceiver. The Spare Fiber with Connector shall be safely and securely attached to the interior of the equipment rack with plastic ties. The cable shall not be stressed beyond the minimum bending radius at any time.
  19. Drop Cable fibers in the Mini-Hub Cabinet shall be spliced to pig-tails in a rack-mounted splice closure provided by others. Splicing shall be in accordance with the requirements specified elsewhere in these Specifications and as shown on the Drawings. All unused fibers shall be properly terminated in accordance with manufacturer recommendations.
  20. All cable ends, connectors, and fiber optic jacks shall be protected from moisture ingress by using properly sealed caps.
  21. Following installation of the cable in the ducts, all duct entrances at pedestals and cabinets shall be sealed with duct sealing compound to prevent the ingress of moisture, foreign materials, and rodents.
  22. 20 feet (6 m) of cable going to and coming from each Splice Closure shall be coiled in the first pull box on each side of each closure. In addition, 50 feet (15 m) of cable shall be left coiled in the first pull box on each side of all surface mounted conduit systems.
  23. Where trunk cable terminations are left "dead ended", 100 feet (25 m) of cable shall be left coiled.
  24. All coiled cables shall be securely fastened in place with a minimum of four galvanized steel conduit straps.
  25. Fish line shall be installed in all communications ducts or conduits along with fiber optic communication cables. A 6ft. 6 in (2.0 m) length of fish line shall be left coiled, tied and accessible in each cabinet, vault, maintenance hole and junction box. The fish line shall be installed according to manufacturer specifications and shall be "free" and NOT helical about communications cables.

26. At intermediate pulling points, to prevent over tension on the cable, the cable shall be either taken up with an intermediate cable take up device as approved by the Engineer, or all excess cable shall be laid out on the ground in a figure eight configuration before subsequent installation.
27. Following installation in duct, a label shall be affixed to each cable end in a pull box or cable vault and the label shall contain the following information:
  28. Customer order number
    - x. Reel number
    - xi. Ship date
    - xii. Manufactured date
    - xiii. Manufacturer's name
    - xiv. Cable designation as shown on the Drawings
    - xv. Length of cable to next reel-end splice point
    - xvi. Location of other end of cable (reel-end splice point)
    - xvii. Cable test data

D. Splicing

1. Splicing of the cable shall only be permitted at splice closure or field fiber optic interconnect panel locations as indicated in the Drawings, unless authorized by the Engineer.
2. The Contractor shall prepare for splicing the designated fibers of the cable to the Drop Cables connecting the communications equipment located in the Camera Hub and Mini-Hub cabinets. Sufficient cable shall be coiled in the vault/cabinet to allow for consumption during the splicing and to permit the splice closure to be removed from the vault/cabinet for future splicing.
3. At least 1.0m of each fiber shall be stored in the splice trays. The Contractor shall further splice all additional fibers provided in order to meet the fiber requirements specified in the Contract and including any fibers provided which are additional to the Contract requirements.

E. Testing

1. Test Documentation

- a. The Contractor shall be responsible for all testing and documentation required to establish approval and acceptance of this Item.
  - b. The Contractor shall submit test procedures and documented test results to the Engineer. The test procedures shall document the nature of test activities to be performed.
  - c. The test procedures shall be submitted to the Engineer prior to initiation of the testing. The procedures will be returned to the Contractor within two week indicating either “accepted” or “make corrections noted”. If corrections are required, the Contractor shall submit revisions within 1 week.
  - d. Four copies of the final test procedures shall be submitted to the Engineer prior to commencement of testing.
2. Pre-Installation Testing
- a. Reels of cable shall be tested for attenuation prior to installation in ducts. The Contractor shall measure and record the attenuation of 100% of the total single mode fibers on each reel. Attenuation shall meet or exceed the specified performance requirements in accordance with the Contract.
  - b. The Contractor shall ensure that specifications for the fiber optic cable are met prior to installation.
3. Proof of Performance Testing

- a. The Contractor shall measure the attenuation per kilometer of fiber in each length of cable after installation.
  - b. The Contractor shall measure the attenuation of a randomly selected minimum of 10% of the total single mode fibers, which will be connected to equipment.
  - c. All (100%) of optical fibers assigned to be spare or reserved shall be individually tested for optical attenuation.
  - d. The Contractor shall sequence the fibers which are to be measured after each pull, such that the same fibers are not measured on consecutive lengths.
  - e. The Contractor shall record the reel number from which the cable came, the identification of the fibers measured and the attenuation in dB/km of the fibers measured.
  - f. The Contractor shall measure and record the splice quality of each fusion splice performed. The Engineer shall be provided with access to interim results.
4. Optical Time Domain Reflectometer (OTDR) Testing
- a. The Contractor shall perform single mode Fiber OTDR testing after each cable has been installed.
  - b. The Contractor shall provide the Engineer with information regarding OTDR test equipment make and model with the equipment calibration procedures and certification dates prior to conducting the test routine.
  - c. An OTDR shall be used for backscattered light measurements. The OTDR shall operate at a nominal wavelength of 1310 nm and 1550 nm and shall include all necessary hardware required to couple it with single mode fiber.
  - d. The backscatter light measurement of each single mode fiber and each single mode optical link shall be measured in both directions and at both 1310 nm and 1550 nm wavelengths. Each single mode optical link shall be defined as being the total length of interconnected single mode fibers and the splices which form a continuous end-to-end optical link. This includes: CCTV Camera Hub to Mini-Hub, Mini-Hub to Main Fiber Hub and Main Fiber Hub to Newington Highway Operations Center (HOC).
  - e. The Contractor shall maintain a test result record of each single mode optical link and each single mode fiber by means of printer copy of the OTDR measured cable

attenuation profile. Single mode optical links shall be identified in the test results by identifying the fiber under test and by identifying the cabinet site or HOC Cabinet at which the OTDR was connected.

- f. The test results shall include the following measurements:
  - i. Total length of the single mode link
  - ii. Total attenuation of the single mode link
  - iii. Attenuation of each splice in the link under test
  - iv. Attenuation per kilometer of each interconnected fiber in the link under test
- g. Attenuation shall be measured in decibels referencing optical power.
- h. Each single mode fiber and splice tested shall be tested to meet the performance requirements in accordance with the Contract. Fiber strands failing this test shall be re-terminated and re-tested.

### **Method of Measurement**

Work under this item shall be measured for payment by the number of linear meters of Fiber Optic Cable furnished and installed, as specified and shown on the Drawings.

### **Basis of Payment**

The work to be done under this item shall be paid at the Contract unit price for each meter of the Fiber Optic Cable furnished and installed as described in this Specification. This work shall include all cable, connectors, equipment, materials and incidental items required to satisfy these Specifications.

## **ITEM #1131002A - REMOTE CONTROLLED CHANGEABLE MESSAGE SIGN**

**11.31.01 - 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.

**11.31.02 - 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.

**11.31.03 - 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.

**11.31.04 - 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.

**11.31.05 - 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.

Pay Item

Remote Controlled Changeable Message Sign

Pay Unit

Day

## **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:

<b>Yield Strength</b>	<b>Thickness in.</b>	<b>Minimum Test Value Energy ft.-lbs.</b>	<b>Minimum Average Energy, ft.-lbs.</b>
$F_y \leq 50$ ksi	$\leq 2$	20	25 at 40°F
$50 \text{ ksi} < F_y \leq 70$ ksi	$\leq 4$	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 of the sign structure for galloping-induced cyclic loads is optional. 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 0.85.

- 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 a 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  $5^\circ$  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  $\frac{1}{4}$ ".

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 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 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 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 concrete for the formed pedestal shall conform to Article M.03 for Class 'F' Concrete. The 28 day minimum compressive strength of the concrete in the constructed pedestal shall be 4,400 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:**

**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, 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 determined by the subsurface investigation.

- The specified compressive strength,  $f'_c$ , of the concrete used in the design shall be 4,000 psi. 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 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.
- 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 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 maximum spacing/pitch of the transverse reinforcement in the top 2'-0” of the foundation 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 in an individual file in electronic portable document format (.pdf) with appropriate bookmarks 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
- 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.

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 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 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, 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)

<b>Property (Units)</b>	<b>Time of Slurry Introduction</b>	<b>Time of Concreting (in Hole)</b>	<b>Test Method</b>
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.

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 ½" 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.

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 has attained a 28 day compressive strength,  $f'_c$ , greater than or equal to 4,000 psi and the concrete in the pedestal has attained a 28 day compressive strength,  $f'_c$ , greater than or equal to 4,400 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 #1206023A - REMOVAL AND RELOCATION OF EXISTING SIGNS**

**12.06.01 – Description:** Add 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.

**12.06.03 - Construction Methods:** Add 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.

The Contractor, Engineer and a representative from DOT Maintenance shall perform an inventory of the signs prior to removal and storage.

**12.06.04 - Method of Measurement:** Add 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.

**12.06.05 -Basis of Payment:** Add 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.

A schedule of values for payment shall be submitted to the Department for review and comment prior to payment.

<u>Pay Item</u>	<u>Pay Unit</u>
Removal and Relocation of Existing Signs	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.

<b>Pay Item</b>	<b>Pay Unit</b>
Sign Face - Extruded Aluminum (Type IV Retroreflective Sheeting)	S.F. (S.M.)



**ITEM #1210101A – 4” (100 mm) WHITE EPOXY RESIN PAVEMENT MARKINGS**

**ITEM # 1210102A – 4” (100 mm) YELLOW EPOXY RESIN PAVEMENT MARKINGS**

**ITEM #1210103A – 6” (150 mm) WHITE EPOXY RESIN PAVEMENT MARKINGS**

**ITEM #1210104A – 8” (200 mm) 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.*

**12.10.03 – Construction Methods:** *Add the following:*

*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)

ITEM #1210101A  
 ITEM #1210102A  
 ITEM #1210103A  
 ITEM #1210104A  
 ITEM #1210105A

## **Measurement Equipment and Procedure**

### 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/ft<sup>2</sup>/fc (mcd/m<sup>2</sup>/lux)

**Yellow Epoxy:** minimum retroreflectivity reading of 325 mcd/ft<sup>2</sup>/fc (mcd/m<sup>2</sup>/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 #1216020A - 6" BLACK AGGREGATE COVER-UP RESIN PAVEMENT MARKINGS**

**ITEM #1216021A - 8" BLACK AGGREGATE COVER-UP RESIN PAVEMENT MARKINGS**

**Description:**

This item shall consist of furnishing and installing black aggregate cover-up resin pavement markings of the width specified to cover existing markings in accordance with this section and in conformance with the plans or as directed by the Engineer.

The black aggregate cover-up resin pavement markings shall be a highly durable, skid resistant, non-reflective material designed to cover existing pavement markings.

The black aggregate cover-up resin pavement marking material, when applied according to the recommendations of the manufacturer, shall provide a neat, durable masking that will not flow or distort. The black aggregate cover-up resin pavement marking material shall be weather resistant and, through normal traffic wear, shall show no wearing which would significantly impair the intended usage.

**Materials:**

Materials for this work shall conform to the following requirements:

**Black Cover-up Resin Pavement Markings:**

**Identification:** Each container shall have a label affixed to it with the following information thereon: name and address of manufacturer, shipping point, grade production batch number, date of manufacture, grade name and/or identification number, type of material, number of liters, contract number, use intended, directions for application, and formula. Improperly labeled samples and deliveries shall be rejected.

**Certification:** For each batch of black cover-up resin, a Certified Test Reports conforming to Article 1.06.07 shall be submitted from an independent testing laboratory and approved by the Engineer, prior to installation on the project.

**Detailed Requirements:**

**(a) Cover-up Resin Material:** The material shall be composed of resins and pigments only.

<b>(b) Composition:</b>	<u>Component</u>	<u>Percent by Weight (Mass)</u>
	Carbon Black (ASTM D 476 Type III)	7 ± 2

Talc	14 ± 2
Resins	79 ± 4

**(c) Black Aggregate:** The moisture resistant aggregate shall meet the gradation requirements as follows:

<u>Sieve Size</u>	<u>Percent Retained</u>
#20 (850 µm)	23 - 38
#50 (300 µm)	58 - 74
#270 (53 µm)	1 - 6
Pan	0 - 0.5

The moisture resistant aggregate shall have a urethane coating. The aggregate shall be angular with no dry dispensement pigment allowed.

**(d) Adhesion:** The black resin pavement marking material shall be formulated so as to adhere to the pavement and existing pavement markings under climatic and traffic conditions normally encountered in the construction work zone.

**(e) Abrasion Resistance:** When the abrasion resistance of the material is tested according to ASTM D 4060 with a CS-17 wheel under a load of 1000 grams for 1000 cycles, the wear index shall be no greater than 82.

**(f) Hardness:** The Type D durometer hardness of the material shall not be less than 75 nor more than 90 when tested according to ASTM D 2240 after the material has cured for 72 hours at 73.5° F ± 3.5° F.

**(g) Compressive Strength:** The compressive strength of the material, when tested according to ASTM D 695, shall not be less than 12,000 psi after 72 hours cured at 73.5° F ± 3.5° F.

### **Construction Methods:**

The black aggregate cover-up resin pavement markings shall be applied strictly in accordance with the manufacturer's recommendations and installed as shown on the plans and to the control points as established by the Engineer.

The areas to be covered shall be dry and sufficiently cleaned of sand and debris so as to provide an acceptable bond. All surfaces which are power washed shall be allowed to dry sufficiently prior to the application of the black aggregate cover-up resin pavement markings. The areas that have been pre-marked shall be broom cleaned immediately prior to the application of the black aggregate cover-up resin pavement markings.

Operations shall be conducted only when the road surface temperatures are 32° F or greater. Operations shall be discontinued during periods of rain, and shall not continue until the Engineer determines that the pavement surface is dry enough to achieve adhesion. The cover-up resin pavement markings shall be applied uniformly to a prepared surface in a manner that ensures a wet film thickness (without black aggregate) of 20 mils +/- 1 mils.

Black aggregate shall be applied at a rate of 100 pounds per gallon of black aggregate pavement marking material. The black aggregate shall be applied using a double drop bead system, with each drop distributing 50 pounds per gallon of black aggregate pavement marking material.

The black aggregate cover-up resin pavement markings shall extend approximately 1 inch beyond the edges of the existing markings which are to be covered.

After application, the pavement markings shall be protected from crossing vehicles for a time at least equivalent to the drying time of the material, as specified by the manufacturer.

**Initial, In-Service Retro-Reflectivity and Serviceability for Cover-Up Long-Lines:** In order to be acceptable, the applied cover-up markings shall meet the following maximum retro-reflectivity and minimum serviceability readings, as measured by the Engineer using a LTL 2000 Retrometer with 30-meter geometry:

1. Initial Retro-reflectivity: shall measure up to a maximum of 20 milli-candelas per square meter per lux, or as otherwise approved by the Engineer, when tested within 14 days of installation.
2. In-service retro-reflectivity: shall measure up to a maximum of 30 milli-candelas per square meter per lux, or as otherwise approved by the Engineer when tested at anytime within one (1) year of installation.

The Contractor shall replace, at its own expense, such amount of cover-up resin pavement markings that fail the initial or in-service retro-reflectivity when, in the opinion of the Engineer, it is no longer effective for the intended use or do not meet the requirements, as specified herein.

**Serviceability:** shall retain a minimum of 95% linear feet. Determination of percentages of serviceability values will be made anytime within one (1) year by the Contractor's representative and by the Engineer. The decision of the Engineer shall be final. The term "percentage of serviceability" shall be defined as the percentage of the total linear feet for cover-up resin pavement markings measured on the project for payment.

The Contractor shall replace, at its own expense, such amount of markings, if any, required to meet the above stated percentage. The Engineer will indicate the areas and lines to be replaced to meet the above stated percentages.

Replacement under either situation shall include all materials, equipment, labor and work incidental thereto.

**Removal of Cover-up Resin Pavement Markings:** The cover-up resin pavement markings shall be removed by the Contractor by an appropriate mechanical means that ensures complete removal with minimal pavement scarring, to the satisfaction of the Engineer. Painting over existing pavement markings with black paint or spraying with asphalt shall not be accepted as a substitute for removal or obliteration of pavement markings.

**Method of Measurement:**

Black aggregate cover-up resin pavement markings shall be measured for payment by the actual number of linear feet (meters) of black aggregate cover-up resin pavement markings acceptably installed on and removed from the pavement when it is no longer applicable or when its removal is directed by the Engineer.

**Basis of Payment:**

This work shall be paid for at the contract unit price per linear foot (meter) for "Black Aggregate Cover-up Resin Pavement Markings" of the width specified, acceptably installed on and removed from the pavement. This price shall be for all the work required by this section including the cleaning and preparing of the pavement surface, installation and removal, and all materials, equipment, tools, and labor incidental thereto.

Any black aggregate cover-up resin pavement marking material which is not effective, in the opinion of the Engineer, shall be replaced by the Contractor at no cost to the State.

<u>Pay Item</u>	<u>Pay Unit</u>
6" Black Aggregate Cover-Up Resin Pavement Markings	l.f.
8" Black Aggregate Cover-Up Resin Pavement Markings	l.f.

## **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<sub>1</sub>) shall be -4 degrees and +30 degrees.

**TABLE I**  
Minimum Coefficient of Retroreflection R<sub>A</sub>  
Candelas per footcandle per square foot

Observation Angle (deg.)	Entrance Angle (deg.)	R <sub>A</sub> 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  $170^{\circ} \pm 5^{\circ}$  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 #1803066A - TYPE B IMPACT ATTENUATION SYSTEM (HIGH-INCIDENT) NON-GATING**

**Description:** Work under this item shall consist of furnishing, delivering, and installing a (High - Incident) Non-Gating impact attenuation system for the site shown or as directed by the Engineer including reflective sheeting for delineation.

The system shall be – SCI100GM from SGI Products Inc.  
Distributed by Onsite Inc. 1-860-669-3988

The Proprietary Item documentation is attached to this specification.

**Performance Criteria:** This attenuation system shall be a crash tested device having approval in writing from FHWA conforming to the requirements in the National Cooperative Highway Research Program (NCHRP) Report 350 or the AASHTO Manual for Assessing Safety Hardware (MASH).

**Materials:** The materials shall conform to the following requirements:

1. All materials for the impact attenuation system, including any transition sections and concrete backup walls, or pads, shall meet the Manufacturer's specification for the latest version of the attenuator chosen from the Department's Qualified Products List (High-Incident) category.
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, transition and concrete pad, 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, an 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:** The impact attenuation system will be measured for payment by the number of each system installed at the location shown on the plans in conformance with the Manufacturer's details and specifications as accepted by the Engineer.

**Basis of Payment:** The impact attenuation systems will be paid for at the Contract unit price for each "Type B Impact Attenuation System (High-Incident) Non-Gating" as specified on the plans. This price shall include all materials, excavation, concrete pad and reinforcement, backup system, transition section, reflective sheeting, site preparation, and transportation, removal of surplus material, equipment, tools and labor incidental to complete the installation.

Pay Item	Pay Unit
Type B Impact Attenuation System (High-Incident) Non-Gating	ea.

**PERMITS AND/OR SUPPLEMENTAL TO FORM 816 AND REQUIRED PROVISIONS:**

The following Permits and/or Supplemental to Form 816 and Required Provisions follow this page and are hereby made part of this Contract.

- **PERMITS AND/OR PERMIT APPLICATIONS**

Inland Wetland (General Certification)	Anticipated: February 15, 2015 (see waiver)
Storm Water Discharge Permit	Acquisition occurs during construction
Flood Management (General Certification)	Acquired: September 9, 2014

- **SUPPLEMENTAL SPECIFICATIONS TO STANDARD SPECIFICATIONS FORM 816**

- **Construction Contracts - Required Contract Provisions (FHWA Funded Contracts)**

- **TRANSPORTATION MANAGEMENT PLAN**

Project Nos.: 42-304, 42-305, 42-310, 42-316

Description: Bridge Nos. 02374, 02375, 02368A, 02376  
I-84/Route 2 Mixmaster

Town: East Hartford

Date: August 20, 2014

m e m o r a n d u m

to: Mr. Michael E. Masayda  
Transportation Principal Engineer  
Hydraulics and Drainage  
Bureau of Engineering and Construction

from: Timothy D. Fields  
Transportation Principal Engineer  
Bridges  
Bureau of Engineering and Construction

Please review this request for Flood Management General Certification and indicate your concurrence below.

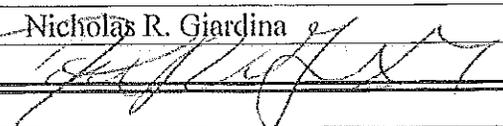
**Certification** (to be completed by designer)

*I have read the Flood Management General Certification and the descriptions for the approved DOT minor activities. This project qualifies for the Flood Management General Certification under:*

- Minor Safety Improvements and Streetscape Projects
- Roadway Repaving, Maintenance & Underground Utilities
- Minor Stormwater Drainage Improvements
- Removal of Sediment or Debris from a Floodplain
- Wetland Restoration Creation or Enhancement
- Scour Repairs at Structures; *(Must acquire DEEP Fisheries Concurrence to be eligible)*
- Guide Rail Installation
- Deck and Superstructure Replacements
- Minor Bridge Repairs and Access
- Fisheries Enhancements
- Surveying and Testing
- Bicycle / Pedestrian, Multi Use Trails and Enhancement Projects

*The following required documentation is attached in support of this certification:*

- Project description
- Location plan
- Description of Floodplain involvement and how project qualifies for general certification
- 8-1/2" by 11" excerpt copy of the FEMA Flood Insurance Rate Map (FIRM) and Floodway Boundary Map (if applicable)
- Design plans, (dated August 2014) with FEMA floodplain and floodway boundaries plotted, cross sections and profiles, as necessary, that clearly depict the floodplain involvement
- FEMA 100-year flood elevation plotted on elevation view (for structures)

Print Name Nicholas R. Giardina	Title Project Manager
Signature 	Date 8/14/14

**Concurrence** (to be completed by Hydraulics and Drainage)

Based on the documentation submitted, I hereby concur that the project qualifies for Flood Management General Certification.

*If there are any changes to the proposed activities within the floodplain or floodway, the project must be re-submitted for review and approval.*

Signature 	Date 9-9-14
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# Transportation Management Plan

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## *Rehabilitation of Bridges*

<b>Site No.</b>	<b>State Project No.</b>	<b>Bridge No.</b>	<b>Location</b>
1	42-304	02374	SR 500 TR 805 over I-84 Connector
2	42-305	02375	SR 500 TR 801 over I-84 Eastbound and I-84 Connector
3	42-316	02376	I-84 TR 831 over I-84 Eastbound
4	42-310	02368A	Route 2 Westbound over I-84 Eastbound and I-84 connector

*Town of East Hartford*

*November 2014*

*Prepared for:*



*Prepared By:*



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## 1. Introduction

This Transportation Management Plan (TMP) was developed pursuant to the following:

- The Connecticut Department of Transportation (CTDOT) Highway Design Manual, Chapter 14 – “Maintenance and Protection of Traffic Through Construction Zones,” and;
- The CTDOT “Policy on Systematic Consideration and Management of Work Zone Impacts” (Policy Number E&H.O.-57) and the associated Implementation Plan, dated August 6, 2007. (The CTDOT policy conforms to the updated Federal Highway Administration Work (FHWA) Zone Safety and Mobility Rule.)

The proposed projects are being governed by CTDOT standards and are included in the State List Bridge Program administered by CTDOT.

## 2. Project Description

The project area is comprised of four (4) State Bridge Projects: 42-304, 42-305, 42-316, and 42-310. The projects have been assigned site numbers, as described in the Notice to Contractor provided in the Contract Documents.

- Site No. 1: Project No. 42-304
- Site No. 2: Project No. 42-305
- Site No. 3: Project No. 42-316
- Site No. 4: Project No. 42-310

The subject bridges are part of the complex directional interchange (The Interchange) located at the junction of I-84 and Route 2 in the town of East Hartford. All four projects are categorized as Spot Improvement Projects.

For a project location map, refer to Figure No. 1. For a project site location map, refer to Figure No. 2.

### 2.1. Site No. 1

Project No. 42-304 involves the replacement of the existing Bridge No. 02374 and the project limits are contained in an area that is referred to in the Contract Documents and in this document as Site No. 1.

#### 2.1.1. Existing Conditions

The CTDOT Bridge Safety & Evaluation Unit has identified Bridge No. 02374 as being in need of repair. The bridge is Structurally Deficient due to the serious condition of the superstructure and substructure and is Functionally Obsolete due to the inadequate horizontal and vertical under clearance. As such, Bridge No. 02374 has been recommended for replacement under the List 21 Bridge Program.

Bridge No. 02374 consists of three simply-supported, steel multi-girder spans with a cast-in-place concrete deck and a bituminous concrete wearing surface. The piers, abutments and u-

shaped wingwalls are founded on spread footings. Recent inspections of the bridge indicate accelerated deterioration of the concrete and a deformation in one of the stringer webs. The bridge has been placed on a three (3) month inspection cycle due to these concerns.

At the crossing location, SR 500 TR 805 serves as the Governor Street connection to Route 2 Eastbound, while TR 830 is a direct connection from I-84 Westbound to Route 2 Eastbound. Just north of the bridge, the two ramps merge to form a two-lane on-ramp to Route 2 Eastbound. The bridge crosses the TR 833 (I-84 Connector), a two-lane expressway that serves as a direct connection between Route 2 Eastbound and I-84 Eastbound, and TR 831, a left side off-ramp that provides access to Governor Street from TR 833 (I-84 Connector).

The total average daily traffic (ADT) on the bridge is 9,200 vehicles (CTDOT Traffic Log) with 2,700 vehicles entering from Governor Street (via SR 500 TR 805) and 6,500 vehicles entering from I-84 Westbound (via TR 830).

### **2.1.2. Proposed Conditions**

The proposed Bridge No. 02374 will consist of an 85-foot simple single-span steel girder and concrete deck superstructure supported on H-pile founded abutments. The project includes the reconstruction of approximately 350-feet of approach roadway. The proposed bridge will provide 15-feet 1-inch of vertical under clearance in the final condition, thereby removing its functionally obsolete designation.

Traffic will be accommodated through Site No. 1 under a staged construction scenario. SR 500 TR 805 ramp from Governor Street will be closed to traffic at Governor Street and vehicles will be detoured via local roads as described in the Detour Plan. The substructure repair work will require the use of full weekend closures as well as off-peak lane and shoulder closures on the I-84 Connector (TR 833), as described in the Detour Plan and the Contract Documents.

## **2.2. Site No. 2**

Project No. 42-305 involves the rehabilitation of the existing Bridge No. 02375 and the project limits are contained in an area that is referred to in the Contract Documents and in this document as Site No. 2.

### **2.2.1. Existing Conditions**

The CTDOT Bridge Safety & Evaluation Unit has identified Bridge No. 02375 as being in need of repair. The bridge is Structurally Deficient due to the poor condition of the superstructure and is Functionally Obsolete due to inadequate horizontal and vertical under clearance. The inadequate vertical under clearance is measured along TR 833 (I-84 Connector) and the inadequate horizontal clearances are measured along both TR 833 (I-84 Connector) and I-84 Eastbound. As such, Bridge No. 02375 has been recommended for rehabilitation under the List 21 Bridge Program.

Bridge No. 02375 is 419-feet long and consists of seven simply-supported, steel multi-girder spans with a cast-in-place concrete deck and bituminous wearing surface. The piers, abutments and u-shaped wingwalls are founded on spread footings. The bridge exhibits areas of deteriorated concrete, structural steel corrosion and deck joint leakage.

At the crossing location, SR 500 TR 801 serves as a single lane connection from Route 2 Westbound to Governor Street. The average daily traffic (ADT) is 3,900 vehicles (CTDOT Traffic Log).

### **2.2.2. Proposed Conditions**

The proposed rehabilitation of Bridge No. 02375 will consist of concrete patching and repair to the super- and substructure units, modifying the parapets to safety shape, performing steel repairs at various locations, painting all beam ends and end diaphragms, replacing expansion bearings and repairing all fixed bearings. Also included in the scope of the project is replacing the deck joints and making the deck continuous over the piers by constructing link slabs at pier locations.

The proposed lane and shoulder configurations will match the existing roadway layout.

Traffic will be accommodated through Site No. 2 under a staged construction scenario. The proposed repairs will be constructed in two stages allowing one lane of traffic to be maintained on the bridge during construction. The substructure repair work will require the use of off-peak lane and shoulder closures on I-84 Eastbound and the I-84 Connector (TR 833), as described in the Contract Documents.

## **2.3.Site No. 3**

Project No. 42-316 involves the rehabilitation of the existing Bridge No. 02376 and the project limits are contained in an area that is referred to in the Contract Documents and in this document as Site No. 3.

### **2.3.1. Existing Conditions**

The CTDOT Bridge Safety & Evaluation Unit has identified Bridge No. 02376 as being in need of repair. The bridge is Structurally Deficient due to the poor condition of the superstructure and is Functionally Obsolete due to inadequate vertical under clearance. As such, Bridge No. 02376 has been recommended for rehabilitation under the List 21 Bridge Program.

Bridge No. 02376 is 161-feet long and consists of three simply-supported, steel multi-girder spans with a cast-in-place concrete deck and bituminous wearing surface. The piers, abutments and u-shaped wingwalls are founded on spread footings. The bridge exhibits areas of deteriorated concrete, structural steel corrosion and deck joint leakage.

At the crossing location, TR 831 serves as a single lane connection from TR 833 (I-84 Connector) to Governor Street. The average daily traffic (ADT) is 7,000 vehicles (CTDOT Traffic Log).

### **2.3.2. Proposed Conditions**

The proposed rehabilitation of Bridge No. 02376 will consist of a superstructure replacement which, in conjunction with a raised vertical roadway profile, will provide 16-feet of vertical under clearance, thereby removing its functionally obsolete designation. The proposed bridge will be made continuous across the three spans. The existing abutments, wingwalls, piers and footings will be modified to accommodate the new superstructure and vertical alignment. The existing substructure components that are not modified will be repaired as appropriate to correct minor deficiencies such as spalls and exposed rebar. The project includes approximately 750-feet of full depth roadway reconstruction.

The proposed lane and shoulder configurations will match the existing roadway layout.

During construction, traffic will be detoured around Site No. 3 via local roads, as described in the Detour Plan and Contract Documents. The substructure repair work will require the use of off-peak lane and shoulder closures on I-84 Eastbound, as described in the Contract Documents.

## **2.4. Site No. 4**

### **2.4.1. Existing Conditions**

The CTDOT Bridge Safety & Evaluation Unit has identified Bridge No. 02368A as being in need of repair. The bridge is Structurally Deficient due to the poor condition of the superstructure and deck. As such, Bridge No. 02368A has been recommended for rehabilitation under the List 21 Bridge Program.

Bridge No. 02368A is 645-feet long and consists of seven simply-supported, curved steel multi-girder spans with a cast-in-place concrete deck and bituminous wearing surface. The piers, abutments and u-shaped wingwalls are founded on spread footings. The bridge exhibits areas of deteriorated concrete, structural steel corrosion and deck joint leakage.

Bridge No. 02368A carries Route 2 Westbound (single lane) as it approaches the Founders Bridge. The average daily traffic (ADT) is 4,550 vehicles (CTDOT Inspection Report).

### **2.4.2. Proposed Conditions**

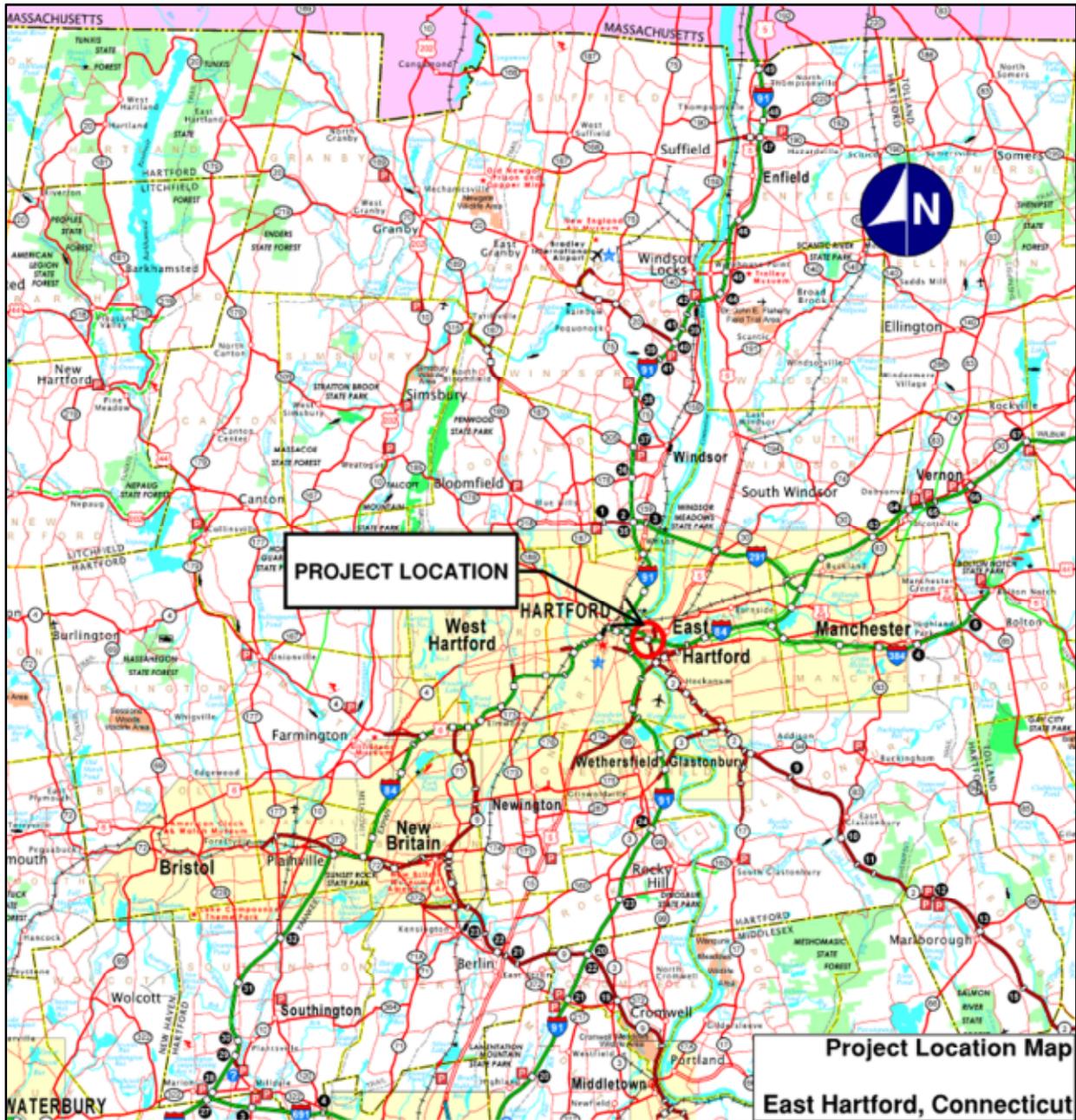
The proposed rehabilitation of Bridge No. 02368A will entail a superstructure replacement consisting of weathering steel girders and a cast-in-place concrete deck. The project includes approximately 645-feet of approach roadway reconstruction. Roadway safety is expected to be enhanced by providing increased vertical under clearance and standard bridge rail.

The proposed lane and right shoulder configurations will match the existing roadway layout. The proposed left shoulder will be wider due to a slight increase in deck width that improves stopping sight distance around the inside of the horizontal curve along the bridge.

During construction, traffic will be detoured around Site No. 4 via local roads, as described in the Detour Plan and Contract Documents. The substructure repair work will require the use of full

weekend closures as well as off-peak lane and shoulder closures on the I-84 Connector (TR 833), SR 500 TR 805 from Governor Street to Site No. 1, TR 830 from I-84 Westbound to Site No. 1 and TR 831 from I-84 Connector to Governor Street as described in the Detour Plan and Contract Documents.

Figure 1: Project Location Map





### 3. Work Zone Impact Assessment

Transportation effects emanate from work zone related interference of normal traffic. The subject four projects are being combined into a single construction contract and therefore required a comprehensive investigation into the impact that all the projects would have on traffic within the work zone. A qualitative assessment of impacts was conducted based on project context, scopes and selected strategies. Previous relevant experience, interdisciplinary reviews and consultation with local officials were employed to gauge impacts. In some cases, discretion was employed to essentially “draw a line” between tolerable and unacceptable impacts. These judgments are the basis for selecting fundamental work zone strategies. This section outlines various categories of impacts and mitigation measures.

#### 3.1. User Safety

Work zones represent an incremental elevation in motorist risk. Despite extensive research, the specific factors that elevate accident risk within work zones are uncertain. Consequently, reliance was placed on subjective knowledge and institutional processes (e.g. review by CTDOT officials, use of typical installations, adherence to highway safety principles) to identify and mitigate risk factors. For example, the concept of “positive guidance” was employed to establish easy-to-follow temporary travel paths. Also, roadside safety principles were used to create separation (e.g., distance and/or barrier) between unavoidable roadside hazards and active travel lanes. Based on traffic volumes, composition (i.e., percent of heavy vehicles) and operating speeds, Route I-84 Eastbound mainline, Route 2 mainline and ramps as well as local roads along the detour routes are the elements with the greatest potential for adverse safety experience. Signing, delineation and traffic directors will be employed to reduce the probability of errant vehicles and conflicts.

According to the contract documents, during construction existing lane and shoulder configuration for Route I-84 and Route 2 are to be maintained as described within Section 1.08 – Prosecution and Progress. A minimum of an 11-foot paved travel way is to be maintained along turning roads and ramps associated with Site Nos. 1 and 2 when staged construction techniques are expected to be employed, as described in the Contract Documents. The major impact of these work zone types on traffic operating conditions will be a reduction in speed. Signing, delineation and traffic control devices will be employed to guide traffic through the work zone. With the selected work zone strategy in place, the impact on traffic operating conditions is not expected to be unmanageable.

According to the contract documents, construction at Site Nos. 1, 3 and 4 will be wholly or partially constructed while traffic is detoured around the site. The major impact of these work zone types on traffic operating conditions will be an increased amount of traffic congestion along the detour routes and increased travel time. The volume of vehicles expected to use the detours will be accommodated by a temporary restriping of Pitkin Street while the detour associated with Site No. 4 is in place. Temporary timing modifications will also be employed at various signals along Pitkin Street in an attempt to reduce potential delays associated with the increase volume of traffic along the local road. Signing, delineation and traffic control devices will also be employed to guide traffic through the work zones. Additionally, the traffic to be carried by the local road detour routes is

largely commuter based and dependent on rush hour. Increased vehicular use along the detour routes can be expected at the morning or evening rush hours. At other times during the day or night, traffic volumes along the detour routes will increase only slightly more than normal.

### **3.2. Worker Safety**

National statistics indicate that highway construction workers have substantially higher work-related injury and death rates than the general population of construction workers. Some worker risks can be mitigated by programmatic and project-level measures. Driver awareness, positive guidance, protective clothing and positive protection strategies are included in this project. These concepts are implemented primarily through the Maintenance and Protection of Traffic plans and special provisions including Maintenance and Protection of Traffic (e.g., Temporary Precast Concrete Barrier Curb layout, device design, and specifications related to flagger training and safety garments). The majority of work on these bridge projects will take place behind temporary concrete barrier curbing or while live traffic is detoured away from the worksite as shown on the Detour Plans.

### **3.3. Emergency Services**

The work zone will affect emergency medical, law enforcement, and fire service responses. Detours are associated with work involved at Site Nos. 1, 3 and 4. All detour routes will provide adequate signage and advanced warning according to the contract plans, and since the detour routes are relatively short in distance, the effect of the detour on response times would be minimal.

### **3.4. Connectivity and Traffic Operations**

Except for the possible intermittent, short duration closures, Route I-84, Route 2 and most ramps within the Interchange will be open throughout the project. However, capacity will be negatively affected by the detours associated with work at Site Nos. 1, 3 and 4, reduced lane widths, changing traffic patterns, and the presence of the nearby construction activities. The effects on traffic operations can be expressed using measures such as delay, user cost or queue length. The number of mainline travel lanes open to traffic will match existing except during the allowable periods as described in the Contract Documents.

### **3.5. Sequence of Construction**

The sequence of construction is contained within the Section 1.08 – Prosecution and Progress of the Contract Documents. It is expected that the construction of all four projects will be completed by the completion date noted in the Contract Time portion of the contract documents. The overall duration of the construction project is expected to be two construction seasons or approximately eighteen (18) months.

At the time of this TMP, there are no related ongoing construction projects in the vicinity of the project area containing Site Nos. 1, 2, 3 and 4.

### **3.6. Traffic Incident Occurrence and Response**

Traffic incidents within the work zones are inevitable and work zone conditions may occasionally become incidents. Further, work zone conditions will probably magnify the effect of some incidents. The CTDOT District 1 Office of Construction will perform informal reviews of work zone accidents shortly after the notice of information (accident report) becomes available. Depending on the circumstances (eg. severity, consistency with pattern), additional countermeasures may be considered and implemented. Please refer to contract drawings and specifications for all Maintenance and Protection of Traffic details.

## **4. Temporary Traffic Control Plan**

The Temporary Traffic Control Plan (TTC) supports the TMP objectives of efficient transportation and the safety of workers, motorists and other users. The TTC Plan draws heavily on CTDOT knowledge, references, and experience. In practical terms, the following are significant TTC Plan elements for the proposed bridge projects:

- Closing SR 500 TR 805 at Governor Street
- Closing TR 831 at its divergence from the TR 833 (I-84 Connector)
- Closing Route 2 westbound prior to Bridge No. 02368A
- Closing TR 833 (I-84 Connector) during off-peak, night and/or weekend hours
- Shifting traffic from TR 830 in two stages through Site No. 1
- Shifting traffic on SR 500 TR 801 through Site No. 2
- Adequately provide advanced warning signs, systems and Changeable Message Signs
- Shielding permanent and temporary roadside hazards

Nearly all aspects of the TTC Plan are developed during design and will be implemented during construction. The TTC Plan will be implemented through the construction contract, by the construction contractor, with oversight by the CTDOT Construction personnel and inspectors. TTC provisions within the contract documents include plans, standard specifications and special provisions. Key TTC Plan components and elements include:

### **4.1. Stage Construction Plans**

Construction work at Site Nos. 1 and 2 will involve stage construction plans and documents. Identify working and staging areas within or in close proximity to the Sites by type for each stage, along with temporary concrete barrier curb, attenuation systems, temporary pavement markings and signs.

### **4.2. M&PT Miscellaneous Details**

Provide typical construction cross sections and impact attenuation barrier layouts. Utilize standardized Maintenance and Protection of Traffic configurations as per CTDOT standards when possible and appropriate.

A Notice to Contractor regarding *NCHRP 350 Requirements for Work Zone Traffic Control Devices* is included in the Contract Documents. This notice to contract describes requirements that traffic control devices must meet in order for their use to be approved on the worksite.

### **4.3. Detour Plans**

Provide Detour Plans at Site Nos. 1, 3 and 4. At Site No. 1 traffic from TR 830 will be maintained across Bridge No. 02374 while vehicles travelling from Governor Street on SR 500 TR 805 will be detoured via local roads, as described in the Detour Plan and Contract Documents. A Detour Plan and Contract Documents also describe the detour associated with closing TR 833 (I-84 Connector) during off peak night and weekend hours. At Site No. 3, vehicles travelling from TR 833 (I-84 Connector) to Governor Street on TR 831 will be detoured via local roads, as described in the Detour Plan and Contract Plans. At Site No. 4, vehicles traveling from Route 2 westbound to the Founders Bridge will be detoured via local roads, as described in the Detour Plan and Contract Plans. Detour Plans and Contract Documents also describe the detours associated with closing TR 833 (I-84 Connector), TR 830, TR 831 and SR 500 TR 805 during off peak night and weekend hours.

### **4.4. Standard Specifications and Supplement**

Standard specification provisions pertain to all projects unless amended by a special provision. This project is following CTDOT standard specifications dated 2004, and supplemented through July 2014. The Maintenance and Protection of Traffic Standard Specification covers the most generic requirements. Standard specifications are augmented by special provisions.

### **4.5. Special Provisions**

Project specific special provisions will also cover TTC Plan elements, including the following:

Maintenance and Protection of Traffic (Article 9.71.01) and Prosecution and Progress – Section 1.08 refer to the CTDOT standard maintenance and protection of traffic scope of services but modifies it for site specific conditions including traffic control restrictions (lane closure restrictions), sequence of construction, work restrictions, holiday periods for Connecticut and special events in the Hartford/East Hartford area.

Additional project specific specifications will be developed in conjunction with CTDOT as the project progresses. They will become part of the Contract Documents and will include, but not be limited to:

- Construction Signing
- Portable Variable Message Signs and Arrow Boards
- Dedicated Police Service
- Temporary Pavement Markings
- Lighting for Nighttime Operations

#### **4.6. Payment Provisions**

The final contract documents (Plans, Specifications and Estimates) will include pay items provisions for implementing the TMP, particularly the TTC Plan. Items are paid for either as lump sum or unit cost basis. It is usually easier to implement changes for items covered by unit cost based pay items since construction phase flexibility is needed for unanticipated conditions.

### **5. Transportation Operation Plan**

The Transportation Operations (TO) Plan is a selected set of mitigation strategies based primarily on non-highway infrastructure systems. The Transportation Operations of the work zone will be managed through the use of Changeable Message Signs (CMSs) that will be used to warn travelers about delays through the work zone. An Incident Management System (IMS) is operated by CTDOT from a Traffic Operations Center (TOC) in Newington. The TOC is staffed 24/7 by operators that respond to incidents and other conditions through established response protocols. TOC staff monitors fixed camera and Traffic Flow Monitor (TFM) detector stations and disseminate traveler information through the use of fixed-mounted CMS, Highway Advisory Radio, CTDOT Traveler Information webpage and the Traffic E-Alert system. An advance warning sign layout will be used on I-84 Eastbound and Route 2 near the project limits to warn motorists of the upcoming work area and lane shift. Work that interferes with thru traffic operations on I-84 and Route 2 will not be allowed during peak hours unless noted in the Contract Plans and Documents. The CTDOT's strategy to reduce delays during permitted periods is to promote alternative routes. Traffic delays and travel on parallel routes will be monitored during construction. It is anticipated that the signal timing at several signalized intersections along Pitkin Street will be modified during construction in an effort to alleviate potential traffic congestion resulting from detoured traffic, as noted in the Contract Plans and Documents related to Project No. 42-310.

CTDOT offers motorists an assistance program when incidents occur within the Hartford area. The Connecticut Highway Assistance Motorist Program (CHAMP) is operated by CTDOT and provides service throughout the Hartford area, including the area associated with the projects. Services include jump starting, pushing disabled vehicles to the shoulder, fuel, and changing flat tires. Service patrols also react to accidents and notify the TOC of the need for State Police, medical, fire and/or other emergency response.

#### **5.1. Incident Management**

Incidents will be reported via the 911 system and will be responded to by the Connecticut State Police Troop H located in Hartford. Other emergency services (Fire & Emergency Medical Services) will also be dispatched via the Connecticut State 911 systems.

#### **5.2. Police Presence**

The contract includes an appropriate number of Police personnel (State and local) who will be stationed to help manage traffic and assist and coordinate with emergency responders as needed. The following charts give a breakdown of State Police responsibilities during construction:

**Figure 3: State Police Responsibilities**

	<b>Connecticut State Police</b>
Monitor and Assist with Work Zone Management	In all work zone areas on State numbered routes and interchange ramps.
Remove Disabled Vehicles	Assist the On-Call tow service
Remove Accidents in one-way ramps	To access the scene, police need to enter either the beginning of the ramp or, in extenuating circumstances, the end of the ramp and travel in the wrong direction to the scene. Note: Officers may have to climb over the construction or median barrier.
Remove Accident in two (2) Lane section	To access the scene police need to utilize one of the adjacent lanes.
Remove Accident along detour routes	No action required; Local police to respond

### 5.3. Continuity of Emergency Services

Response to an incident within the work zone will require a coordinated effort beginning with 911 Centers located in Harford County and the State of Connecticut. Emergency Responders must know in what direction they will need to approach the incident and the best place to enter Route I-84, Route 2, any of the ramps and turning roadways and any of the local roads used for detours.

Communications will be critical to any emergency response within the construction area. Call takers must attempt to obtain information that is more detailed than normal. Identifying the location, lane blockage, and type of response needed – EMS, fire department, or police department will be extremely important.

Below is a series of scenarios and suggested responses. This is by no means a fixed response, nor is it designed to cover all possibilities. It should serve as a framework for handling emergencies in the construction area. Incidents will be reviewed with all stake holders on a weekly basis or as needed in order to improve response.

**Figure 4: Incidents and Responses**

<b>Incident</b>	<b>Response</b>	<b>Actions</b>
<p><b>Disabled Vehicle or Accident</b></p> <p><b>One Lane Blocked</b></p> <p><b>No injuries, Fire or Entrapment</b></p>	<p>On-Site Trooper or Post Car with Push Bumpers if Available</p>	<p>Respond – Assess – Request Additional Resources if needed</p> <p>Push Vehicle(s) to Pull Off Area or nearest exit if Possible</p> <p>Document Response and Actions</p>
	<p>Maintenance / Contractor</p>	<p>Respond with attenuator truck with arrow panel to move traffic to open lane.</p>
	<p>Transportation Security Operations Center (TSOC)</p>	<p>Activate appropriate ITS elements to provide advanced warning of incident and potential backups.</p>

Figure 4 continued.

Incident	Response	Actions
<p><b>Disabled Vehicle or Accident</b></p> <p><b>Both Lanes Blocked</b></p> <p><b>No Injuries, Fire, or Entrapment</b></p>	<p>State Police w/ push bumpers/ Attenuator truck respond in opposite direction to assess / verify lanes closed</p>	<p>Second State Police unit / Emergency Responders stage at crossover and will travel in wrong direction to reach scene after it is verified that roadway is closed.</p> <p>Assess – request additional resources if needed.</p> <p>Push vehicle(s) to pull off area or nearest exit if possible.</p> <p>Document response and actions.</p>
	<p>State Police</p>	<p>Respond to scene and initiate Interchange closure with assistance of Contractor and/or Maintenance</p> <p>Coordinate with Traffic Safety.</p> <p>Assess / request additional resources.</p> <p>Make appropriate notifications</p>
	<p>“H” Unit or other SP unit</p>	<p>Respond to appropriate exit to assist with closing lane(s).</p>
	<p>Transportation Security Operations Center (TSOC)</p>	<p>Activates next VMS past incident with message for all traffic to stay right</p>
	<p>Maintenance/Contractor</p>	<p>Respond with back up truck to close lanes as required.</p>

Figure 4 continued.

Incident	Response	Actions
<p><b>Disabled Vehicle or Accident</b></p> <p><b>Both Lanes Blocked</b></p> <p><b>With Injuries, Fire, or Entrapment</b></p>	<p>State Police followed by attenuator truck respond in the opposite direction of the incident to assess the scene and insure that all traffic is stopped</p>	<p>Second State police unit / Emergency Responders – respond in the wrong direction to reach incident after verification that traffic is stopped.</p>
	<p>State Police</p>	<p>Response – May Requires Driving Wrong Way on Interchange.</p> <p>Ensure Route is Clear for Additional Response.</p> <p>Assess – Request Additional Resources if Needed to Push Vehicle(s) to Pull Off Area or nearest exit if Possible.</p> <p>Document Response and Actions.</p>
	<p>State Police Officer</p>	<p>Respond to Scene.</p> <p>Initiate lane(s) Closure with Assistance of Contractor and/or Maintenance.</p> <p>Contact/Coordinate with Traffic Safety.</p> <p>Assess/Request Additional Resources.</p> <p>Make Appropriate Notifications.</p>
	<p>“H” Unit or other SP unit</p>	<p>Respond to Appropriate Exit to Assist with lane(s) Closing</p>

Figure 4 continued.

Incident	Response	Actions
<p><b>Hazardous Material Incident</b></p>	<p>On-Site Trooper and Post Car</p>	<p>Response – Ensure Route is Clear for EMS, Fire Dept.</p> <p>Assess – Request Additional Resources as Needed to Push Vehicle(s) to Pull Off Area or nearest exit if Possible.</p> <p>Document Response and Actions.</p>
	<p>State Police Officer</p>	<p>Respond to Scene Initiate lane(s) Closure with Assistance of Contractor and/or Maintenance.</p> <p>Contact/Coordination with Traffic Safety.</p> <p>Assess/Request Additional Resources.</p> <p>Consider Removing Trapped Traffic.</p> <p>Maker Appropriate Notifications.</p>
	<p>'H' Unit or SP Unit</p>	<p>Respond to Appropriate Exit to Assist with Lane(s) closing.</p>
	<p>Fire/EMS</p>	<p>MUST be authorized to Respond by Trooper at Scene who has Cleared Wrong Way Entry to Scene.</p>
	<p>Maintenance /Contractor</p>	<p>Close lane(s) respond with back up truck</p>

CTDOT Maintenance and Connecticut State Police and an authorized towing service will have to be able to communicate. The Fire Departments and Ambulance Crews currently will have to communicate by having their respective 911 Center call the Connecticut State Police.

In case of an emergency several means of notifying the traveling public are available including the use of fixed-mounted CMS, Highway Advisory Radio, CTDOT Traveler Information webpage and the Traffic E-Alert system.

## 5.4. Work Zone Safety Meeting

Prior to construction, a meeting will be convened to review traffic control requirements. Members of the CTDOT Construction divisions, the contractor, and state and local police personnel will participate. Subsequent meetings of similar scope and representation will be held as needed.

## 6. Public Outreach/Public Involvement Component

The Public Outreach/Public Information (PO/PI) component of the Transportation Management Plan includes both programmatic and project-level communications strategies. Programmatic measures are intended to create a general awareness of important work zone issues. Project-level measures provide information about a specific work zone to the people and organizations that will be directly affected.

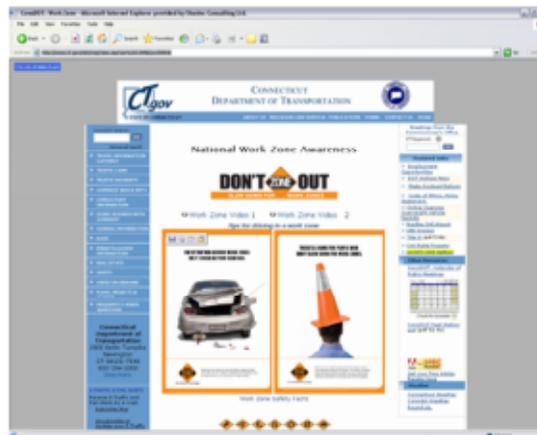
Public involvement and information are scaled to the probable intensity and extent of impacts. The transportation effects resulting from this project work zone are expected to be noticeable but not profound. The overall project PO/PI effort will address transportation effects and other subjects of interest.

### 6.1. Programmatic Work Zone Public Awareness

The CTDOT disseminates general work zone safety information via the work zone safety page of the agencies' Web sites, CTDOT Westbound site:

<http://www.ct.gov/dot/cwp/view.asp?a=1410&q=417232>

Figure 5: CTDOT Work Zone Safety Website



### 6.2. Public Information Meetings

This type of forum is routinely conducted during design development and serves a variety of purposes. In the context of work zone safety and mobility, the meeting will provide the public with advance notification of construction-phase conditions and transportation impacts. Residents, major employers, shippers, merchants, transportation-dependent service providers, utility owners and emergency responders use the information to coordinate their plans with anticipated work zone conditions. One public information meeting was held on June 13, 2013 (see Appendix A for copy of

Report of Meeting) during which all four projects were presented. The project was generally well received by those in attendance.

Prior to the commencement of construction activities, the CTDOT will notify the general public of the impending project through press releases to state and local media outlets as well as postings on the CTDOT website. Additional PIMs may be conducted during various phases of planning and construction, if deemed necessary.

### **6.3. Electronically-Disseminated Project Work Zone Information**

Standard practices include the posting of project information which is accessible from the CTDOT homepage [www.ct.gov/dot](http://www.ct.gov/dot) Travel Resource page that includes links to “Traffic Incidents”, “CT Travel Info Map”, and “Traffic Cams”. “CT Travel Info” is an interactive map displaying icons for ongoing active construction projects, roadway incidents, traffic camera images, and CMS sign displays by location. Additionally, motorists can sign up for e-mail news and traffic alerts. The E-Traffic Alerts are sent via e-mail when there is a traffic incident that will affect travel in a specified area of the state and the E-News alert sends information on general and construction news (press information) issued by the CTDOT.

### **6.4. Changeable Message Signs**

Two types of changeable message signs (CMS) will be utilized to provide real-time information of regional, corridor or location-specific relevance. Portable CMS will be provided through the construction contract, located in or near the work zone, and controlled by project personnel. CTDOT fixed-location CMS are located along major highways and are controlled by the respective authorities.

Portable CMS display messages related to the project work zone. Fixed-location CMS support regional and corridor movement. There will be occasions, based on other priorities, when fixed-location CMS messages will be used to mitigate work zone impacts. CMS messages will convey information on scheduled events and current conditions.

## **7. Transportation Management Plan Monitoring**

The various TMP elements and individual strategies will be monitored during implementation, both to minimize work zone transportation impacts and to assure that State contracts and agreements are administered properly.

### **7.1. Temporary Traffic Control Plan Conformance**

Nearly all aspects of the TTC Plan are incorporated into the construction contract. The construction contractor will be responsible for deploying the specified configurations, devices, and conditions. The Construction Division will administer the construction contract on behalf of the state. Construction representatives will review and document a myriad of contractor-provided TTC

products, services and conditions in relation to contract provisions. Information will be documented in daily work reports.

## **7.2. On-site Observations**

Ongoing, real-time observations by on-site personnel are a primary means of monitoring TMP operations and effectiveness. Contractor, inspection, enforcement/police, and service patrol personnel are likely to observe incidents, situations, and recurring conditions of interest and/or concern. Construction personnel will record and report significant observations. Responsive action will vary in consideration of the numerous factors including risk, intensity, persistence, and frequency of the effects and the cost and feasibility of potential remediation measures. For other observed conditions of concern, Construction division may elect to: take no action, initiate change, or seek the advice of another unit.

## **8. Transportation Management Plan Roles and Responsibilities**

This TMP encompasses a wide variety of impacts, disciplines and activities. Selecting, refining and implementing this plan compels an interdisciplinary team approach. Numerous technical and functional disciplines and organizations, each with relevant expertise and domains of responsibility, collaborated in the preparation of the TMP. Similarly, implementation will be carried out by many CTDOT units and external partners. The Consultant has overall responsibility for preparing the TMP and CTDOT Construction Division will have the primary implementation role. District personnel will monitor, maintain and revise (as needed) the TMP during construction. Specific information on the roles of various units and organizations is provided below.

### **8.1. Construction Contractor**

By definition, the contractor fulfills the specified contract requirements. The TTC plan will be implemented primarily through construction contract provisions. In addition to the lead role for physically shaping all aspects of the work zone and executing construction operations, the Contractor makes other contributions to the TMP. An effective public information program can only be based on credible information regarding construction operations (e.g. intermittent closures, phase changes). Much of this information is developed by the Contractor.

### **8.2. Consulting Engineer**

The Consulting Engineer for Project Nos. 42-304 and 42-305 (Site Nos. 1 and 2) is McFarland Johnson, Inc. The Consulting Engineer for Project No. 42-316 (Site No. 3) is Stantec Consulting Services, Inc. The Consulting Engineer, with aid from the Liaison Engineer, is responsible for design and preparation of the contract documents, including the Provisions for Maintenance and Protection of Traffic. The Consultant Engineers will be available to support CTDOT during construction, especially in situations that require detailed familiarity of design decisions and design modifications. Assistance of the Consulting Engineer may be needed during the TTC Plan implementation.

### **8.3. CTDOT Bridge Design**

The Design Engineer for Project No. 42-310 (Site No. 4) is State Bridge Design. State Bridge Design, with aid from the Liaison Engineer, is responsible for design and preparation of the contract documents, including the Special Provisions for Maintenance and Protection of Traffic. Bridge Design will be available to support CTDOT during construction, especially in situations that require detailed familiarity of design decisions and design modifications. Assistance of Bridge Design may be needed during the TTC Plan implementation.

### **8.4. CTDOT Construction**

Award of the construction contract marks a transfer of principal responsibility between CTDOT units, from Design to Construction. CTDOT Construction will be responsible for overall monitoring of the TMP. The designated contact person for CTDOT Construction for this project is Mr. Ravi Chandran, District Engineer - District 1 (Ph: 860-258-4601).

### **8.5. CTDOT Design**

The Design Division has the primary responsibility for the development of major engineering design projects and is the lead unit involved in the management of this TMP. Design will support implementation of this TMP by CTDOT Construction, primarily in the area of public information. The designated contact person for this project is Mr. Theodore Nezames, Manager of Bridges (Ph: 860-594-3272).

### **8.6. CTDOT Highway Operations**

The Connecticut Highway Assistance Motorist Program (CHAMP) is operated by CTDOT and provides service throughout the Route I-84 and Route 2 portion of construction. CHAMP services are described under the Transportation Operations component. No adjustments of CHAMP services are planned.

### **8.7. CTDOT Operations**

The location, capabilities and general functions of the TOC are described under the Transportation Operations Center. The contact for CTDOT Operations is (Ph: 860-594-3447)

### **8.8. CTDOT Traffic**

The project MPT will be reviewed by the CTDOT Traffic Engineering Division, CTDOT Construction, and CTDOT Design as part of the normal design process prior to advertising. CTDOT Traffic Engineering will also provide TTC-related construction consultation. The designated contact person for CTDOT Traffic Engineering is Charles S. Harlow, Manager of Traffic Engineering – Division of Traffic Engineering (Ph: 860-594-2788)

### **8.9. Public Safety/State Police**

An active project-level State Police presence is planned. The role, conduct, cost and reimbursement provisions for State Police personnel on CTDOT-administered construction projects are covered by a Memorandum of Understanding between CTDOT and Connecticut Department of Emergency

Services. State Police will be used to assist in work zone management on I-84 eastbound, Route 2 and all associated ramps and turning roadways, while local (East Hartford) police personnel will be used for local roadways, wherever needed. East Hartford is served by Connecticut State Police Troop H (Ph: 860-534-1000) and the East Hartford Police Department (Ph: 860-528-4401).

### 8.10. Partners

This category includes non-CTDOT organizations that provide specialized assistance and support. These partners include:

- Town of East Hartford (Ph: 860-291-7100)
- Emergency Services
  - Emergency Management Coordinator, Fire Marshall (Ph: 860-291-7400)
- Major East Hartford employers
  - Pratt & Whitney (Ph: 860-565-4321)
  - Fremont Riverview, LLC. (Ph: 860-289-8269)
  - Goodwin College (Ph: 860-528-4111)
- Major Hartford employers
  - The Hartford (Ph: 860-547-5000)
  - Aetna, Inc. (Ph: 860-273-0123)
  - Northeast Utilities (Ph: 860-665-5000)

Through routine and close contact with these parties, CTDOT will gain feedback and observations that can be used for TMP monitoring.

## 9. Implementation Summary and Contact Information

This Transportation Management Plan describes a series of actions, some completed and others planned for the future. CTDOT unit(s) and other organizations with primary and supporting responsibility are also identified. This concluding section summarizes and references significant Transportation Management Plan activities and roles. Contact information for each unit or organization with a designated TMP role is also provided.

**Figure 6: Overview of TMP Responsibilities by Organization**

Unit or Organization	Impact Assessment	TMP Component						Monitoring
		TTC		TO		PO/PI		
		Prep	Imp	Prep	Imp	Prep	Imp	
Construction Contractor			1				2	
Consulting Engineering		1					2	
CTDOT Bridge Design	1	2	2			1	2	
CTDOT Construction	2	2	2		1		2	1
CTDOT Design	2	2	2				2	2
CTDOT Highway Operations					2		2	2
CTDOT Operations				2	1			
CTDOT Traffic		2		2				
Public Safety/State Police			2		2			

1 = Primary Responsibility

Prep = Prepare TMP component

2 = Support Responsibility

Imp = Implement TMP component

Figure 7: Summary TMP Action Plan

TMP Element	Action Item	Responsible Party
Temporary Traffic Control	Develop Construction sequence/staging	Consulting Engineering
	Develop Maintenance and Protection of Traffic (M&PT)	Consulting Engineering, CTDOT Traffic Engineering,
	Identify and estimate M&PT pay items	Consulting Engineering
	Fulfill contract requirement, including M&PT	Construction Contractor, CTDOT Construction
	Initiate TTC revisions as determined by monitoring programs	CTDOT Construction, CTDOT Traffic, Consulting Engineering
Transportation Operations	Coordinate with Local Officials	Consulting Engineering, CTDOT Construction
	Provide advance notice	CTDOT Construction
	Administer and coordinate with CTDOT	CTDOT Construction
	Coordinate with emergency response agencies	Consulting Engineering, CTDOT Construction
	Administer and coordinate dedicated	CTDOT Construction, Connecticut State Police
	Establish Construction-Highway Operations	CTDOT Construction, CTDOT Highway Operations, CTDOT Operations
	Monitor and document work zone operational	CTDOT Construction, CTDOT Highway Operations, CTDOT Operations
Public Information	Hold public information meetings	Consulting Engineering, CTDOT Construction
	Prepare Press Releases	CTDOT Design, CTDOT Construction
	Release, disseminate and post news	CTDOT Design, CTDOT Operations
	Provide credible and timely information	CTDOT Construction, CTDOT Highway Operations

## **Appendix A – Correspondence**

<b>REPORT OF MEETING</b>
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**SUBJECT:** Public Information Meeting – East Hartford, CT

**DATE OF MEETING:** June 13, 2013

**BRIDGES:**

<u>Bridge No.</u>	<u>Project No.</u>	<u>Town</u>	<u>Route</u>	<u>Location</u>
02374	042-304	East Hartford	SR 500 TR 805	I-84
02375	042-305	East Hartford	SR 500 TR 801	I-84
02368A	042-310	East Hartford	Route 2 WB	I-84
02376	042-316	East Hartford	I-84 Ramp 831	I-84

**LOCATION OF MEETING:** Town Hall – East Hartford, CT

**IN ATTENDANCE:**

<u>NAME</u>	<u>REPRESENTING</u>	<u>Contact</u>
James Kulpa	Assistant Town Engineer – East Hartford	860-291-7318
Rabih Barakat	Bridge Design – ConnDOT	860-594-3208
Lou Bacho	Consultant Bridge Design – ConnDOT	860-594-3212
Joseph Scalise	Consultant Bridge Design – ConnDOT	860-594-3389
Ralph Daily	Bridge Design – ConnDOT	860-594-3312
Matt Gillis	Bridge Design – ConnDOT	860-594-3318
Edward Powell	Bridge Design – ConnDOT	860-594-2142
Brett Stoeffler	Traffic Design – ConnDOT	860-594-2758
Nick Giardina	BL Companies	860-249-2200
Sara Bastos	BL Companies	860-249-2200
Michael Woods	Close Jensen and Miller	860-563-9375
Mark Levesque	Close Jensen and Miller	860-563-9375
Gene McCarthy	McFarland Johnson	603-225-2978
James Hall	McFarland Johnson	603-225-2978
Stephen Makris	C & C (Garg)	617-903-4600
Andrew Lessard	Stantec	203-281-1350 x7062

**TRANSACTIONS AND DETERMINATIONS:**

The meeting opened with a brief introduction followed by the presentation of the four subject bridges. The town was represented by the assistant town engineer. Two East Hartford residents were in attendance. After the presentation, the meeting was opened to questions and comments. The following is a summary of the presentation and comments.

Bridge No. 02374

The existing bridge consists of three (3) simply supported steel multi girder spans with a cast in place concrete deck and a bituminous wearing surface. The bridge supports ramps from Governor St. and I-84 WB to Route 2 EB in the town of East Hartford. The bridge carries two lanes of traffic. The existing bridge has a curb-to-curb width of 51 feet. The total average daily traffic (ADT) on the bridge is 9,200 vehicles with 2,700 vehicles entering from Governor Street and 6,500 vehicles entering from I-84 Westbound.

The purpose and need for the project is to address the bridge's structural deficiencies and functional obsolescence. The bridge is Structurally Deficient due to significant substructure deterioration and Functionally Obsolete due to inadequate vertical under-clearance. The proposed bridge replacement will result in approximately 400-feet of roadway construction. The proposed lane and shoulder configurations will match the existing roadway layout.

The Governor Street ramp will be closed and traffic will be detoured via Governor Street to Blacksmith Lane to East River Drive. From East River Drive, traffic will take I-84 East to Route 2 East via Exit 55. The I-84 WB ramp will be maintained at all times throughout construction.

Bridge No. 02375

The existing bridge consists of seven (7) simply supported steel multi girder spans with a cast in place concrete deck and a bituminous wearing surface. The bridge supports the ramp from Route 2 WB to Governor Street in the town of East Hartford. The bridge carries one lane of traffic. The total average daily traffic (ADT) on the bridge is 3,900 vehicles.

The purpose and need for the project is to address the bridge's structural deficiencies and functional obsolescence. The bridge is Structurally Deficient due to the poor condition of the superstructure and Functionally Obsolete due to inadequate vertical under-clearance. The proposed lane and shoulder configurations will match the existing roadway layout. The proposed repairs will be constructed in two stages allowing one lane of traffic to be maintained on the bridge during construction. The substructure repair work will require the use of off-peak lane and shoulder closures on I-84 Eastbound and the I-84 Connector (TR833) using ConnDOT's Construction Traffic Control Plans.

Bridge No. 02368A

The existing curved seven (7) span bridge consists of simple span steel plate girders composite with a reinforced concrete deck supported by reinforced concrete piers and abutments. The bridge supports Route 2 WB over Interstate 84 EB, I-84 Ramp 831, and I-84 Ramp 833 in the Town of East Hartford. The overall length is 645 feet and the curb-to-curb roadway width is 26 feet. The bridge substructure, superstructure, and deck are currently rated in poor condition.

A full closure of the bridge is necessary to perform this work. Detour will be put in place once the construction areas have been established and the road will be reopened when the bridge work is complete.

#### Bridge No. 02376

The existing bridge is a three (3) span steel beam structure with a reinforced concrete deck. The bridge is supported by reinforced concrete abutments and piers founded on spread footings. TR 831 adjoins with TR 801, which carries SR 500 traffic from Route 2 West to Governor Street, directly north of the bridge. The curb-to-curb deck width is 26 feet. The total structure length is 161 feet with a max span length of 68 feet.

The existing structure is structurally deficient due to the poor condition of the superstructure and functionally obsolete due to the substandard minimum vertical under-clearance over I-84 eastbound. The proposed project consists of replacing the existing superstructure with a three span continuous steel superstructure. A curb-to-curb roadway width of 26 feet will be provided for this project. The substructure will be modified in order to accommodate the proposed superstructure. The proposed lane and shoulder configuration will match the existing roadway layout.

Construction will be performed utilizing a complete detour of I-84 TR 831. Vehicles destined for Governor Street from downtown Hartford would be detoured to take Exit 3 on Route 2 East and proceed on a combination of local and state roads to reach Governor Street. An additional truck through traffic detour has been added. Temporary off-peak lane and shoulder closures of I-84 EB will be necessary.

Work is anticipated to begin in the Spring of 2015 with a two-year construction duration. The total project cost for the replacement of these four bridges is approximately \$20 million.

The town of East Hartford representative noted that Pitkin Street is scheduled to be milled and overlaid in 2014.

A resident asked if work would be performed during the daytime hours and if night work was to be allowed. *A representative from ConnDOT stated that if any of the bridges were to be completely closed to traffic, then work would be permitted during the daytime hours. If the bridge is to remain open to traffic and stage construction is proposed, the work would have to be performed during off-peak traffic hours and night work would be permitted.*

A resident asked if the proposed construction work would allow the contractor to work on all four bridges at the same time. *A representative from ConnDOT stated that the proposed construction sequencing will be defined in the contract specifications that will allow only approved detours.*

We believe the minutes of this meeting reasonably reflect the content and findings of the meeting. Unless notified in writing to the contrary within ten (10) days of receipt of this report, we will assume all in attendance concur with the accuracy of this transcript.

Submitted by:

  
\_\_\_\_\_  
Nick R. Giardina

Date: 6/28/13

Approved by:

**Louis Bacho**  
\_\_\_\_\_  
Digitally signed by Louis Bacho  
DN: cn=Louis Bacho, o=CT Department of  
Transportation, ou=Consultant Design  
(Bridge), email=louis.bacho@ct.gov, c=US  
Date: 2013.07.03 16:50:54 -04'00'

Date: \_\_\_\_\_