

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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July 10, 2019
FEDERAL AID PROJECT NOS. 0066(121) & 0009(117)
STATE PROJECT NOS. 0082-0312 & 0082-0320

Rehabilitation of the Approach Spans for Arrigoni Bridge No. 00524
Saint John's Square and Main Street Intersection Improvements

Towns of Middletown and Portland
Federal Aid Project Nos. 0066(121) & 0009(117)

The State of Connecticut, Department of Transportation, Standard Specifications for Roads, Bridges, Facilities and Incidental Construction, Form 817, 2016, as revised by the Supplemental Specifications dated July 2018 (otherwise referred to collectively as "ConnDOT Form 817") is hereby made part of this contract, as modified by the Special Provisions contained herein. Form 817 is available at the following DOT website link <http://www.ct.gov/dot/cwp/view.asp?a=3609&q=430362>. The current edition of the State of Connecticut Department of Transportation's "Construction Contract Bidding and Award Manual" ("Manual"), 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 at the following DOT website link <http://www.ct.gov/dot/cwp/view.asp?a=2288&q=259258>. The Special Provisions relate in particular to the Rehabilitation of the Approach Spans for Arrigoni Bridge No. 00524 and Saint John's Square and Main Street Intersection Improvements in the Towns of Middletown and Portland.

COMBINED PROJECTS

There will be but one Contract for Federal Aid Project No. 0066(121) State Project No.(0082-0312) and Federal Aid Project No. 0009(117) (State Project No. 0082-0320). The two projects will be considered as a single contract in all respects.

CONTRACT TIME AND LIQUIDATED DAMAGES

For Federal Aid Project No. 0066(121) (State Project No.0082-0312 and Federal Aid Project No. 0009(117) (State Project No. 0082-0312) Seven Hundred Thirty (730) calendar days will be allowed for completion of the work and the liquidated damages charge to apply will be Five Thousand Dollars (\$5,000.00) per calendar day.

**NOTICE TO CONTRACTOR – GLOBAL POSITIONING SYSTEM (GPS)
COORDINATES FOR SIGNS**

The Contractor shall obtain and provide to the Engineer sign installation data, including Global Positioning System (GPS) latitude and longitude coordinates, for all new State owned and maintained signs. The Engineer shall forward the sign data to the Division of Traffic Engineering for upload into the Highway Sign Inventory and Maintenance Management Program (SIMS). Sign data submissions or questions relating to SIMS or GPS shall be sent to DOT-SignInventory@ct.gov. Refer to the special provision for Section 12.00 General Clauses For Highway Signing.

NOTICE TO CONTRACTOR – UTILITY GENERATED SCHEDULE

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

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

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

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

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

rev. 5/20/2013		UTILITY WORK SCHEDULE	
CTDOT Project Number:	082-312	Town:	Middletown/portland
Project Description: Relocation of Comcast lines under bridge			
CTDOT Utilities Engineer:			
Phone:		Email:	
Utility Company: Comcast of Clinton			
Prepared By:	Christopher Martino	Date Prepared:	1/7/2019
Phone:	860-662-1154	Email:	chris_martino@cable.comcast.com
Scope of Work			
The following is a description of all utility work planned to be completed in conjunction with the CTDOT project. The narrative describes all work to be carried out by the utility or its contractor, including temporary and permanent work required by the project as well as any additional utility infrastructure work the utility intends on performing within the project limits during the construction of the project.			
Relocate Comcast lines under the Arrigoni bridge out of the construction location when construction is completed Relocate back to the original location.. Relocation work will be done 7AM-3PM Monday to Friday.. 1 week per relocation expected. Total 2 weeks of construction to finish			
Special Considerations and Constraints			
The following describes the limiting factors that must be planned for in the scheduling and performance of the utility work. For example, restrictions on cut-overs, outages, limitations on customer service interruptions (e.g. nights, weekends, holidays), seasonal and environmental shutdown periods, long lead material procurements, etc..			

UTILITY WORK SCHEDULE Rev 08 02 2016		
CTDOT Project Number:	82-320	Town: Middletown
Project Description: Improvements on Main Street		
CTDOT Utilities Engineer: Gregg Hendrickson		
Phone:	(860)594-3264	Email: gregg.hendrickson@ct.gov
Utility Company: Eversource (Electric)		
Prepared By:	Richard Russo	Date Prepared: 03/19/2019
Phone:	203-245-5440	Email: richard.russo@eversource.com
Scope of Work		
<p>The following is a description of all utility work planned to be completed in conjunction with the CTDOT project. The narrative describes all work to be carried out by the utility or its contractor, including temporary and permanent work required by the project as well as any additional utility infrastructure work the utility intends on performing within the project limits during the construction of the project.</p>		
<p>Lower manhole cover and frame at NW corner of intersection of Main and Washington St.</p>		
Special Considerations and Constraints		
<p>The following describes the limiting factors that must be planned for in the scheduling and performance of the utility work. For example, restrictions on cut-overs, outages, limitations on customer service interruptions (e.g. nights, weekends, holidays), seasonal and environmental shutdown periods, long lead material procurements, etc..</p>		

UTILITY WORK SCHEDULE Rev 3/2015

CTDOT Project Number: 82-320

Utility Company: Eversource Energy (Electric)

Prepared By: Richard Russo

Total Working Days: 1

Schedule

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

Location (Station to Station)	Description of Utility Work Activity	Predecessor Activity	Duration (working days)
33 + 5 Left 35	Lower manhole cover and frame	Contractor to remove sidewalk adjacent to cover / survey to provide final grade	1

UTILITY WORK SCHEDULE Rev 3/2015			
CTDOT Project Number:	82-320	Town:	Middletown
Project Description:	Relocate existing 2" vent stacks and services on Main Street in Middletown		
CTDOT Utilities Engineer:	Gregg W. Hendrickson		
Phone:	860-594-3264	Email:	gregg.hendrickson@ct.gov
Utility Company:	Eversource Gas		
Prepared By:	Tyler Kent	Date Prepared:	2/23/2017
Phone:	203-317-4484	Email:	tyler.kent@eversource.com
Scope of Work			
<p>The following is a description of all utility work planned to be completed in conjunction with the CTDOT project. The narrative describes all work to be carried out by the utility or its contractor, including temporary and permanent work required by the project as well as any additional utility infrastructure work the utility intends on performing within the project limits during the construction of the project.</p> <p>This project will involve the relocation of Eversource's 2" steel vent lines/stacks and 2 services that are in conflict with the intersection reconstruction. The new 2" vent lines/stacks, which are located inside the existing median, will be relocated to the northern side of the railroad bridge, with one vent stack going on each side of the bridge. Due to drainage conflicts, new 1" plastic services will be installed from the existing 12" steel main to 656 and 728 Main Street. Approximately 117' of new 2" steel pipe and 181' of new 1" plastic pipe main will be installed to avoid construction conflicts.</p>			
Special Considerations and Constraints			
<p>The following describes the limiting factors that must be planned for in the scheduling and performance of the utility work. For example, restrictions on cut-overs, outages, limitations on customer service interruptions (e.g. nights, weekends, holidays), seasonal and environmental shutdown periods, long lead material procurements, etc..</p> <p>Buy America pipe has a 12-16 week lead time. After the notice to proceed with work is given, there will be 12-16 weeks before the steel pipe will be available for installation.</p>			

UTILITY WORK SCHEDULE Rev 3/2015

CTDOT Project Number: 82-320

Utility Company: Eversource Gas

Prepared By: Tyler Kent

Total Working Days: 10

Schedule

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

Location (Station to Station)	Description of Utility Work Activity	Predecessor Activity	Duration (working days)
47+03-47+16	Install 2" vent stack to west side of railroad bridge		3
47+32-47+43	Install 2" vent stack to east side of railroad bridge		2
46+45	Install new plastic service to 728 Main Street		3
42+75	Install new plastic service to 656 Main Street		2

NOTICE TO CONTRACTOR - TRAFFIC SIGNALS

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

Qualified/Unqualified Workers

U.S. Department of Labor

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

Part Number 1910

Part Title Occupational Safety & Health Administration

Subpart S

Subpart Title Electrical

Standard Number 1910.333

Title Selection and use of work practices

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

The electric distribution company is responsible to provide and install all necessary anchors and guy strands on utility poles. It is the Contractors responsibility to coordinate with the utility company to ensure proper placement of the anchor.

For utility poles owned and maintained by Frontier Communications:

Frontier will be responsible to provide and install the pole anchor. The installation of the guy wire will be the responsibility of the Contractor and should follow Frontier specifications.

The Controller Unit (CU) shall conform to the current edition of the Functional Specifications for Traffic Control Equipment. The Functional Specifications require the CU meet NEMA Standard Publication No. TS2-1992 Type 2. The Functional Specifications are available on the Departments' web site <http://www.ct.gov/dot/site/default.asp>, click on "Doing Business with CONNDOT", under Engineering Resources click on "Traffic Engineering", Scroll down to Traffic Documents click on "Functional_Specifications_for_Traffic_Control_Equip.pdf".

Utility poles cannot be double loaded without proper guying.

The contractor will be held liable for all damage to existing equipment resulting from his or his subcontractor's actions. A credit will be deducted from monies due the Contractor for all maintenance calls responded to by Department of Transportation personnel.

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

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

The 30 Day Test on traffic control equipment, as specified in Section 10.00, Article 10.00.10 - TESTS, will not begin until the items listed below are delivered:

Five (5) sets of cabinet wiring diagrams. Leave one set in the controller cabinet.
All spare load switches and flash relays.

For City-owned intersections no. 082-214 and 082-222, the items shall be delivered to the City of Middletown, Public Works Department. For State-owned intersection no. 082-241, the items shall be delivered to the Department of Transportation, Traffic Signal Lab in Rocky Hill.

A single cast in place pedestal foundation is to be installed at intersection #082-241. Refer to the details provided on the plans. This work is to be paid for under item #1002203 – TRAFFIC CONTROL FOUNDATION – PEDESTAL – TYPE I along with the standard precast pedestal foundations that are also to be installed under this project.

Two existing combination mast arm assemblies at intersection #082-222 are to be modified to function solely as light poles. Refer to the construction notes on the traffic signal plan. This work is to be paid for under item #1118012A – REMOVAL AND/OR RELOCATION OF TRAFFIC SIGNAL EQUIPMENT.

**NOTICE TO CONTRACTOR – SPAN WIRES, SPAN POLES AND SPAN
POLE FOUNDATIONS**

The Contractor is notified that the Contract includes special provisions for the span wire, steel span pole, and span pole foundation items that require the submittal of working drawings and calculations for each span wire structure configuration.

NOTICE TO CONTRACTOR – CONSTRUCTION EQUIPMENT

The load ratings of the Arrigoni Bridge shown below are in accordance with the AASHTO “Manual for Bridge Evaluation”.

AASHTO Designation	Inventory Rating	Governing Element
SU7	24.8 Tons	GIRDER

It shall be the Contractors’ responsibility to determine the type, size, and weight of all vehicles that can be used safely on the structure during construction. This determination shall be based on the condition of the existing structure and be done prior to placement of the Contractors’ equipment. This determination shall be made by a Professional Engineer licensed in the State of Connecticut and paid for by the Contractor.

The Contractor shall submit to the Engineer for review and approval his proposed method of work, schedule and identification of equipment to be used prior to start of construction.

NOTICE TO CONTRACTOR – SALVAGE

The Contractor shall salvage the following items for the City of Middletown:

- Existing Granite Stone Curbing that is removed and not reset along Main Street and adjacent side streets.
- Existing bike rack at the southeast corner of Rapallo Avenue and Main Street.

The salvaged Granite Stone Curbing in good, reusable condition shall be banded to pallets. (curbing will not be accepted if not properly banded.) Elements with damage will not be accepted.

The Engineer will determine the condition of the materials to be satisfactory for salvage purposes.

The salvaged granite curbing and bike rack shall be delivered to the City of Middletown Yard at 465 Washington Street, Middletown, CT 06457.

48 hours prior to delivery the contractor shall contact Mr. Christopher Holden, Deputy Public Works Director at (860) 638-4850 or via email at Chris.Holden@MiddletownCT.gov to make arrangement for receiving shipment.

The salvaged material shall be loaded, transported and unloaded by the Contractor. All material shall be stacked and stored by the Contractor according to the direction of the Deputy Director or his/her representative.

The Contractor shall not receive direct payment for this work. The cost of dismantling, sorting, banding, loading, transporting and unloading the items designated for salvage shall be included in the general cost of the work for the project.

NOTICE TO CONTRACTOR – COORDINATION WITH EXISTING UTILITIES

Existing utilities shall be maintained during construction. The contractor shall verify the location of underground and overhead utilities, construction work with the vicinity of utilities shall be in accordance with current safety regulations.

Utility relocation work, by others, is required within the project limits. The contractor is hereby notified that utility work schedules will have to be accommodated prior to proceeding. The Contractor shall coordinate with the utility companies to accommodate their schedule with all the utility schedules. Access, staging and sequence and protection of work shall be coordinated by the contractor. Any inconvenience or delay that may result from the utility company work shall be included in the contract bid for the work. The proposed utility relocations are shown on the utility plans for information purposes on and are subject to change. The work to repair or replace any damaged to utilities caused by the contractor operations will be solely at the contractor expense, in accordance with Form 816, Section 1.07.

The Contractor shall notify “Call before you Dig”, telephone 1-800-922-4455 for location of public utility underground facilities, in accordance with Section 16-345 of regulation of the Department of Public Utility Control. The notification to “Call before you Dig” must be made at least 48 hours in advance.

While performing excavation activities around the center island along Main Street care need to be take in protecting and maintaining the existing gas main facilities. When forming the subgrade around the existing gas main; hand compact around main and minimize the use of heavy machinery in the general vicinity. In addition, provide protection from ignition sources and support the facility during excavation activities.

The contractor shall contact the following company representatives at least two weeks in advance of work being done to coordinate protection and or temporary support of their utilities.

Yankee Gas Services Company dba Eversource Energy-Gas Distribution

Mr. James Shea
Lead Engineer Gas Project Engineering
107 Selden Street, Mail Stop NUE2
Berlin, Connecticut 06037
(203) 317-4570
James.Shea@eversource.com

The Connecticut Light & Power dba Eversource Energy- Electric Energy

Mr. Thomas Woronik
Supervisor - Construction Engineering
22 East High Street
East Hampton, Connecticut 06424
(860) 267-3891
Thomas.Woronik@eversource.com

NOTICE TO CONTRACTOR – FEDERAL WAGE DETERMINATIONS (Davis Bacon Act)

The following Federal Wage Determinations are applicable to this Federal- Aid contract and are hereby incorporated by reference. During the bid advertisement period, it is the bidder’s responsibility to obtain the latest Federal wage rates from the US Department of Labor website, as may be revised 10 days prior to bid opening. Any revisions posted 10 days prior to the bid opening shall be the wage determinations assigned to this contract.

Check Applicable WD# (DOT Use Only)	WD#	Construction Type	Counties
X	CT1	Highway	Fairfield, Litchfield, Middlesex, New Haven, Tolland, Windham
	CT2	Highway	New London
	CT3	Highway	Hartford
	CT5	Heavy Dredging (Hopper Dredging)	Fairfield, Middlesex, New Haven, New London
	CT6	Heavy Dredging	Statewide
	CT13	Heavy	Fairfield
	CT14	Heavy	Hartford
	CT15	Heavy	Middlesex, Tolland
	CT16	Heavy	New Haven
	CT17	Heavy	New London
	CT26	Heavy	Litchfield, Windham
	CT18	Building	Litchfield
	CT19	Building	Windham
	CT20	Building	Fairfield
	CT21	Building	Hartford
	CT22	Building	Middlesex
	CT23	Building	New Haven
	CT24	Building	New London
	CT25	Building	Tolland
	CT4	Residential	Litchfield, Windham
	CT7	Residential	Fairfield
	CT8	Residential	Hartford
	CT9	Residential	Middlesex
	CT10	Residential	New Haven
	CT11	Residential	New London
	CT12	Residential	Tolland

The Federal wage rates (Davis-Bacon Act) applicable to this Contract shall be the Federal wage rates that are current on the US Department of Labor website (<http://www.wdol.gov/dba.aspx>) as may be revised 10 days prior to bid opening. The Department will no longer physically include revised Federal wage rates in the bid documents or as part of addenda documents. These applicable Federal wage rates will be incorporated in the final contract document executed by both parties.

If a conflict exists between the Federal and State wage rates, the higher rate shall govern.

To obtain the latest Federal wage rates, go to the US Department of Labor website (link above). Under Davis-Bacon Act, choose “Selecting DBA WDs” and follow the instruction to search the latest wage rates for the State, County and Construction Type.

NOTICE TO CONTRACTOR – ELECTRONIC ENGINEERING DATA (EED)

The EED is an assembly of engineering data files that were used to produce the Contract plans.

Electronic Engineering Data (EED) is provided for information purposes only. In case of conflict between the EED and the Contract plans and specifications, the contract plans and specifications shall govern. The EED has been reviewed by the Department for quality control purposes, but it is the Contractor's responsibility to build the Project per the contract plans and specifications.

The EED is being provided to the Engineer for GPS/RTS inspection. The Contractor may use the EED to assist in bidding, layout and Automated Machine Control/Guidance.

The EED includes geospatially-correct 2D CAD files and may include horizontal and vertical alignment data files, 3D surface model files (break-line features and triangles) and a preference file. The data is being provided in two formats:

- Native Format
 - Bentley MicroStation CAD files (dgn)
 - Bentley SS2 InRoads Alignment Files (alg)
 - Bentley SS2 InRoads Digital Terrain Models (dtm)
 - Bentley SS2 InRoads Preference File (xin)
- Converted Format (for use in GPS/RTS Site equipment)
 - AutoCAD CAD files (dxf)
 - Alignment files (xml)
 - Surface Models (xml)

For a complete list of EED files, see the EED file manifest (PDF) located in the EED_0082-0320.zip file (0082-0320 is the project number) which is posted with the contract PS&E's on the State Contracting portal.

NOTICE TO CONTRACTOR – EXISTING SHOP DRAWINGS

Shop drawings used for the original construction are available for examination at the Departments' Engineering Records, 160 Pascone Place, Newington, CT 06111.

NOTICE TO CONTRACTOR – ONGOING PROJECTS

The Contractor is hereby advised that current and/or anticipated projects may be ongoing simultaneously with this project. Such projects may include but not be limited State Project Nos. 0082-0318 (Route 9 Traffic Signal Removal) and 0082-0319 (Sidewalk Bump-Out's along Main Street). The Contractor shall be aware of those projects so that he may coordinate his work accordingly.

**NOTICE TO CONTRACTOR – CONSTRUCTION CONTRACTOR
DIGITAL SUBMISSIONS**

Upon execution of the Contract, the Contractor acknowledges and agrees that contractual submittals for this Project shall be submitted and handled through a system of paperless electronic means as outlined in the special provision for Section 1.05 herein.

Shop drawings, working drawings, and product data shall be created, digitally signed and delivered by the Contractor in accordance with the Department's [Contractor Digital Submission Manual](#) (CDSM). Other deliverables that are required by other special provisions shall be similarly submitted.

Access credentials will be provided to the Contractor by the Department.

The Department will provide the Contractor with a list of email addresses that are to be used for each submittal type.

The Department shall not be held responsible for delays, lack of processing or response to submittals that do not follow the specified guidelines in the CDSM.

NOTICE TO CONTRACTOR – PROTECTION AND COORDINATION OF EXISTING UTILITIES

Existing utilities shall be maintained during construction. The Contractor shall verify the location of underground and overhead utilities. Construction work within the vicinity of utilities shall be performed in accordance with current safety regulations.

Representatives of the various utility companies shall be allowed access to the work, by the Contractor. Refer to Notice to Contractor – Coordination with Utilities for contact information for each utility.

The Contractor shall be liable for all damages or claims received or sustained by any persons, corporations or property in consequence of damage to existing utilities, their appurtenances, or other facilities caused directly or indirectly by the operations of the Contractor.

In order to notify utility companies the number 1-800-922-4455 (Call Before You Dig), in accordance with Section 16-345 of Regulation of the Department of Utility Control, must be called at least forty-eight (48) hours prior to the start of excavation. This notification will enable the utility companies to mark out their facilities in the field.

Contractors are cautioned that it is their responsibility to verify locations, conditions, and field dimensions of all existing features, as actual conditions may differ from the information shown on the plans or contained elsewhere in the specifications.

Contractor shall notify the Engineer prior to the start of work and shall be responsible for all coordination with the Department. The Contractor shall allow the Engineer complete access to the work.

Any damage to any existing private and public utility, as a result of the Contractors operations, shall be repaired to the utility and Engineer's satisfaction at no cost to the State, the Town or the Utilities, including all materials, labor, etc., required to complete the repairs in accordance with Article 1.07.09.

During the excavation for the proposed improvements, the cover over the existing underground Utilities will be reduced. Therefore, the Contractor shall have the location of the underground Utilities marked out prior to the following the excavation. The Contractor's attention is directed to the requirements of Article 1.07.13-Contractor's Responsibility for Adjacent Property and Services.

Prior to opening an excavation, effort shall be made to determine whether underground installations, i.e., sewer, fuel, electric line, etc., will be encountered and, if so, where such underground installations are located. When the excavation approaches the estimated location of such installations, the exact location shall be determined by careful probing or hand digging, and when it is uncovered, proper supports shall be provided for the existing installation. Utility

companies shall be contacted and advised of proposed work prior to the start of actual excavation.

The Contractor shall perform all work in such a manner that will protect each Utility Company's facilities from damage. This may include excavation by hand methods as well as modified compaction methods when working close to underground Utilities. The Contractor is responsible for coordinating their work with each utility sufficiently in advance of the work so that the utility can schedule their work crews.

The Contractor shall use care when excavating in the vicinity of manholes, catch basins and pipes, which are to remain to avoid damage to these structures. As a minimum, the Contractor shall notify the following Utilities representative a minimum of two (2) weeks prior to any scheduled excavation so as not to cause any delay to his anticipated progress.

NOTICE TO CONTRACTOR – RECENT REVISIONS

The Contractor is hereby notified that the following Traffic Engineering Special Provisions have been revised:

Section 10.00 – General Clauses for Highway Illumination and Traffic Signal Projects

- Updated as-built plan requirements

1105xxxA – X_Way_X_Section Traffic Signal:

- Changed the color of housing, brackets, and hardware
- Clarified color of housing door and visor.
- Backplates:
 - changed to louvered
 - changed retroreflective strip sheeting type
 - changed aluminum alloy to 5052-H32
 - provided range for acceptable thickness

1106xxxA – X_Way_Pedestrian Signal:

- Changed the color of housing, brackets, and hardware
- Clarified color of housing door and visor

1107011A – Accessible Pedestrian Signal and Detector (Type A)

- Changed the color of housing, brackets, and hardware
- Changed the sign size to 9” x 15”
- Changed to include confirmation light

1112286A – 360 Degree Camera Assembly

1112288A – IP Video Detection Camera Assembly

- Added installation best practices guide

The Contractor is hereby notified that Traffic Engineering’s following Standard Sheets have been revised:

TR-1105_01 – Traffic Signals and Cable Assignments

- Revised grounding note for span and other minor revisions

TR-1107_01 – Pedestrian Push Buttons

- Updated pedestrian sign legends and notes.

TR-1114_01 – Bonding and Utility Pole Attachment Details, Sign Hanger, “Y” Clamp Detail

- Revised wood pole grounding details, added ground rod.

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 five (5) years that includes the installation of each of the ITS equipment identified below.

- 4” (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 (3) years. Experience shall be in related fiber optic systems for installers involving single-mode cables in excess of 6 miles (9.7 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.

The document for the ITS Equipment Installer, Traffic Structure Foundations 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, 36-Fiber
- Fiber Optic Cable Splice Enclosures
- Equipment Operations
- Traffic Management System Cabinets
- Video equipment, including cameras and mountings
- Optical Video/Data Transmitter and Receiver
- 10/100 Base – TX Ethernet Switch
- Terminal Server
- Port Sharing Device
- Ethernet Media Converter
- Media Converter
- Video and Graphics Wall Equipment
- Traffic Flow Monitor
- Motorist Variable Message Signs

The Contractor shall not start work on the Incident Management System until the Contractor receives approval from the Department.

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 (830) 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 Newington 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 – Federal Rail Safety Regulations (49 C.F.R. Part 219) Concerning Alcohol and Drug Testing

On October 16, 2008, the United States Congress enacted the Rail Safety Improvement Act of 2008 (RSIA). RSIA directs the Federal Railroad Administration (FRA) to promulgate new safety regulations related to railroad safety. The purpose of this NTC is to notify you of certain requirements recently promulgated by the FRA that may be applicable to work you are currently performing, or may in the future perform, for the Connecticut Department of Transportation (Department).

On June 10, 2016, the FRA published a final rule expanding the scope of its drug and alcohol testing regulations (FRA Regulations) to provide that “[e]ach railroad must ensure that a regulated employee is subject to being selected for random testing... whenever the employee performs regulated service on the railroad’s behalf.” 49 C.F.R. § 219.601. A “regulated employee” includes a contractor to a railroad or any individual who is performing activities for a railroad and includes those contractors, consultants or individuals who are deemed “maintenance-of-way” employees under 49 CFR.Part 219 (See 49 C.F.R. §219.5).

The term maintenance-of-way (MOW) employee, as used in 49 C.F.R. Part 219, is defined in 49 C.F.R. § 214.7 as “any employee...of a contractor to a railroad, whose duties include inspection, construction, maintenance or repair of railroad track, bridges, roadway, signal and communications systems, electric traction systems, roadway facilities or roadway maintenance machinery on or near track or with the potential of fouling a track, and flagmen and watchmen/lookouts.” (collectively, MOW Activities).

The final rule, which is effective June 12, 2017, requires contractors and consultants employing MOW employees to submit a Part 219 Compliance Plan to FRA prior to the effective date. Please consult the following link to the model drug and alcohol plan prepared by the FRA for guidance.

<https://www.fra.dot.gov/eLib/details/L02814>

The final rule mandates, among other things, the establishment of a random testing pool to ensure a testing rate of 50% of MOW employees for drugs and 25% of MOW employees for alcohol on an annual basis. For more information related to the requirements, please refer to:

<http://www.ecfr.gov/cgi-bin/text-idx?rgn=div5&node=49:4.1.1.1.14>

Every contractor or consultant that is performing MOW Activities must comply with its obligations under 49 C.F.R. Part 219 to ensure that all MOW employees are being randomly tested for drugs and alcohol. Failure of a contractor or consultant to timely comply with the FRA Regulations may subject that firm to civil penalties. In addition, MetroNorth Railroad (MNR) has stated that contractors or consultants who do not comply with the FRA regulations will not be able to work on MNR property.

The Department strongly urges all contractors and consultants to consult with their attorneys and/or to conduct their own independent due diligence regarding the requirements imposed by the new FRA Regulations to determine what steps are necessary to assure compliance. The information provided herein is advisory in nature and is offered without warranty of any kind. The Department does not accept any responsibility or liability for the accuracy, content, completeness, legality, or reliability of the information contained herein.

Any questions regarding the FRA Regulations concerning drug and alcohol testing should be directed to: Mr. Gerald Powers, Drug and Alcohol Program Manager, Office of Safety Enforcement, Federal Railroad Administration, 1200 New Jersey Avenue SE, Mail Stop 25, Washington, DC 20590 or via telephone (202) 493-6313.

GENERAL



NOTICE TO CONTRACTOR - WORK ON RAILROAD PROPERTY

The Contractor is hereby notified that all railroad specifications contained elsewhere herein shall be made a part of this contract, and that the Contractor shall be bound to comply with all requirements of such specifications with the following exception: Providence and Worcester Railroad (P&W) is a subsidiary of Genesee & Wyoming, Inc. (G&W) and their specifications include some provisions that the Department has determined are not applicable for this project given the State's or City's ownership of the track and associated property.

The requirements and conditions set forth in the subject specifications shall be binding on the Contractor just as any other specification would be.

The Contractor is herein notified of the following railroad related special provisions that are part of this contract:

- G&W General Special Provision: This specification provides general requirements for the Contractor to work on the property upon which the railroad operates. The cost of complying with the specification shall be included in the general cost of the work.
- G&W Public Project Manual (Relevant Sections): 1.07 Railroad Flagging Requirements, 1.10 Project Requirements, 1.11 Construction Submission Criteria, 1.12 Railroad Property Safety. These specifications provide requirements for Contractor. The cost of complying with the specification shall be included in the general cost of the work.

Cost of Railroad Protection: The Contractor will be reimbursed for the cost of Railroad Protection necessary to complete the work shown in the contract in accordance with the item "RAILROAD PROTECTION".

G&W GENERAL SPECIAL PROVISION



Authority of the Railroad Engineer

The Providence and Worcester (P&W or the Railroad) is a subsidiary of Genesee & Wyoming, Inc. (G&W or GWI). A representative of the Railroad shall have final authority in all matters affecting the safe maintenance of Railroad operations and Railroad property, and approval shall be obtained by the Agency or its Contractor for methods of construction to avoid interference with Railroad operations and Railroad property and all other matters contemplated by the Agreement and these Special Provisions.

The Agency and its Contractor shall:

1. Cooperate at all times with the local officials of the Railroad or its representative.
2. Use all reasonable care and diligence in the work in order to avoid accidents, damage or unnecessary delay to, or interference with the trains and other property of the Railroad.
3. Conduct its work in a manner satisfactory to the Chief Engineer of the Railroad or his authorized representative, to perform its work in such manner and at such time as not to unnecessarily interfere with the movements of trains or Railroad traffic, and to hold its work open to inspection of Railroad inspectors.
4. Avoid unnecessary use of Railroad property without written permission of the Railroad and to leave the Railroad roadbed and property in a condition acceptable to the Chief Engineer of the Railroad. No storage of materials and/or loose equipment will remain on the ROW.
5. Pay the Railroad or owning company for any changes, requested for his convenience, to Railroad property, facilities, wire, fiber optic and/or pipe lines other than shown on the plans for the project.
6. Comply with the attached Genesee & Wyoming Contractor Safety Rules.

Methods and procedures for performing work on property of **Providence & Worcester** must be approved by:

Dave Cuthbertson
AVP, Engineering
Northeast Region Railroads
75 Hammond Street
Worcester, MA 01610-1729
(508) 755-4000
david.cuthbertson@gwrr.com

Public Projects Contacts:

Debra-Ann Bocash
Regional Coordinator | Northeast
Providence & Worcester
2 Federal St., Suite 201
St. Albans, VT 05478
(802) 527-3444
deb.bocash@gwrr.com

Copy all correspondence to:

Jacob Smith
Director of Public Projects
Genesee & Wyoming Railroad Services, Inc.
13901 Sutton Park Dr., Suite 345
Jacksonville, FL 32224
(904) 900-6320 // Ext: 3755
jacob.smith@gwrr.com

G&W GENERAL SPECIAL PROVISION



Project Information

State Project: CT DOT #082-312
Middletown, Middlesex County, Connecticut
Rehabilitation of the Approach Spans for Arrigoni Bridge No. 00524
Providence & Worcester Railroad
P&W: MP: 22.53 / Middletown Branch, MP 0.68 / Laurel Branch
RPN: 18PWRZ06R

Train Movements

The **estimated** number of trains (not including specials) operating through the project area is:

Total Trains:
2 trains daily at **10** mph per track (two tracks).

Insurance Requirements

Contractors completing new installations or working on or around any of the Railroad's properties are required to carry insurance as stipulated on the G&W website. This information can be found at: https://www.gwrr.com/real_estate/insurance_requirements.

If you have questions or need additional information regarding the required insurance coverage, please contact:

Donna Killingsworth, MBA
Real Estate Manager
Genesee & Wyoming Railroad Services, Inc.
13901 Sutton Park Dr., S.,
Suite 160
Jacksonville, FL 32224
(904) 900-6286
donna.killingsworth@gwrr.com

Accessing Railroad Property

Any entry or construction activities on railroad right of way must be authorized by the Railroad in writing. Written authorization is obtained through a Right of Entry Permit or Contractor Occupancy/Access Agreement. The application is accessible via the link provided below.

https://gwrr.com/real_estate/accessing_property

The applicant must submit the completed application to the Real Estate Department including a check or money order, to cover the non-refundable fee of \$1,500 made payable to the Railroad. The application must include railroad milepost, railroad subdivision, and scope of work. If any of these items on the application are incomplete, the application will be immediately rejected.

The standard term for a Right of Entry Permit or Contractor Occupancy/Access Agreement is sixty (60) days. Longer terms are reviewed on a case by case basis and may be assessed additional fees.

G&W GENERAL SPECIAL PROVISION



Upon approval of the application, the Real Estate Department will draft an agreement and forward to the applicant for signature. Application does not guarantee approval. The applicant must then return the signed document to the Real Estate Department along with the pertinent certificate of insurance outlined in the agreement. Once in receipt of these documents, the agreement will then be executed on behalf of the Railroad.

For "standard processing", the entire process takes between 6-8 weeks. "Expedited processing" will reduce the processing time to between 1-2 weeks and costs an additional \$1,750. If the application and plans require engineering approval, and are returned to applicant for revisions in order to meet required specifications the expedited process could take longer than 2 weeks.

For any questions regarding Right of Entry Permits, please contact:

Donna Killingsworth, MBA
Real Estate Manager
Genesee & Wyoming Railroad Services, Inc.
13901 Sutton Park Dr., S.,
Suite 160
Jacksonville, FL 32224
(904) 900-6286
donna.killingsworth@gwrr.com

Notice of Starting Work

Agency or its Contractor shall not commence any work on Railroad Property or rights-of-way until it has complied with the following conditions:

1. Notify the Railroad in writing of the date that it intends to commence Work on the Project. Such notice must be received by the Railroad at least ten (10) business days in advance of the date the Agency or its Contractor proposes to begin Work on Railroad property. The notice must refer to this Agreement by date. If flagging service is required, such notice shall be submitted at least thirty (30) business days in advance of the date scheduled to commence the Work.
2. Obtain authorization from the Railroad Representative to begin Work on Railroad property, such authorization to include an outline of specific conditions with which it must comply.

Submittal Timing

Review of design submittals by the Railroad will require a minimum of four (4) weeks. To avoid impacting the construction schedule, the Contractor must schedule submittals well in advance. Partial, incomplete or inadequate designs will be rejected, thus delaying the approval. Drawings and calculations must be signed and stamped by a Registered Professional Engineer familiar with Railway loadings and who is licensed in the state where the shoring system is intended for use. Drawings accompanying the shoring plans shall be submitted in 11" x 17" or 8½" x 11" sized paper format.

G&W GENERAL SPECIAL PROVISION



Flagging Protection/Inspection Service

The Railroad has sole authority to determine the need for flagging required to protect its operations and property. In general, flagging protection will be required whenever Agency or Contractor or their equipment are, or are likely to be, working within fifty (50) feet of live track or other track clearances specified by the Railroad, or over tracks, or when work being performed adjacent to operating tracks may present hazards to tracks, train operation, or when equipment does or may infringe upon such limits.

If the Railroad provides flagging or other services, the Contractor shall not be relieved of any responsibilities or liabilities as set forth in any document authorizing the work. No work is allowed within 50 feet of track centerline when a train passes the work site and all personnel must clear the area within 25 feet of track centerline and secure all equipment when trains are present.

No work shall be undertaken until the flag person(s) is/are at the job site. If it is necessary for the Railroad to advertise a flagging job for bid, it may take up to 90-days to obtain this service, and the Railroad shall not be liable for the cost of delays attributable to obtaining such service.

The Railroad shall have the right to assign an individual to the site of the Project to perform inspection service whenever, in the opinion of the Railroad Representative, such inspection may be necessary. Agency shall reimburse the Railroad for the costs incurred by the Railroad for such inspection service. Inspection service shall not relieve Agency or Contractor from liability for its Work.

The Contractor will not be permitted to operate any of his own equipment on Railroad tracks except under an acceptable arrangement with the Railroad. Such equipment and the operation of such equipment, or equipment rented from the Railroad, shall be arranged for by the Contractor with the Railroad and the cost for its use, including protection of Railroad traffic, shall be borne by the Contractor.

The Contractor shall notify the following named individual for the Railroad at least 30 days, or as directed by the authorized representative of the Railroad, in advance of starting any work which might require protection:

Debra-Ann Bocash
Regional Coordinator | Northeast Region
Providence & Worcester
2 Federal Street, Suite 201
St. Albans, VT 05478
Office: 802-527-3444
Email: deb.bocash@gwrr.com

The Contractor shall notify the Railroad at least 5 working days in advance of suspending or ceasing operations that require a flagger.

Clearance Requirements

The Contractor shall maintain a clearance envelope in accordance with AREMA clearance diagrams for fixed obstructions. (See attached clearance diagram and specification). The resultant

G&W GENERAL SPECIAL PROVISION



clearance envelope is to be verified by the Railroad personnel or its representative prior to commencement of work.

Temporary Crossings

If at any time the Agency or its Contractor desires a temporary crossing of the Railroad's tracks, he shall make a request for a temporary crossing from the Railroad. If approved, he shall arrange with the Railroad, execute its regular form of private grade crossing agreement covering the crossing desired, paying all construction, maintenance, removal, protection and other costs.

Clean-up

Agency or Contractor, upon completion of the Project, shall remove from the Railroad's Property any temporary grade crossings, any temporary erosion control measures used to control drainage, all machinery, equipment, surplus materials, falsework, rubbish, or temporary buildings belonging to Agency or Contractor. Agency or Contractor, upon completion of the Project, shall leave the Railroad Property in neat condition, satisfactory to the Railroad Representative.

PUBLIC PROJECT MANUAL



North America

For Any Activity or Project That May
Involve The Railroad



Prepared By Public Projects Department
Revision: January 2019

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Section 1.02 - Introduction

Providence & Worcester (the Railroad), is a subsidiary of Genesee & Wyoming Inc. (G&W), the largest holding company in the U.S. of regional and short line railroads. G&W has 107 subsidiary railroads in 41 states serving thousands of communities and customers. G&W also has a major rail freight presence in Australia and Europe. From its 1899 start up with a 14-mile short line in upstate New York, G&W has experienced significant growth in reaching its current structure.

The G&W structure is based on each subsidiary railroad being its own separate legal entity, and each of these railroads as much authority over their operations as possible to best meet their customers' needs. G&W railroads in the U.S. are managed based on seven regions that provide a consistent focus on safety, operating standards and marketing.

The G&W regions and railroads receive support from corporate staffs in areas such as Engineering Services, Locomotives, Real Estate, Legal Counsel, and other support entities.

The Public Projects Department (PPD) at G&W is part of Engineering Services with the goal to support the Railroads. PPD is also tasked to support outside agencies by streamlining the flow of outside party projects and initiatives.

PPD is involved in a wide variety of projects initiated by government agencies, local businesses and others. Accurate and timely communication of information between the Railroad and these parties improves planning, relationships and successful completion of projects. The information in this manual explains important steps project sponsors should follow to streamline their projects and proposals.

G&W places the highest priority on safety; for the public and for its employees. Therefore, any activity that has the potential to adversely impact safe railroad operations must be evaluated by the Railroad. This Manual is intended to be a general guide for reference to the Railroad's minimum requirements and standards. The Railroad reserves the right to deviate from any of the requirements or standards set forth in this Manual.

We look forward to working together to serve the common goal of the safe operation of trains alongside the outside public. We hope the information provided in this Manual makes it easier to work together as a team.

Jacob Smith
Director of Public Projects

Section 1.03 - Basic Information in this Manual

This Manual is intended to be a general guide, but in no way overrides the express guidance, requirements or standards of the Railroad. As a tool only, the information herein is intended for broad use and each project will be reviewed by PPD and the Railroad to ensure the safest actions are taken.

Any subject not covered in the Manual should be routed to PPD for review.

Any activity that either directly or indirectly impacts Railroad property must have approval by the Railroad.

Common Types of Public Projects:

- ❖ **Highway-Rail Grade Crossings:** Closure, removal, installation and alterations of public highway-rail grade crossings.
- ❖ **Bridges Over Railroad:** Construction, reconstruction, rehabilitation, repair, removal, painting, and maintenance of bridges over the Railroad by outside parties.
- ❖ **Parallel Roads/Facilities:** Construction, reconstruction, modification, removal, and maintenance of parallel roads or other public facilities affecting Railroad property or operations.
- ❖ **Entry on to Railroad Property:** Temporary rights of entry onto Railroad property and utility installation licenses.
- ❖ **Other Projects Involving Rail Corridors:** Publicly sponsored projects involving or altering Railroad facilities or its property. These projects may be on, above, adjacent to, or otherwise have the potential to impact the property.
- ❖ **General Engineering Consultants (GEC):** Although the PPD is the primary point of contact, GECs provide additional engineering services as directed by the Railroad to assist the Railroad in managing public projects.

Section 1.04 - Definitions and Common Terms

- **Agency** – The project sponsor (i.e., State DOT, Local Agencies, Private Developer, etc.)
- **AREMA** – American Railway Engineering and Maintenance-of-Way Association – the North American railroad industry standards group. The use of this term shall be in specific reference to the AREMA Manual for Railway Engineering.
- **Basis for Design (BOD)** – The developed scope of a project needed to bid out the project.
- **Construction Engineering Inspection (CEI)** – Consultant who oversees the construction operations who is authorized to act on behalf of the Railroad and to ensure that only the safest and least impactful practices are being performed.
- **Contractor** – The Agency’s representative retained to perform the project work.
- **Engineer** – G&W Engineering Representative or a GEC authorized to act on their behalf.
- **Employee in Charge (EIC)** – An employee or designated contractor qualified to protect a project team during an operation, activity, or project.
- **Flagman/Flagger** – A qualified EIC with the sole responsibility protect the outside public and contractors while facilitating the safe passage of trains.
- **General Engineering Consultant (GEC)** – Consultant who has been authorized to act on the behalf of the Railroad. GECs perform preliminary engineering, construction inspection, and monitoring under the direction of the Engineering personnel. GEC personnel also perform day-to-day administration of certain types of projects.
- **Notice to Proceed (NTP)** – Authorization by the project sponsor allowing the Railroad, its appointed consultants, and subcontractors to proceed out of PE and move into construction.
- **Order of Magnitude (OOM)** – A high level estimate to quantify the estimated total value of the project. Typically estimate is marked up to account for the project unknowns.
- **Potential to Encroach** – Any activity having the possibility of impacting Railroad property or operations; defined as one or more of the following:
 - Any activity where access onto Railroad property is required.
 - Any activity where work is being performed on the ROW.
 - Any excavation work adjacent to Railroad tracks or facilities, within the Theoretical Railroad Live Load Influence Zone, or where the active earth pressure zone extends within the Railroad property.
 - The use of any equipment where, if tipped and laid flat in any direction (360 degrees) about its center pin, can encroach within twenty-five feet (25’-0”) of the nearest track. This is based upon the proposed location of the equipment during use and may be a function of the equipment boom length.
 - Note that hoisting equipment with the potential to foul must satisfy the 150% factor of safety requirement for lifting capacities.

- Any activity where the scatter of debris or other materials has the potential to encroach within twenty-five feet (25'-0") of the nearest track.
 - Any activity where significant vibration forces may be induced upon the track structure or existing structures located under, over, or adjacent to the track structure.
 - Any other work which poses the potential to disrupt rail operations, threaten the safety of Railroad employees, or otherwise negatively impact Railroad property, as determined by the Railroad.
- **Preliminary Engineering (PE)** – The review and development of the project scope or project discovery that typically includes a site visit, design or design review, and estimate to complete the project.
 - **Public Projects Department (PPD)** – A member of the G&W Public Projects team or assigned GEC representative.
 - **Request for Proposal (RFP)** – The process by which a Design Build contractor is selected and awarded to complete the project.
 - **Right of Entry (ROE)** – Formal document applied for through the G&W Real Estate Department.
 - **Right of Way (ROW)** – Railroad Right of Way; as well as any Railroad property and facilities. This includes all aerial space within the property limits, and any underground facilities.
 - **Theoretical Railroad Live Load Influence Zone** – 1 horizontal to 1 vertical theoretical slope line starting at bottom corner of tie.
 - **Top of Rail (TOR)** – This is the base point for clearance measurements. It refers to the crown (top) of the steel rail; the point where train wheels bear on the steel rails. Use the higher of the two rails when track is superelevated.
 - **Track Structure** – All load bearing elements which support the train. This includes, but is not limited to, the rail, ties, appurtenances, ballast, sub-ballast, embankment, retaining walls, and bridge structures.
 - **Vertical Clearance** – Distance measured from TOR to the lowest obstruction, within six feet (6'-0") of the track centerline, in either direction.

Section 1.05 - Payment of Railroad Cost and Expenses

Summary

The project types addressed in this Manual typically do not directly benefit and, in some cases, create risk to, and challenges for, Railroad operations and impacts the Railroad's ability to serve its customers and the American economy. For these reasons, the Railroad seeks payment for its costs and expenses incurred in connection with project reviews and construction.

Types of Reimbursable Costs and Expenses

Costs reimbursable by the project sponsor in connection with the project include, but not limited to:

- Railroad labor and support services
- Sums paid to Railroad consultants and subcontractors
- Engineering reviews and CEI
- All out of pocket expenses
- Costs for equipment, tools, materials and supplies
- Telephone, facsimile, and mailing expenses
- Real Estate or Legal Reviews
- Cost for flagging or other action to protect rail operations and infrastructure

Key Points

- Preliminary Engineering is usually initiated by the project sponsor with a commitment to reimburse for the project discovery and engineering services.
- The Railroad will not begin its preliminary engineering review until a PE agreement or other legal reimbursable agreement is provided.
- PE costs typically range between \$10,000 to \$30,000 depending on the project.
- All funding sources must be identified up front, and any time funding sources change, the Railroad must be immediately informed. All special funding requirements must be identified prior to the commencement of any project such as 'Buy America' or 'Buy American' requirements.
- All costs billed will be actual cost and no profit will be gained by performing services on behalf of the project.
- Construction and CEI will be estimated prior to getting an NTP.
- The Railroad will not begin construction until all applicable contracts are provided along with an NTP.

Section 1.06 - Insurance Requirements for Public Projects

Summary

For any project that is performed on, above, or adjacent to Railroad property, proper insurance must be obtained, submitted and approved prior to work commencing. Insurance requirements will be incorporated in all applicable contracts.

The insurance requirements will be determined based on-site specific location as well as level of impact to the Railroad. Those specific requirements can be requested at the initiation of the project once the scope and project limits have been determined.

If during the project the insurance coverage expires or lapses, the Agency or its Contractor, as applicable, is responsible for notifying the Railroad and cease all work until the requirements have once again been met and approved by the Railroad.

Section 1.07 - Railroad Flagging Requirements

Summary

In the interest of public safety and the safety of the Railroad's and project sponsor's employees and property, the Railroad will work cooperatively with agencies, consultants, contractors and others who need to access Railroad property when work brings them in close proximity to active Railroad tracks to determine the appropriate flagging services needed and to make arrangements for those services.

Flagging services may only be performed by personnel qualified by the Railroad who are trained in the proper procedures related to rail operations and safety requirements, familiar with rail operations and procedures in a project area and able to communicate directly with dispatching personnel and train crews.

All costs and expenses associated with Railroad flagging services are the sole responsibility of the agency, consultant or contractor. The GEC will provide its estimated costs prior to the start of the project work or its assignment of flagging personnel, but it is up to the Agency to provide the estimated number of days the flagman is needed.

Once flagging personnel are formally assigned to a specific work location, the period of assignment can only be changed with appropriate advanced arrangements. Charges for providing flagging services beyond a normal eight-hour weekday are calculated and billed at an overtime rate.

The GEC will coordinate the flagman and should be the primary point of contact for scheduling, changing the working schedule or duration the flagman is required.

Conditions

The following are conditions that may require the use of a flagman as required by the Railroad:

- When any entity is working on, near or adjacent to active Railroad tracks.
- When an outside party is using Railroad property or performing operations that may affect Railroad property or facilities, (Including occasions when a party has been given express permission to enter Railroad property or perform such operations under the terms of the applicable contracts).
- When work off Railroad property has the potential to impact Railroad property or operations.
- When off-highway construction equipment is crossing the Railroad at a private or public crossing.
- When oversized equipment or highway vehicles are to cross the Railroad at a private or public crossing.
- In other instances, as determined by the Railroad.

Section 1.08 - Engineering Reviews and Construction Monitoring

Summary

Any project proposals that may affect or be near the Railroad's right-of-way must be evaluated by the Railroad. To initiate a project, a PE agreement or other applicable contract is required to identify the project sponsor, the scope, define the tasks to be accomplished, and specify the payment required. Once the plans and scope are approved by the Railroad, the project can proceed into construction.

The purpose of PE is to identify issues related to safety, engineering, customer service, operations, legal and regulatory matters, expense, risk and other considerations specific to any proposed project. The Railroad's review is only to determine that the plans and improvements constructed are in accordance with the Railroad standards and satisfy the Railroad's requirements. Plans should be submitted early in project development to ensure that the Railroad requirements can be incorporated up front. If property is leased, the review might require additional party signoff.

Cost and Timing

Prior to commencing with engineering, design or reviews, a legal document or associated PE agreement must be executed where the outside party will bear the cost of the design or design reviews, (**See Section 1.05**). This includes the cost of Railroad employees as well as GEC support. The scope includes attending meetings, site surveys, reviewing plans, preparing plans, correspondence and any other activity to support the review of the project and development of scope.

It is the goal of PPD to have a design review turned around within 30 to 45 days depending on the level of effort. It is in the interest of all parties to complete the PE review before commitments are made or construction steps begin. The Railroad and its GEC will work with the project sponsor to schedule PE and construction to meet project schedule objectives whenever possible, considering available resources.

Construction Monitoring

To ensure the safety of the public and Railroad employees, maintain quality rail service to customers and to protect Railroad assets, the Railroad may require construction monitoring (in addition to flagman protection) of the project. The construction monitoring will be conducted by the Railroad and its GEC at the expense of the project sponsor.

Construction monitoring includes intermittent or continuous on-site presence of Railroad or its GEC during construction activities. The following typically applies:

- The construction project sponsor, owner, or agency in charge will pay for the cost of construction monitoring. Construction monitoring will be specified, and the estimated cost will be included in the construction agreement for the project.
- Construction monitoring is in addition to Railroad required flagging.
- Construction monitoring includes Railroad review and approval of all plan changes and required contractor submissions during the construction phase of the project.
- The project sponsor is responsible for its safety and the safety of its property, contractors, and employees. The GEC, as part of its construction monitoring, will review the work site for activities that could interfere with safe operation of the Railroad.
- The GEC is only responsible for monitoring the general work activities for safety and impact to the Railroad and its property and not to manage the overall project work. Any observed unsafe acts or conditions will be reported immediately to the project sponsor or contractor representative.

Section 1.09 - Real Estate

Summary

All projects that modify or impact the Railroad's property must be reviewed by the G&W Real Estate Department to determine property descriptions, ownership, and implications. Any rail line requiring special handling due to a lease or property agreement must be taken into consideration when performing engineering reviews and providing project acceptance.

All parties accessing the Railroad's ROW for investigative activities or for the performance of construction work are required to have a written agreement with the Railroad fully detailing each party's responsibilities. Activities by others with the potential to affect the Railroad's property, operations, and or personnel without actually entering the Railroad's property must also be reviewed by the Railroad and appropriate arrangements and agreements completed.

If a Right of Entry or Utility license, or any applicable agreement is required for the project, the Agency or its Contractor, as applicable, will need to work directly with the G&W Real Estate Department to enter into all contracts are in place prior to commencing work on the property.

Construction and improvement projects involving Railroad property may require a conveyance of property rights, subject to adequate consideration and corporate approvals. Such projects include, but not limited to:

- Highway –Rail Grade Crossings
- Bridges over/under the Railroad
- Parallel Roads/Facilities
- Road/Bridge Widening Projects

Further clarification can be requested by contacting the PPD and the appropriate G&W Real Estate Department specialist.

Section 1.10 – Project Requirements

Summary

The Project Requirements set forth in this Section 1.10 shall apply to any project, subject to the terms or conditions of any applicable contracts. The Railroad representative shall have final authority in all matters affecting the safe maintenance of railroad operations and property, and his or her approval shall be obtained by the Agency or its Contractor for methods of construction to avoid interference with railroad operations and property and all other matters contemplated by these requirements.

Agency or its Contractor shall arrange and conduct its work so that there will be no interference with railroad operations, including train, signal, telephone and telegraphic services, or damage to Railroad property, or to poles, wires, and other facilities of tenants on its Property or right-of-way. Agency or its Contractor shall store materials so as to prevent trespassers from causing damage to trains, or Property. Whenever Work is likely to affect the operations or safety of trains, the method of doing such Work shall first be submitted to the Railroad for approval, but such approval shall not relieve Agency or its Contractor from liability in connection with such Work. No Work shall be performed without it first being approved by the Railroad.

If conditions arising from or in connection with the Project require that immediate and unusual provisions be made to protect train operation or property, Agency or its Contractor shall make such provision. If the Railroad determines that such provision is insufficient, the Railroad may, at the expense of Agency or its Contractor, require or provide such provision as may be deemed necessary, or cause the Work to cease immediately.

If Agency or Contractor violate or fail to comply with any of the requirements in the section:

- The Railroad may require Agency and/or Contractor to vacate its Property; and
- May withhold monies due Agency and/or Contractor;
- The Railroad may require Agency to withhold monies due to the Contractor; and
- The Railroad may cure such failure and the Agency, and/or any contractor shall reimburse for the cost of curing such failure.

Notice to Start Work

Agency or its Contractor shall not commence any work on Railroad Property or ROW until it has entered into all applicable contracts and received all requisite approvals from the Railroad. Thereafter, unless otherwise specified in such applicable contracts, the Agency or its Contractor must:

- Notify Railroad in writing of the date that it intends to commence Work on the Project. Such notice must be received at least 10 business days in advance of the date the Agency or its Contractor proposes to begin Work on Railroad property. The notice must refer to

the specific project Agreement. If flagging service is required, such notice shall be submitted at least thirty (30) business days in advance of the date scheduled to commence the Work.

- Obtain authorization from the Railroad to begin Work on the property, such authorization to include an outline of specific conditions with which it must comply.
- Obtain from the Railroad the names, addresses and telephone numbers of Railroad personnel who must receive notice under provisions in the construction agreement. Where more than one individual is designated, the area of responsibility of each shall be specified.

Hauling across Railroad

If Agency or Contractor desires access across the Railroad's property or tracks at other than an existing and open public road crossing in or adjacent to the construction of the Project, the Agency or Contractor must first obtain the permission of the Railroad and shall execute any applicable contracts as described in Section 1.09 Real Estate herein.

Cooperation & Delays

Agency or Contractor shall arrange a schedule with the Railroad for accomplishing stage construction involving work by the Railroad. In arranging its schedule, Agency or Contractor shall ascertain, from the Railroad, the lead time required for assembling crews and materials and shall make due allowance therefore.

Agency or Contractor may not charge any costs or submit any claims against the Railroad for hindrance or delay caused by Railroad traffic; work done by the Railroad or other delay incident to or necessary for safe maintenance of Railroad traffic; or for any delays due to compliance with these requirements. Agency and Contractor shall cooperate with others participating in the construction of the Project to the end that all work may continue to move forward.

Agency and Contractor understand and agree that the Railroad does not assume any responsibility for work performed by others in connection with the Project. Agency and Contractor further understand and agree that they shall have no claim whatsoever against the Railroad for any inconvenience, delay or additional cost incurred by Agency or Contractor on account of operations by others.

Storage

Agency and Contractor shall not store their materials or equipment on Railroad property or where they may potentially interfere with operations, unless Agency or Contractor has received prior written permission. Agency and Contractor understand and agree that the Railroad will not be liable for any damage to such materials and equipment from any cause and that the Railroad may move, or require Agency or Contractor to move, such material and equipment at Agency's or Contractor's sole expense. To minimize the possibility of damage to the Railroad tracks resulting from the unauthorized use of equipment, all grading or other construction equipment that is left

parked near the tracks unattended and shall be immobilized to the extent feasible so that it cannot be moved by unauthorized persons.

Construction

Construction work on Railroad property shall be subject to Railroad inspection and approval. Work shall be in accordance with written specific conditions and with these requirements. Agency or Contractor shall obtain Railroad and Agency Representative's prior written approval for use of explosives on or adjacent to Railroad property. If permission for use of explosives is granted, Agency or Contractor must comply with the following:

- Blasting shall be done with light charges under the direct supervision of a responsible officer or employee of Agency or Contractor.
- Electric detonating fuses shall not be used because of the possibility of premature explosions resulting from operation of two-way train radios.
- No blasting shall be done without the presence of Railroad CEI. At least 30 days' notice to the Railroad is required to arrange for site presence.
- Explosive shall not be stored on Railroad property.

The Railroad will:

- Determine the approximate location of trains and advise Agency or Contractor of the approximate amount of time available for the blasting operation and clean-up.
- Have the authority to order discontinuance of blasting if, in his or her opinion, blasting is too hazardous or is not in accord with these requirements.

Agency or Contractor shall maintain all ditches and drainage structures free of silt or other obstructions that may result from their operations. Agency or Contractor shall provide erosion control measures during construction and use methods that accord with applicable state standard specifications for road and bridge construction, including either (1) silt fence; (2) hay or straw barrier; (3) berm or temporary ditches; (4) sediment basin; (5) aggregate checks; and (6) channel lining. All such maintenance and repair of damages due to Agency's or Contractor's operations shall be performed at Agency's expense.

Agency shall arrange, upon approval from the Railroad, to have any utility facilities on or over Railroad Property changed as may be necessary to provide clearances for the proposed trackage.

Agency or Contractor, upon completion of the Project, shall remove from Railroad Property any temporary grade crossings, any temporary erosion control measures used to control drainage, all machinery, equipment, surplus materials, falsework, rubbish, or temporary buildings belonging to Agency or Contractor. Agency or Contractor, upon completion of the Project, shall leave Property in neat condition, satisfactory to the Railroad.

Section 1.11 – Construction Submission Criteria

Summary

The intent of this Manual is to guide outside parties and their contractors when performing work on, over, or with potential to impact Railroad property. Work plans shall be submitted for review to the Railroad for all work which presents the potential to affect Railroad property or operations. All work shall be performed in a manner that does not adversely impact the Railroad operations or safety; as such, the requirements of this Manual shall be strictly adhered to, in addition to all other applicable standards associated with the construction.

General

- A construction work plan is required to be submitted by the Agency or the Railroad, for review and acceptance, prior to accessing or performing any work with Potential to Foul.
- The Agency or its representative shall submit sets of plans, specifications, supporting calculations, detailed means and methods, and procedures for the specific proposed work activity.
- Construction submissions shall include all information relevant to the work activity and shall clearly and concisely explain the nature of the work, how it is being performed, and what measures are being taken to ensure that Railroad property and operations are continuously maintained.
- All construction plans shall include a map of the work site, depicting the tracks, the ROW, proposed means of access, proposed locations for equipment and material staging (dimensioned from nearest track centerline), as well as all other relevant project information. An elevation drawing may also be necessary to depict clearances or other components of the work.
- Please note that the Railroad will not provide pricing to individual contractors involved in bidding projects. Bidding contractors shall request information from the agency only.
- The Contractor shall install a geotextile fabric ballast protection system to prevent construction or demolition debris and fines from fouling ballast. The geotextile ballast protection system shall be installed and maintained by the Contractor to the satisfaction of the Railroad.
- The Railroad shall be kept aware of the construction schedule. The Contractor shall provide timely communication to the Railroad when scheduling the work such that a representative may be present during the work. The Contractor's schedule shall not dictate the work plan review schedule, and flagging shall not be scheduled prior to receipt of an accepted work plan.
- At any time during construction activities, the Railroad may require revisions to the previously approved procedures to address weather, site conditions or other circumstances that may create a potential hazard to rail operations or facilities. Such revisions may require

immediate interruption or termination of ongoing activities until such time the issue is resolved to the Railroad satisfaction. The Railroad shall not be responsible for any additional costs or time claims associated with such revisions.

- Blasting will not be permitted to demolish a structure over or within Railroad property. When blasting off Railroad property but with Potential to Foul, vibration monitoring, track settlement surveying, and/or other protective measures may be required as determined by the Railroad.
- Blasting is not permitted adjacent to Railroad ROW without written approval from the Railroad.
- Mechanical and chemical means of rock removal must be explored before blasting is considered. If written permission for the use of explosives is granted, the Agency or Contractor must submit a work plan, (**See Section 1.08 & Section 1.10**).

Hoisting

All proposed hoisting operations with Potential to Foul shall be submitted in accordance with the following:

- A plan view drawing shall depict the work site, the track(s), the proposed location(s) of the lifting equipment, as well as the proposed locations for picking, any intermediate staging, and setting the load(s). All locations shall be dimensioned from centerline of the nearest track. Crane locations shall also be dimensioned from a stationary point at the work site for field confirmation.
- Computations showing the anticipated weight of all picks. Computations shall be made based upon the field-verified plans of the existing structure. Pick weights shall account for the weight of concrete rubble or other materials attached to the component being removed; this includes the weight of subsequent rigging devices/components. Rigging components shall be sized for the subsequent pick weight.
- All lifting equipment, rigging devices, and other load bearing elements shall have a rated (safe lifting) capacity that is greater than or equal to **150%** of the load it is carrying, as a factor of safety. Supporting calculations shall be furnished to verify the minimum capacity requirement is maintained for the duration of the hoisting operation.
- Dynamic hoisting operations are prohibited when carrying a load with the Potential to Foul. Cranes or other lifting equipment shall remain stationary during lifting. (i.e., no moving picks).
- For lifting equipment, the manufacturer's capacity charts, including crane, counterweight, maximum boom angle, and boom nomenclature is to be submitted.
- A schematic rigging diagram must be provided to clearly call out each rigging component from crane hook to the material being hoisted. Copies of catalog or information sheets shall be provided to verify rigging weights and capacities.
- For built-up rigging devices, the contractor shall submit the following:

- Details of the device, calling out material types, sizes, connections and other properties.
- Load test certification documents and/or design computations bearing the seal and signature of a Professional Engineer. Load tests shall be performed in the configuration of its intended use as part of the subject demolition procedure.
- Copies of the latest inspection reports of the rigging device. The device shall be inspected within one (1) calendar year of the proposed date for use.
- A detailed drawing shall be provided showing the crane outrigger setup, including dimensions from adjacent slopes or facilities. The drawing shall indicate requirements for bearing surface preparation, including material requirements and compaction efforts. As a minimum, outriggers and/or tracks shall bear on mats, positioned on level material with adequate bearing capacity.
- A complete written narrative that describes the sequence of events, indicating the order of lifts and any repositioning or re-hitching of the crane(s).

Demolition

The Agency or its Contractor shall submit a detailed procedure for a controlled demolition of any structure on, over, or adjacent to the ROW. The controlled demolition procedure must be approved by the Railroad prior to beginning work on the project.

Existing Condition of structure being demolished:

- The Contractor shall submit as-built plans for the structure(s) being demolished.
- If as-built plans are unavailable, the Contractor shall perform an investigation of the structure, including any foundations, substructures, etc. The field measurements are to be made under the supervision of the Professional Engineer submitting the demolition procedure. Findings shall be submitted as part of the demolition means and methods submittal for review by the Railroad.
- Any proposed method for temporary stabilization of the structure during the demolition shall be based on the existing plans or investigative findings and submitted as part of the demolition means and methods for review by the Railroad.

Demolition work plans shall include a schematic plan depicting the proposed locations of the following, at various stages of the demolition:

- All cranes and equipment, calling out the operating radii.
- All proposed access and staging locations with all dimensions referenced from the center line of the nearest track.
- Proposed locations for stockpiling material or locations for truck loading.

- The location, with relevant dimensions, of all tracks, other Railroad facilities; wires, poles, adjacent structures, or buried utilities that could be affected, showing that the proposed lifts are clear of these obstructions.
- Note that no crane or equipment may be set on the rails or track structure and no material may be dropped on Railroad property.

Demolition submittal shall also include the following information:

- A time schedule for each of the various stages must be shown as well as a schedule for the entire lifting procedure and hoisting. The proposed time frames for all critical subtasks (i.e., torch/saw cutting various portions of the superstructure or substructure, dismantling splices, installing temporary bracing, etc.) shall be furnished so that the potential impact(s) to operations may be assessed and eliminated or minimized.
- The names and experience of the key Contractor personnel involved in the operation shall be included in the Contractor's means and methods submission.
- Design and supporting calculations shall be prepared, signed, and sealed by the Professional Engineer for items including the temporary support of components or intermediate stages shall be submitted for review. A guardrail will be required to be installed in the proximity of temporary bents or shoring towers, when located within twelve feet (12'-0") from the centerline of the track. The guardrail will be installed at the expense of the Agency or its contractor.

Girders or girder systems shall be stable at all times during demolition. Temporary bracing shall be provided at the piers, abutments, or other locations to resist overturning and/or buckling of the member(s). The agency shall submit a design and details of the proposed temporary bracing system, for review by the Railroad. Lateral wind forces for the temporary conditions shall be considered in accordance with current version of AREMA.

Existing, obsolete, bridge piers shall be removed to a minimum of three feet (3'-0") below the finished grade, final ditch line invert, or as directed by the Railroad.

A minimum quantity of twenty-five (25) tons of approved granite track ballast may be required to be furnished and stockpiled on site by the Contractor, or as directed by Railroad.

The use of acetylene gas is prohibited for use on or over Railroad property. Torch cutting shall be performed utilizing other materials such as propane.

Tracks, signals, structures, and other Railroad facilities shall be protected from damage during demolition of existing structure or replacement of deck slab.

Demolition Debris Shield

- On-track or ground-level debris shields (such as crane mats) are prohibited for use.

- Demolition Debris Shield shall be installed prior to the demolition of the bridge deck or other relevant portions of the structure. The demolition debris shield shall be erected from the underside of the bridge over the track area to catch all falling debris. The debris shield shall not be the primary means of debris containment.
 - The demolition debris shield design and supporting calculations, all signed/sealed by a Professional Engineer, shall be submitted for review and acceptance.
 - The demolition debris shield shall have a minimum design load of 50 pounds per square foot (**50 psf**) plus the weight of the equipment, debris, personnel, and all other loads.
 - The Contractor shall verify the maximum particle size and quantity of the demolition debris generated during the procedure does not exceed the shield design loads. Shield design shall account for loads induced by particle impact; however, the demolition procedure shall be such that impact forces are minimized. The debris shield shall not be the primary means of debris containment.
 - The Contractor shall include installation/removal means and methods for the demolition debris shield as part of the proposed Controlled Demolition procedure submission.
 - The demolition debris shield shall provide twenty-three feet (**23'-0"**) minimum vertical clearance or maintain the existing vertical clearance if the existing clearance is less than twenty-three feet (**23'-0"**).
 - Horizontal clearance to the centerline of the track should not be reduced unless approved by the Railroad.
 - The Contractor shall clean the demolition debris shield daily or more frequently as dictated either by the approved design parameters or as directed by the Railroad.

Vertical Demolition Debris Shield

This type of shield may be required for substructure removals in close proximity to tracks and other facilities, as determined by the Railroad.

The Agency or its Contractor shall submit detailed plans with detailed calculations, prepared, signed, and sealed by a Professional Engineer, of the protection shield.

Erection

The Agency or its Contractor shall submit a detailed procedure for erection of a structure with Potential to Foul. The erection procedure must be approved by the Railroad prior to beginning work on the project.

Erection work plans shall include a schematic plan depicting the following, at all stages of the construction:

- All proposed locations of all cranes and equipment, calling out the operating radii.
- All proposed access and staging locations with all dimensions referenced from the center line of the nearest track.
- All proposed locations for stockpiling material or locations for truck loading.
- The location, with relevant dimensions, of all tracks, other Railroad facilities; wires, poles, adjacent structures, or buried utilities that could be affected, showing that the proposed lifts are clear of these obstructions.
- No crane or equipment may be set on the rails or track structure and no material may be dropped on Railroad property.

For erection of a structure over the tracks, the following information shall be submitted for review and acceptance by the Railroad, at least thirty (30) days prior to erection:

- As-built beam seat elevations – field surveyed upon completion of pier/abutment construction.
- Current Top of Rail (TOR) elevations – field measured at the time of as-built elevation collection.
- Computations verifying the anticipated minimum vertical clearance in the final condition which accounts for all deflection and camber, based upon the current TOR and as-built beam seat elevations. The anticipated minimum vertical clearance shall be greater than or equal to that which is indicated by the approved plans. Vertical clearance (see definitions) is measured from TOR to the lowest point on the overhead structure at any point within six feet (6'-0") from centerline of the track. Calculations shall be signed and sealed by a Professional Engineer.

Girders or girder systems shall be stable at all times during erection. No crane may unhook prior to stabilizing the beam or girder.

- Lateral wind forces for the temporary conditions shall be considered in accordance with the current version of AREMA Manual.
- Temporary bracing shall be provided at the piers, abutments, or other locations to resist overturning and/or buckling of the member(s). The agency shall submit a design and details of the proposed temporary bracing system, for review by the Railroad.
- Temporary bracing shall not be removed until sufficient lateral bracing or diaphragm members have been installed to establish a stable condition. Supporting calculations, furnished by the Professional Engineer, shall confirm the stable condition.

Erection procedure submissions shall also include the following information:

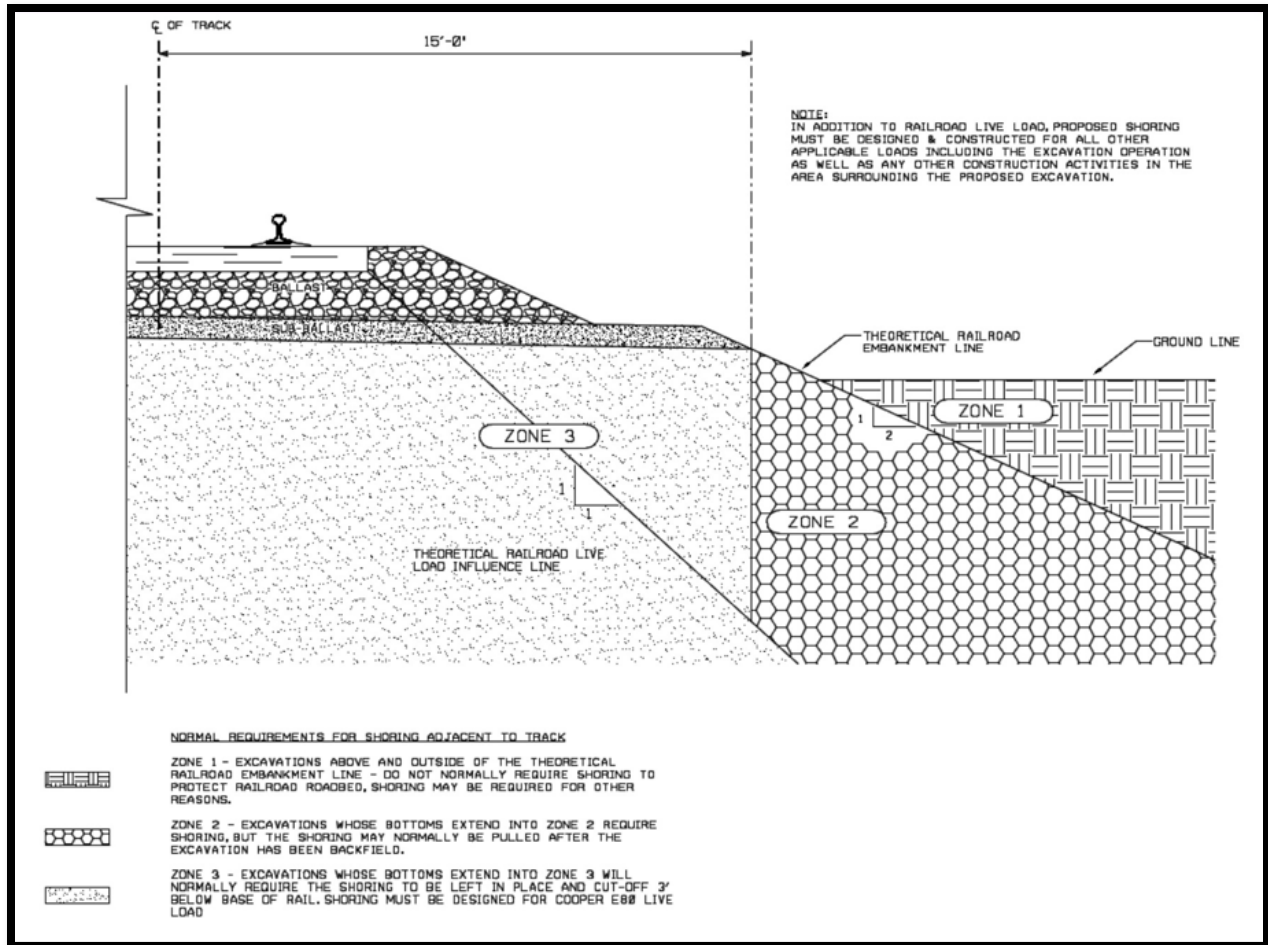
- A time schedule for each of the various stages must be shown as well as a schedule for the entire lifting procedure. The proposed time frames for all critical subtasks (i.e., performing aerial splices, installing temporary bracing, installation of diaphragm members, etc.) shall be furnished so that the potential impact(s) to operations may be assessed and eliminated or minimized.
- The names and experience of the key Contractor personnel involved in the operation shall be included in the Contractor's means and methods submission.
- A guardrail will be required to be installed in a track in the proximity of temporary bents or shoring towers, when located within twelve feet (**12'-0"**) from the centerline of the track.
- Design and supporting calculations prepared by the Professional Engineer for items including the temporary support of components or intermediate stages shall be submitted for review.

Excavation and Shoring

The Agency or its Contractor shall submit a detailed design and procedure for the installation of a sheeting/shoring system adjacent to the tracks. Shoring protection shall be provided when excavating with Potential to Foul, or as otherwise determined by the Railroad. Shoring shall be provided in accordance with the AREMA, except as noted below.

Shoring may not be required if all of the following conditions are satisfied:

- The excavation does not encroach within the Theoretical Live Load Influence Zone. Please refer to Figure below.



- The track structure is situated on level ground, or in a cut section, and on stable soil.
- The excavation does not adversely impact the stability of Railroad facility (i.e., signal bungalow, drainage facility, undergrade bridge, building, etc.), or the stability of any structure on, over, or adjacent to Railroad property with potential to foul.
- Shoring is not required by any governing federal, state, local or other construction code.

Shoring is required when excavating the toe of an embankment. Excavation of any embankment which supports an active track structure without shoring will not be permitted.

Trench boxes are not an acceptable means of shoring. Trench boxes are prohibited for use on Railroad property or within the Theoretical Railroad Live Load Influence Zone.

Shoring shall be a cofferdam-type, which completely encloses the excavation. However, where justified by site or work conditions, partial cofferdams with open sides away from the track may be permissible, as determined by the Railroad.

Cofferdams shall be constructed using interlocking steel sheet piles, or when approved by the Engineer, steel soldier piles with timber lagging. Wales and struts shall be included when dictated by the design.

The use of tiebacks can be permissible for temporary shoring systems, when conditions warrant. Tiebacks shall have a minimum clear cover of **(6'-0")**, measured from the bottom of the rail. Upon completion of the work, tiebacks shall be grouted, cut off, and remain in place.

All shoring systems on, or adjacent to Railroad ROW, shall be equipped with railings or other fall protection, compliant with the governing federal, state or local requirements. Area around pits shall be graded to eliminate all potential tripping hazards.

Interlocking steel sheet piles shall be used for shoring systems qualifying one or more of the following conditions:

- Within **(18'-0")** of the nearest track centerline
- Within the live load influence zone
- Within slopes supporting the track structure
- As otherwise deemed necessary by the Railroad

Sheet piles qualifying for one or more of the requirements listed in this document shall not be removed. Sheet piles shall be left in place and cut off a minimum of **(3'-0")** below the finished grade, the ditch line invert, or as otherwise directed by the Railroad. The ground shall be backfilled and compacted immediately after sheet pile is cut off.

The following design considerations shall be considered when preparing the shoring design package:

- Shoring shall be designed to resist a vertical live load surcharge of **1,882 lbs.** per square foot, in addition to active earth pressure. The surcharge shall be assumed to act on a continuous strip, eight feet six inches **(8'-6")** wide. Lateral pressures due to surcharge shall be computed using the strip load formula shown in the current version of AREMA Manual.
- Allowable stresses in materials shall be in accordance with the current version of AREMA Manual.
- A minimum horizontal clearance of ten feet **(10'-0")** from centerline of the track to face of nearest point of shoring shall be maintained, provided twelve feet **(12'-0")** roadbed is maintained with a temporary walkway and handrail system.
- For temporary shoring systems with Potential to Foul, piles shall be plumb under full dead load. Maximum deflection at the top of wall, under full live load, shall be as follows:
 - One-half (1/2) inch for walls within twelve feet **(12'-0")** of track centerline (Measured from centerline of the nearest track to the nearest point of the supporting structure).

- One (1) inch for walls located greater than twelve feet (12'-0") from track centerline.

Shoring work plans shall be submitted in accordance with this document, as well as the following additional requirements:

- The work plan shall include detailed drawings of the shoring systems calling out the sizes of all structural members, details of all connections. Both plan and elevation drawings shall be provided, calling out dimensions from the face of shoring relative to the nearest track centerline. The elevation drawing shall also show the height of shoring, and track elevation in relation to bottom of excavation.
- Full design calculations for the shoring system shall be furnished.
- A procedure for cutting off the sheet pile, backfilling and restoring the embankment.

Track Monitoring

When work being performed has the potential to disrupt the track structure, a work plan must be submitted detailing a track monitoring program which will serve to monitor and detect both horizontal and vertical movement of the track and roadbed.

The program shall specify the survey locations, the distance between the location points, and frequency of monitoring before, during, and after construction. The Railroad reserves to the right to modify the survey locations and monitoring frequency as necessary during the project.

The survey data shall be collected in accordance with the approved frequency and immediately furnished to the Railroad for analysis.

If any movement has occurred as determined by the Railroad. Railroad, at its sole discretion, shall have the right to immediately require all contractor operations to be ceased, have the excavated area immediately backfilled and/or determine what corrective action is required.

Soil and Water Management

The Railroad must review and approve reuse of soil on Railroad property.

If the soil cannot be reused on Railroad property, it must be properly disposed at an approved disposal facility. The Railroad prohibits any contractor from taking soils for off property reuse. Coordinate with the Railroad to handle waste characterization and profiling into an approved disposal facility. The Railroad prohibits any environmental sampling of its property unless approved in writing. If Agency has arrangements with a disposal facility not approved by the Railroad, Agency can request to evaluate the disposal facility. Request to evaluate alternate disposal facilities should take place prior to work being initiated on Railroad property.

If dewatering is planned for a public project, the Railroad must review and approve the dewatering plan prior to work being initiated on or near Railroad property. The Railroad prohibits the

discharge of water onto its property without prior approval. The Railroad prohibits environmental sampling of groundwater or surface water.

All materials discarded by or on behalf of the Railroad will be managed in accordance with local, state and federal regulations as well as best management practices and sustainability goals. To ensure that these goals are achieved, the Railroad has mechanisms in place to monitor waste management activities.

The clean-up and disposal of material from the surface preparation for painting and actual painting must comply with all appropriate regulations. The materials removed during the surface preparation must not impact the surrounding area including ground, water, or air impacts. Materials must not be stored on Railroad property.

Drainage

For the installation of temporary or permanent shoring systems, including but not limited to soldier piles and lagging, and interlocked steel sheeting on or adjacent to Railroad ROW, the contractor may be required to submit a detailed track monitoring program for approval prior to performing any work near Railroad ROW.

When water is known or expected to be encountered all plans and specifications must be submitted to the Railroad for approval before the process begins. Pumps of sufficient capacity to handle the flow shall be maintained at the site, provided the contractor has received approval to operate them. Pumps in operation shall be constantly attended on a 24-hour basis until, in the sole judgment of the Railroad, the operation can be safely halted. When dewatering, a process for monitoring for any settlement of track or structures must be in place.

If any track movement has occurred as determined by the Railroad. The Railroad, at its sole discretion, shall have the right to immediately require all contractor operations to be ceased, have the excavated area immediately backfilled and/or determine what corrective action is required. Any corrective action required or performed by the Railroad including the monitoring of corrective action of the contractor will be at project expense.

All pipes, ditches, and other structures carrying surface drainage on Railroad property and/or under track(s) shall be designed to carry the run-off from the **100-year, 24-hour design** storm without ponding of water against the roadbed.

Pipe(s) used to carry surface drainage on Railroad ROW shall have a minimum diameter of 24 inches (**24"**).

When calculating the capacity of existing or proposed drainage structures, under track(s), the headwater calculation at the structure shall not be greater than one (**1**):

$$\mathbf{HW/D \leq 1.}$$

Rate and quantity of storm water runoff from any proposed development shall not exceed the rate and quantity of runoff prior to development. This standard shall be maintained for all design storms up to the **100-year storm event**.

Pipes (casing or carrier) placed under tracks shall not be less than 5.5 (**5'-6"**) feet from base of rail to top of pipe at its shallowest point.

Pipelines laid longitudinally on ROW, 50 feet (**50'-0"**) or less from centerline of track shall be buried not less than 4 feet (**4'-0"**) from ground surface to top of pipe. Where the pipeline is laid more than 50 feet (**50'-0"**) from centerline of track, the minimum cover shall be at least 3 feet (**3'-0"**).

Erosion prevention methods shall be used to protect Railroad ditches and other drainage facilities during construction on and adjacent to ROW.

Permanent erosion and sediment pollution control facilities shall be designed for the **100-year storm**. Provide calculations and details of any riprap outlet protection and channel linings as needed within ROW.

Pipes and culverts within the live load influence shall conform to current AREMA Recommendations and ASTM Specifications. All such structures shall be designed to carry Cooper's E-80 loading with diesel impact.

ROW shall not be utilized for retention, detention or settling basins. Also, the Railroad embankment must not be used as any part of a detention pond structure.

Track roadbed fills shall not be used as dams or levees for retention of runoff.

Temporary sediment basins/traps shall not be constructed against track roadbed fill.

Formal approval of the proposed design, by the appropriate governmental agency having jurisdiction, shall be submitted to the Railroad for their review and acceptance.

Pipes and culverts are not to be located within the limits of a turnout or nor closer than 50 feet (**50'-0"**) to any Railroad bridge, building or any other important structure.

When excavation for a pipeline or other structure will be within the theoretical Railroad embankment line of an adjacent track, interlocking steel sheet piling will be required to protect the track(s). Trench Boxes are prohibited for use on ROW within the Theoretical Railroad Live Load Influence Zone.

Blasting is not permitted on or adjacent to Railroad ROW without prior written approval.

Crossing of tracks at grade by equipment and personnel is prohibited except by prior arrangement with and as directed by the Railroad.

Temporary Track Supports may be required when jacking, boring or tunneling method of installation is used, and depending upon the size and location of the drainage crossing. The Agency's contractor shall furnish and supply the approved track supports, with the installation and removal performed by Railroad approved person. The Agency shall reimburse the Railroad for all costs associated with the installation and removal of the track supports.

Plans submitted to the Railroad for approval shall be prepared by a Professional Engineer and should indicate design, suitable topographic plan, and outline of total drainage area.

If the drainage is to discharge into an existing drainage channel on ROW and/or through a drainage structure under track(s), the computations must include the hydraulic analysis of any existing ditch and/or structure.

Extension of pipes, culverts and other drainage structures previously installed under tracks shall be made with culvert or drainage structure having the same size, shape, and dimensions, as the existing pipe. In no case shall the existing drainage structure be extended so that the hydraulic capacity is decreased or obstructed. In some cases, it may be necessary to extend existing outlets with pipe or culvert of a larger size. Details of connections to mismatched culverts shall be submitted for approval.

Agency may be required to provide reasonable corrective measures to alleviate an existing drainage problem within Railroad property which may be affected by the proposed development. It shall be the responsibility of the Agency to obtain all drainage easements and permits. The Railroad shall be indemnified and held harmless of any liability.

Agency is to provide information on groundwater recharge if infiltration is proposed adjacent to Railroad property. Soils testing and certification by a registered professional engineer shall be required.

Emergency spillways discharging onto Railroad property are to be designed and constructed so that the basin berm is protected against erosion.

Energy dissipating devices are to be placed at all outlets discharging to Railroad property.

Concrete end walls shall be placed at outlets discharging to Railroad property. All concrete outlet pipes on property must be equipped with a trash rack.

Under no conditions shall any person be allowed to modify, alter or change a previously approved storm water management (SWM) facility discharging to Railroad property unless an approved alternate facility is approved.

Design of the drainage system, including alterations of the existing drainage system on ROW, is the responsibility of the Agency. Drainage shall not be diverted, directed toward the Railroad, or increased in quantity without prior written approval.

Supporting calculations must be provided for all proposed drainage and storm water management facilities that discharge onto or impact property.

Occupancies shall be designed, and their construction shall be accomplished, so that adequate and uninterrupted drainage of Railroad ROW is maintained.

If, in the course of construction, it may be necessary to block a ditch, pipe, or other drainage facility, temporary pipes, ditches, or other proposed drainage facilities shall be installed to maintain adequate drainage, as approved. Upon completion of the Project, the temporary facilities shall be removed, and the permanent facilities restored.

Temporary and permanent erosion control and sedimentation (E&S) devices must be provided to prevent the flow of sediment onto and adjacent to Railroad property.

The design shall take into account and provide upstream areas within the entire watershed in computing discharge, sizing of pipes, inlets, and other structures.

When applicable, Agency is to provide maintenance and operation of E&S/Storm water facilities.

Plans shall include, but not limited to the following:

- Existing property boundaries, easements, etc.
- Existing drainage features and topography.
- Existing utility locations.
- Existing structures, tracks, roads, features, etc.
- Existing topography including wetlands and all environmental features.
- Delineate & Dimension proposed property acquisition or property easements.
- Dimension distances from all temporary and proposed E&S and storm water management facilities to Railroad property line and/or easement.
- Dimension distances from all temporary and proposed E&S and storm water management facilities to tracks.
- Dimension all temporary and proposed encroachments within property.
- Show existing contours.
- Provide TOR elevations.
- Provide proposed contours, site grading and drainage facilities.
- Provide proposed improvements, including easements and property lines and limit of disturbance.
- Details for all temporary and proposed drainage structures, SWM and E&S Best Management Practices (BMP) devices.
- Detail proposed E&S, SWM, drainage collection & conveyance systems (pipes, ditches, etc.).
 - Provide location, size, slope & type of pipe.

- Ditch cross sections
- Invert elevations
- Grate and rim elevations
- If applicable, identify the 100-year floodplain if project is within a specified flood zone.
- Provide E&S Plans in compliance with all State and Local requirements.
- Signature and Seal of State Licensed PE.

Design Calculations

Pre and post development Drainage Area Maps

- Provide soils boundary lines & soil types.
- Delineate drainage areas.
- Time of Concentration (Tc) flow path.
- Provide weighted CN and c-values (as applicable to design method).

Pre-development 100-year runoff volume and flows for all facilities draining to or on ROW.

Post-development 100-year runoff volume and flows for all facilities draining to or on to ROW.

- Verify no increase in rate or quantity of runoff to property from Pre-Development conditions.
- Provide hydraulic analysis (depth and velocity calculations) for all facilities draining to or on ROW (existing and proposed) and verify sufficient capacity for proposed flow is provided.

Design of proposed collection & conveyance systems (pipes, ditches, etc.)

- Required capacity for a **100-year, 24-hour storm**.
- Required a minimum diameter of **24-inches** for pipes within ROW.

Provide all temporary and permanent E&S and SWM BMP calculations.

Signature and Seal of State Licensed PE.

Project narrative/summary describing proposed improvements, drainage design, SWM and E&S methodologies, site soil and geological conditions (if known), flooding characteristics (if applicable) and State and Local requirements used to produce designs.

Recommended: Photographs of the site and adjacent property, as well as discharge locations and drainage facilities on property to receive runoff from the proposed development.

Section 1.12 – Railroad Property Safety

All work on or near Railroad property shall be conducted in accordance with the Railroad’s safety rules and regulations. Specifically, all Agency’s employees and Contractors, while on Railroad property, shall be required to wear a hard hat, safety glasses with side shields, 6” lace up boots with a distinct heel, shirts with sleeves, and long pants; additional personal protective equipment may be required based on certain operations. The Contractor and its employees shall always comply with the safety rules while occupying Railroad property. Operations will be subject to inspection at any time. All personnel operating equipment must be qualified on it to perform task at hand.

The Agency, its contractors, or any person refusing to comply with Railroad safety rules may be removed from the property at the Railroad’s discretion. Although the GEC and Railroad may perform site visits to verify compliance to safety rules and regulations, it is up to the Agency and its contractors to adhere to all safety rules and regulations at all times.

Additionally, all equipment shall be used only in the manner it was designed for. All applicable safety rules shall be followed to include the use of seat belts on all equipment equipped with such. Equipment operators shall only operate equipment for which they are trained, certified, and qualified to operate. Operators shall have such credentials on their person anytime in which they operate on Railroad property.

If an onsite flagman, (**See Section 1.07**) is assigned, a job briefing must be performed by all persons entering the property even if no work is being performed. If a job function is being performed outside the view of the flagman, it is the responsibility of the Agency and its contractors to brief with the flagman.

For additional Safety requirements, please refer to ‘Contractor Safety Rules’ document. It is the goal of the Railroad to have zero safety incidents every day.

Section 2.01 – Public Road Crossing Openings and Closures

Summary

The Railroad understands the importance of highway-rail grade crossings and their relevance to such priorities as economic development, emergency vehicle access and other growth opportunities in the communities through which we operate. Because of the safety concerns associated with highway-rail grade crossings, however, every effort must be made to obtain alternative access or additional capacity using grade separations, or by other roads leading to existing crossings.

The Railroad shares the goal of eliminating at grade crossings with both the State DOTs and the Federal Railroad Administration (FRA). Likewise, the Federal Highway Administration (FHWA) Railroad-Highway Grade Crossing Handbook acknowledges that the first alternative that should always be considered for a highway-rail at-grade crossing is elimination. Elimination of a crossing provides the highest level of crossing safety because the point of intersection between highway and Railroad is removed. Closing adjacent crossings simplifies the design, installation and operation of highway-rail grade crossing warning systems.

The addition of any grade crossing brings the potential for incidents involving trains and motor vehicles. For this reason, both federal and state government policies discourage the creation of new grade crossings. As such the Railroad, other Railroads, the United States Department of Transportation and most State DOTs encourage communities to carefully consider all alternatives, including grade separations (crossings that go over or under Railroad tracks), as opposed to the creation of new at-grade crossings.

The cost of a grade separation should not outweigh the enhanced safety it would provide for motorists.

Before agreeing to the establishment of a new crossing, the Railroad encourages communities to engage in a study with the purpose of identifying existing redundant public crossings for closure. To comply with and in support of the federal initiative to reduce grade crossings, the Railroad requires that the community identify the closure of three, (3) or more comparable active public at-grade crossings.

As discussed above, the appropriate public authority will be expected to reimburse the Railroad for its cost of design, installation and future maintenance of the crossing.

Process

- Appropriate public authority provides a written request to PPD outlining the reason for the new crossing or seeking to convert a Private crossing to a Public. Include the following:
 - A description of the proposed highway project, including proposed passive or active traffic control devices, and the need for preemption and/or interconnection

with traffic signals, together with a scale drawing or sketch of the proposed highway and vicinity.

- Expected Annual Average Daily Traffic (AADT) and proposed vehicular speed limit, photographs, aerial map. Please include any expected future development.
 - Identify at-grade crossings to be closed. Include their vehicular speed limit, AADT, and traffic type.
 - The determination by the highway or regulatory authority of the need for passive or active traffic control devices and other safety treatments (i.e., signage, roadway medians, etc.), as selected by the highway authority consistent with applicable federal, state, and MUTCD guidelines and requirements.
 - A plan to satisfy any appropriate regulatory authority's requirements, procedures and approval. The project sponsor should coordinate with all applicable agencies (state, county, city, etc.) to ensure proper procedures are followed.
 - Authorization for the Railroad to incur costs for its Preliminary Engineering to review the crossing request (whether or not its approved), design and construction expenses, and for the ongoing maintenance of the crossing surface and related grade crossing warning devices.
- PPD will review the request and follow up with appropriate State authorities.
 - If it is approved by the Railroad, the State DOT, and appropriate roadway authorities, PPD will proceed with creating a project and starting the design review process. To include, but not limited to the following:
 - Assign Temporary DOT Number.
 - Site Survey & Diagnostic Review to determine Level of Protection.
 - Basis for Design.
 - Estimate to Complete.
 - Agency/Sponsor and the Railroad enter into all applicable contracts.
 - RFP and Vendor Selection.
 - Design and Order material.
 - Construct Surface, (Must Remain Closed and Inaccessible).
 - Install Level of Protection as indicated by DOT.
 - Testing and DOT Signoff.
 - Open Crossing and Close Offset Crossings.
 - Update FRA to make DOT Number Permanent.

Section 2.02 – Highway-Rail Grade Crossing Warning Devices

Summary

PPD will process all projects proposing alterations to public highway-rail grade crossing warning systems. Included will be projects for opening new crossings, closing existing crossings, modifying or widening of existing crossings, installing new warning systems, removing and/or relocating existing warning systems and modifying/upgrading existing warning systems. This also pertains to preemption projects.

Each crossing has a unique DOT inventory identification number posted at the crossing. There is often more than one crossing on the same road. The number (i.e. DOT 654321D) must be used to identify the specific crossing in all communications with the Railroad to reduce possible confusion about the specific location.

Highway-rail grade crossing warning systems must adhere to all applicable Federal and State standards and regulations, and local policies, laws and ordinances, as well as Railroad standards. The State DOT and highway agency, not the Railroad, is responsible for determining the level of protection and configuration of warning devices for a public highway-rail grade crossing. In addition, the highway agency or other governmental agency responsible for making warning system and equipment determinations is responsible for selecting appropriate vehicular traffic control signs and/or devices for a specific public highway. Loop Detection Circuitry will not be designed, installed, owned, or maintained by the Railroad.

Preemption must be determined by the highway agency on whether advanced or simultaneous is needed. The agency must also provide a traffic study to determine how much if needed advanced preemption time is required. The Railroad as well as AREMA, and MUTCD discourages the use of excessive preemption times. The Railroad will furnish one preemption interconnection circuit of a normally closed contact that is designed to open upon the approach or presence of a train and will terminate the closed preemption interconnection circuit in a common cable junction box, (set at ROW line) to be used for the interconnection of the traffic signals and the grade crossing warning devices.

Recommended practices and additional information are available in American Railway Engineering and Maintenance of Way Association (AREMA) manuals and the Manual on Uniform Traffic Control Devices (MUTCD).

The Railroad will provide engineering reviews, signal designs, and cost estimates for the installation of highway-rail grade crossing warning devices at the expense of the project sponsor as part of the Preliminary Engineering for a project. Changes to highway-rail grade crossing surfaces may also require engineering and pre-approval by the Railroad. Installation or modification of warning devices must be supervised and performed by a qualified entity as determined by the Railroad.

The Railroad typically does not allow the mixing of different equipment. If additional gates or equipment is added to a location. The entire location should be redesigned and upgraded to the latest standard.

If roadway footprint changes in width to include adding a sidewalk or multiuse path, an easement review must be completed prior to the project construction start, (**See Section 1.09**).

Process

- Agency Requests a Diagnostic Review.
- Agency sends Review Results and PPD supplies Agency with OOM Estimate.
- Agency/Sponsor and Railroad enter into applicable contracts.
- PPD Assigns a GEC to Develop BOD, Estimate to Complete, and RFP.
- GEC Solicits bids for Design-Build Contractor.
- Contractor Completes Design and Orders Material.
- Utility Concerns are Resolved.
- Construct Warning System.
- Testing and DOT Signoff and Update FRA.

Section 2.03 – Highway-Rail Grade Crossing Surface Maintenance

Summary

The crossing surface provides a path for highway vehicles to cross Railroad tracks. The objective is to provide a safe, smooth, and cost-effective crossing for highway and Railroad traffic. Highway and Railroad maintenance work near highway-rail grade crossings must consider safety concerns for both highway and Railroad traffic before, during, and after the work is implemented.

Each public crossing has a unique DOT inventory identification number posted at the crossing. There is often more than one crossing on the same road. The number (i.e. DOT 654321D) must be used to identify the specific crossing in all communications with the Railroad to reduce possible confusion about the specific location.

Railroad track is continuous through the crossing and includes Railroad ties, rail and fasteners below the surface of the crossing, (Joints shall not be made within the crossing). The crossing surface for highway traffic can be made of several different materials. Drainage is required for all four quadrants at a crossing.

Crossing surface material and construction methods are selected for each crossing based on the type of highway and Railroad traffic, past experience and funding available from highway agencies for individual projects. Highway agencies seeking replacement of crossing surfaces should contact PPD. The request for the work and the recommended surface must be reviewed and approved by the Railroad.

Crossing work requires closing the entire highway-rail grade crossing. Replacement of track components through a crossing requires removal of the crossing surface, replacement of track ballast, and surfacing the track through the crossing prior to replacement of the crossing surface. If the subgrade needs to be improved, the application of a hot mixed asphalt underlayment should be considered. Drainage will be reestablished for all four quadrants. After the crossing surface is replaced, the highway approach paving is completed and then the road is opened to highway traffic. Replacement of the track and crossing surface usually requires that the highway be closed for several days. In the event the Agency wants to reopen the crossing prior to allowing the asphalt to properly cool, the Agency is responsible for any rutting that may occur.

If roadway footprint changes in width to include adding additional lanes, a sidewalk or multiuse path, an easement review must be completed prior to the project construction start, (**See Section 1.09**).

Process

- Agency Submits Request to PPD.
- Agency and PPD Research Existing Contractual Requirements.
- Agency/ Sponsor and Railroad enter into applicable contracts.

- Railroad Assigns GEC to Develop Estimate.
- Railroad Orders Materials and Schedules Work.
- Reconstruct Crossing:
 - Place Barricades and Close Roadway.
 - Sawcut Roadway.
 - Remove Existing Track Panel, Ballast, and Sub-ballast.
 - Establish New Foundation.
 - Install New Track Panel.
 - Run Tonnage to Settle System.
 - Install Surface Materials.
 - Install Asphalt, (and concrete if needed).
 - Let Cool and Cure.
 - Remove Barricades.
- Cleanup.
- Agency Signoff and Update FRA.

Section 2.04 – Parallel Road Construction and Maintenance

Summary

New Roadway Construction

In the interest of public safety, parallel public roads shall be located off Railroad property. Parallel roads involving intersections with existing or proposed highways where public or private crossings are present should be aligned to provide sufficient distance from the crossing for the largest vehicle (design vehicle) permitted to use the road to stop between the Railroad and the parallel road traffic control signs, markings, and warning devices without interfering with Railroad operations, obstructing or preventing the operation of traffic control devices or obstructing the crossing in any manner.

The design of highways, highway intersection, and configuration of highway-rail grade crossings is the responsibility of the highway agency. Drainage for highway runoff, the Railroad corridor, and adjacent property must be designed to reduce or maintain existing Railroad drainage and to prevent standing water and potential erosion. Access for Railroad equipment to the Railroad property, structures, and track cannot be restricted or prevented.

Federal and State design manuals, the Manual of Uniform Traffic Control Devices (MUTCD) and additional recommended practices available in American Railway Engineering and Maintenance of Way Association manuals (AREMA) provide design information to be considered by the highway agency responsible for the project engineering. The table of contents of this document has additional information on the MUTCD and AREMA manuals and information.

If new construction encroaches on Railroad property, an easement review must be completed prior to the project construction start, (See **Section 1.09**).

Maintenance of Existing Roadway

Projects that are either parallel or bisect as roadway crossings within the Railroad ROW require both a ROE and the use of a qualified Flagman at the cost of the project sponsor, (See **Section 1.09**).

Process

- Request a ROE through G&W Real Estate.
- Agency/Sponsor and Railroad will enter into applicable contracts, including Contractor Right of Entry Agreement.
- Submit Executed ROE and Insurance Documents to PPD.
- PPD Coordinate with Region to Provide Flagman.

Section 2.05 – Overhead and Undergrade Bridge

Summary

The Railroad requires that new overhead bridges (including existing bridge replacements) span the Railroad's right-of-way and have a minimum 23' vertical clearance above top of rail. The Railroad requires that new undergrade bridges provide accommodations for future operating needs, as determined by the Railroad.

During project construction, rail operations must not be impeded. Temporary run-around track(s) and/or phased construction may be necessary as determined by the Railroad.

All bridge projects over or under the Railroad ROW shall be governed by the appropriate criteria found in this document. This includes but is not limited to replacements, new construction, substructure modifications and/or repairs, superstructure replacement or repair, and deck replacement or overlay. The following criteria must be reviewed and approved by the Railroad prior to construction:

- Temporary and final drainage plans must be approved by the Railroad.
- Railroad's access to its property must be maintained.
- Plans must show all tracks and horizontal and vertical track clearances for both the existing conditions and the proposed project.
- Bridge demolition criteria are found in the Construction Submission, (**See Section 1.11**) in this document.
- Upon completion of construction, a full set of as-built drawings, showing actual measured vertical and horizontal clearances, shall be furnished to the Railroad.

If new construction is bisecting Railroad property an easement review must be performed prior to the project construction start, (**See Section 1.09**). Please note that project may require both a Temporary Construction Easement and a Permanent Easement.

Process

- Agency/ Sponsor and Railroad enter into applicable contracts.
- PPD Assigns GEC.
- GEC Works with Agency to Gather Easement Documentation and ROE.
- GEC Works directly with Agency and Contractor on Submittal Reviews.
- GEC Sends Agency an Estimate to Complete Project.
- Agency Schedules Construction.
- Railroad Supplies Flagman.
- GEC Provides CEI Services.
- Project Completion when both Railroad and Agency Signoff.
- Agency Submits As-built Plans.

Overhead Bridge Criteria

The Railroad has minimum requirements for outside parties constructing, rehabilitating, or replacing bridges over Railroad ROW. These requirements are intended to provide safe and continuous passage of all train traffic during and after construction of bridges over its tracks. Part of these requirements is for the outside party to submit a detailed plan of the project as well as provide details of the construction methodology. This document provides information on the requirements for overhead bridges over Railroad property.

Plans and specifications for new or reconstructed bridges over Railroad ROW shall meet the following requirements:

General

- The Railroad's valuation station and the distance from the nearest milepost at the intersection of the centerline of the track and the centerline of the bridge shall be shown on the General Plan.
- The existing and proposed minimum horizontal and vertical clearances shall be marked clearly on the General Plan and Elevation.
- At least one subsurface exploration boring for each substructure unit adjacent to the track shall be furnished to the Railroad during the design submittal. Borings shall provide enough information to design shoring and foundations.
- Prior to construction activities, all overhead bridge projects will require the procurement of the appropriate property rights from G&WRealEstate.
- All lifting equipment and connection devices shall have capacity for **150%** of the actual lifting load. The factor of safety provided by the manufacturer in the lifting capacity data shall not be considered in the **150%** requirement. A licensed professional engineer, familiar with lifting and rigging, in the State where the construction work is proposed must sign and seal all plans and calculations related to critical lifting on the project.

Clearance

- **Horizontal Clearance:** Standard horizontal clearance from centerline of the track to the face of the pier or abutment shall typically be **(25'-0")** or greater, but never less than **(18'-0")**, measured perpendicular to the track. Provisions for future tracks, access roads, other Railroad facilities, and drainage may require the minimum clearance be increased or use of multi-span structures. The toe of footings shall not be closer than **(11'-0")** from centerline of the track to provide adequate room for sheeting.
- **Vertical Clearance:** A standard vertical clearance of **(23'-0")** shall be provided, measured from top of high rail to lowest point of structure in the horizontal clearance area which extends **(6'-0")** either side of the centerline of track.

- Temporary Construction clearances to be used shall be subject to approval by the Railroad, (Typically reductions in clearance for construction are not permitted).
- As-built drawings showing actual clearances as constructed are to be provided to the Railroad.

Crashwalls

- Reference the AREMA specifications that cover the requirements for crashwalls. Crashwalls are required when face of the pier is closer than **(25'-0")** from centerline of the track, measured perpendicular to the track, except as noted below.
- Crashwalls shall meet the following requirements:
 - Crashwalls for single column piers shall be minimum **(2'-6")** thick and shall extend a minimum of **(6'-0")** above the top of high rail for piers located between **(18'-0")** and **(25'-0")** from the centerline of the nearest track. The wall shall extend minimum **(6'-0")** beyond the column on each side in the direction parallel to the track.
 - For multi-column piers, the columns shall relate to a wall of the same thickness as the columns or **(2'-6")** whichever is greater. The wall shall extend a minimum of **(2'-6")** beyond the end of outside columns in a direction parallel to the track.
 - Reinforcing steel to adequately anchor the crashwalls to the column and footing shall be provided. For piers of heavy construction, crashwalls may be omitted. Solid piers with a minimum thickness of **(2'-6")** and length of **(20'-0")**, single column piers of minimum **(4'-0" x 12'-6")** dimensions or any other solid pier sections with equivalent cross sections and minimum **(2'-6")** thickness are considered as heavy construction.

Drainage

Drainage from the bridge shall be preferably collected with drain pipes and drained away from Railroad ROW. When open scuppers are provided on the bridge, none shall be closer than **(25'-0")** of the centerline of nearest track. Flow from the scuppers shall be directed away from Railroad drainage ditches.

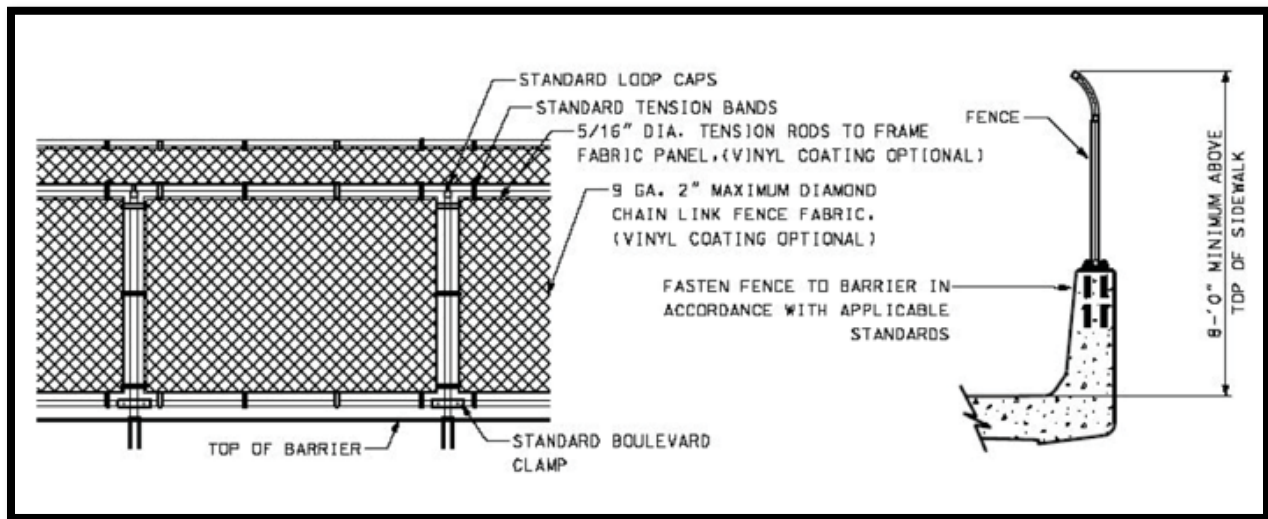
Projects including stormwater systems shall be designed for a **100-year storm event** as a minimum. If stormwater is drained on or to Railroad ROW, calculations must be submitted to Railroad to verify the **100-year storm event** is properly handled. Improvements to the adjacent drainage systems may be required at project expense, to ensure the impacted system will meet the **100-year storm event** minimum condition.

During and after completion of construction, the outside party or its contractor must clear Railroad's drainage ditches of all debris to the satisfaction of the Railroad.

Fencing

All highway structures shall have a protective barrier fence to extend at least (8'-0") from the top of the sidewalk or driving surface adjacent to the barrier wall. The fence may be placed on top of the barrier wall. The fence shall be capable of preventing pedestrians from dropping debris onto Railroad ROW.

Openings in the fence shall not exceed (2" x 2"). Fencing should also include anti-climb shields or be of a configuration to minimize the likelihood of climbing on the outside of the protective fencing. A chain link fence option is shown below:



Excavation and Shoring

Shoring protection shall be provided when excavating adjacent to an active track. Shoring will be provided in accordance with AREMA, except as noted below.

Shoring will not be required if both the following conditions are satisfied:

- Excavation does not encroach upon a 1 horizontal to 1 vertical theoretical slope line starting at bottom corner of tie (live load influence zone).
- Track is on level ground or in a cut section and on stable soil.

When the track is on an embankment, excavating the toe of the embankment without shoring may affect the stability of the embankment. Therefore, excavation of the embankment toe without shoring will not be permitted.

Preferred protection is the cofferdam type that completely encloses the excavation. Where dictated by conditions, partial cofferdams with open sides away from the track may be used. Cofferdams

shall be constructed using steel sheet piling or steel soldier piles with timber lagging. Wales and struts shall be provided as needed. The following shall be considered when designing cofferdams:

- Shoring shall be designed to resist a vertical live load surcharge of **1,882 lbs.** per square foot, in addition to active earth pressure. The surcharge shall be assumed to act on a continuous strip, (**8'-6"**) wide. Lateral pressures due to surcharge shall be computed using the strip load formula shown in AREMA Manual.
- Allowable stresses in materials shall be in accordance with AREMA.
- A construction procedure for temporary shoring shall be shown on the drawing.
- Safety railing shall be installed when temporary shoring is within (**15'-0"**) of the centerline of the track.
- A minimum distance of **10 feet** from centerline of the track to face of nearest point of shoring shall be maintained.

The contractor shall submit the following drawings and calculations for Railroad review and approval:

- Detailed drawings of the shoring systems showing sizes of all structural members, details of connections, and distances from centerline of track to face of shoring. Drawing shall show a section that includes the height of shoring and track elevation in relation to bottom of excavation.
- One set of calculations of the shoring design.
- The drawings and calculations shall be prepared by a Licensed Professional Engineer in the State where shoring is to be constructed and shall bear his seal and signature. Shoring plans shall be approved by the Railroad.
- For sheeting and shoring within (**18'-0"**) of the centerline of the track, the live load influence zone, and in slopes, the contractor shall use sheet pile. No sheet pile in slopes or within (**18'-0"**) of the centerline of track shall be removed. Sheet piles shall be cut off **3'-0"** below the finished ground line. The remaining (**3'-0"**) shall be backfilled and compacted immediately after cutting off.

Demolition of Existing Structure

The Contractor shall submit a detailed procedure for demolition of existing structures over or adjacent to Railroad ROW. The procedure shall clearly indicate the capacity of cranes, location of cranes with respect to the tracks and calculated lifting loads. The demolition procedure shall be approved by the Railroad.

Railroad's tracks, signals, structures, and other facilities shall be protected from damage during demolition of existing structure or replacement of deck slab. As a minimum, both of the following methods shall be used:

- During demolition of the deck, a debris shield shall be erected from the underside of the bridge over the track area to catch falling debris. The shield shall be supported from girders or beams. The deck shall be removed by cutting it in sections and lifting each section out. The shield shall be designed, with supporting calculations, for a minimum of **50 pounds** per

square foot plus the weight of the equipment, debris, personnel, and other loads to be carried.

Large pieces of deck shall not be allowed to fall on the debris shield:

- A ballast protection system consisting of geofabric or canvas shall be placed over the track structure to keep the ballast clean. The system shall extend along the track structure for a minimum of **(25'-0")** beyond the limits of the demolition work, or farther if required by the Railroad.
- The Contractor shall submit detailed plans, with supporting calculations, of the debris shield and ballast protection systems for approval prior to the start of demolition.
- Blasting will not be permitted to demolish a structure over or within Railroad ROW.

Erection

The Contractor shall submit a detailed procedure for erecting over or adjacent to ROW. The procedure shall clearly indicate the capacity of cranes, location of cranes with respect to the tracks and calculated lifting loads. The erection procedure shall be approved by the Railroad.

Pile Installation

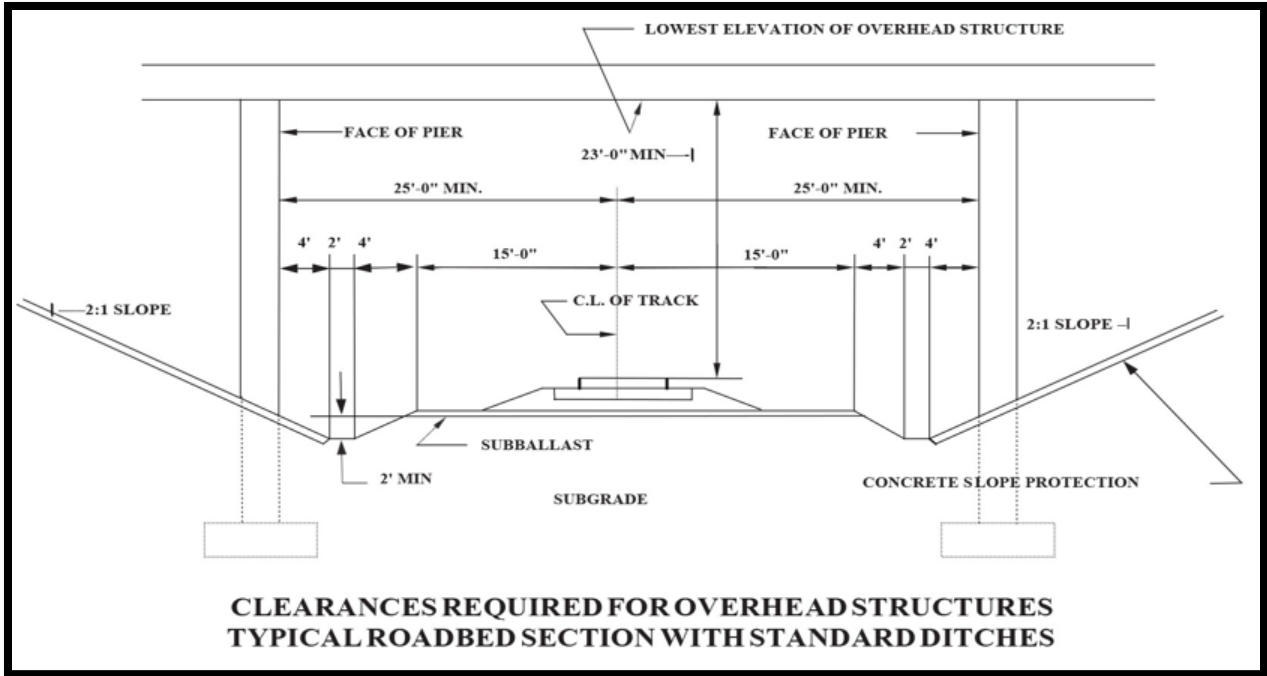
For the installation of piles and sheeting for abutment foundations, pier foundations, retaining wall foundations, temporary and permanent shoring and other structures on or adjacent to Railroad ROW, the contractor may be required to submit a detailed track monitoring program for review and approval by the Railroad.

The program shall specify the survey locations, the distance between the location points, and frequency of monitoring before, during, and after construction. The Railroad shall have the capability of modifying the survey locations and monitoring frequency as needed during the project.

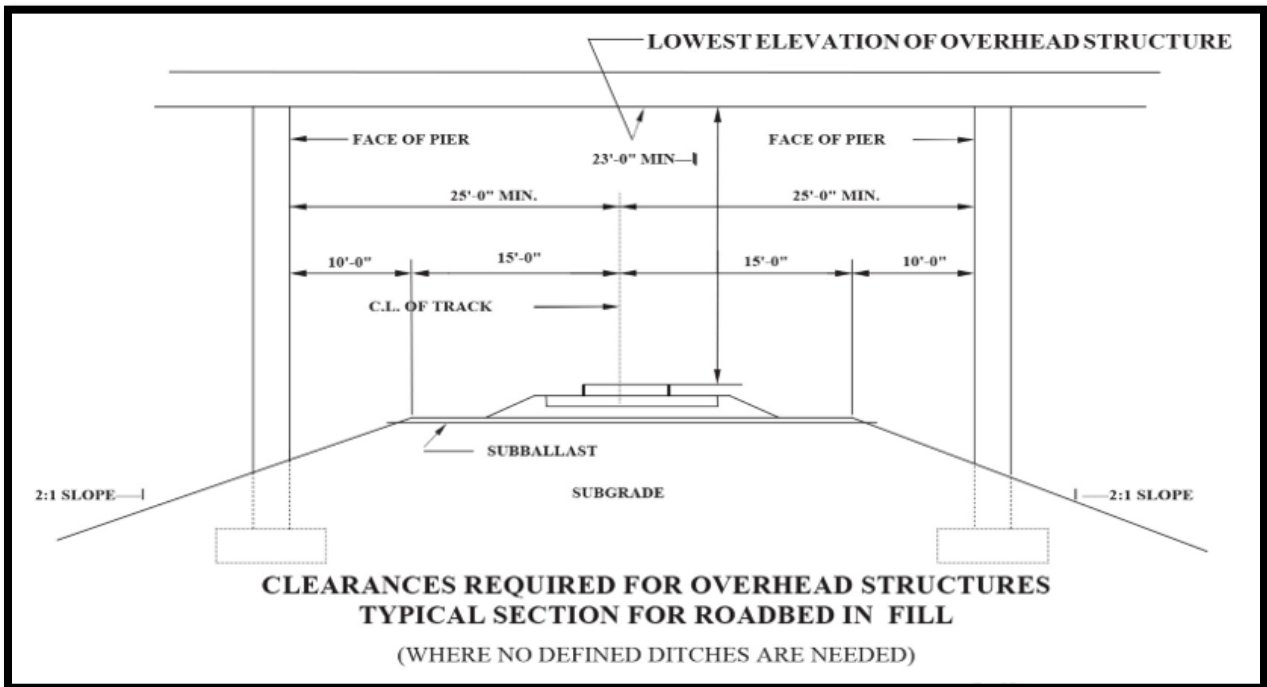
If any settlement is observed, the Railroad shall be immediately notified. The Railroad shall have the right to immediately require all contractor operations to be ceased, have the excavated area immediately backfilled and/or determine what corrective action is required. Any corrective action required by the Railroad or performed by the Railroad including the monitoring of corrective action of the contractor will be at project expense.

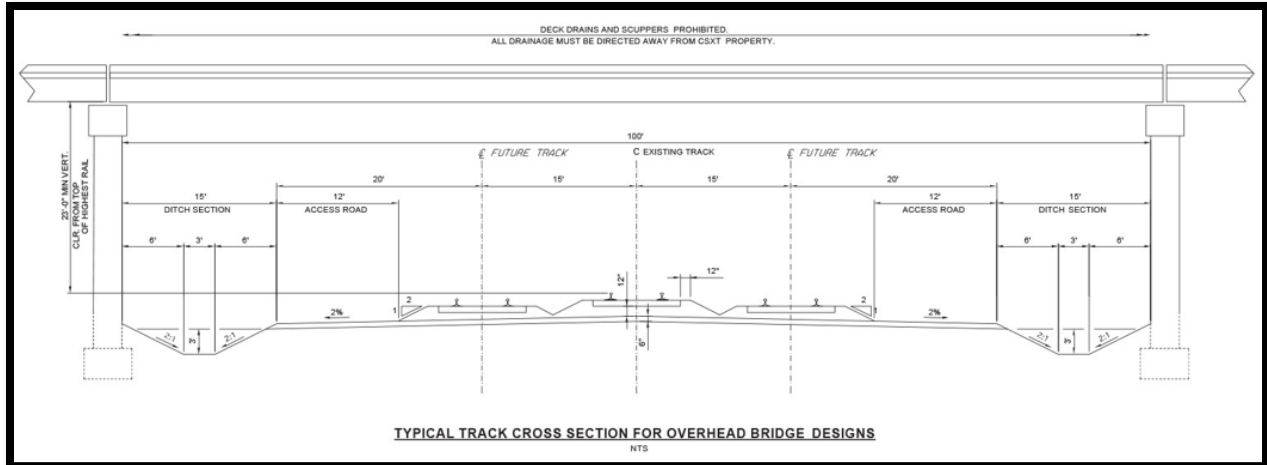
Pedestrian Bridge

- Pedestrian overhead bridges shall span the entire width of Railroad ROW. Intermediate piers or other supports will not be permitted.
- Pedestrian overhead bridges shall be completely enclosed with protective canopy or by other means to prevent users from dropping debris onto Railroad ROW.



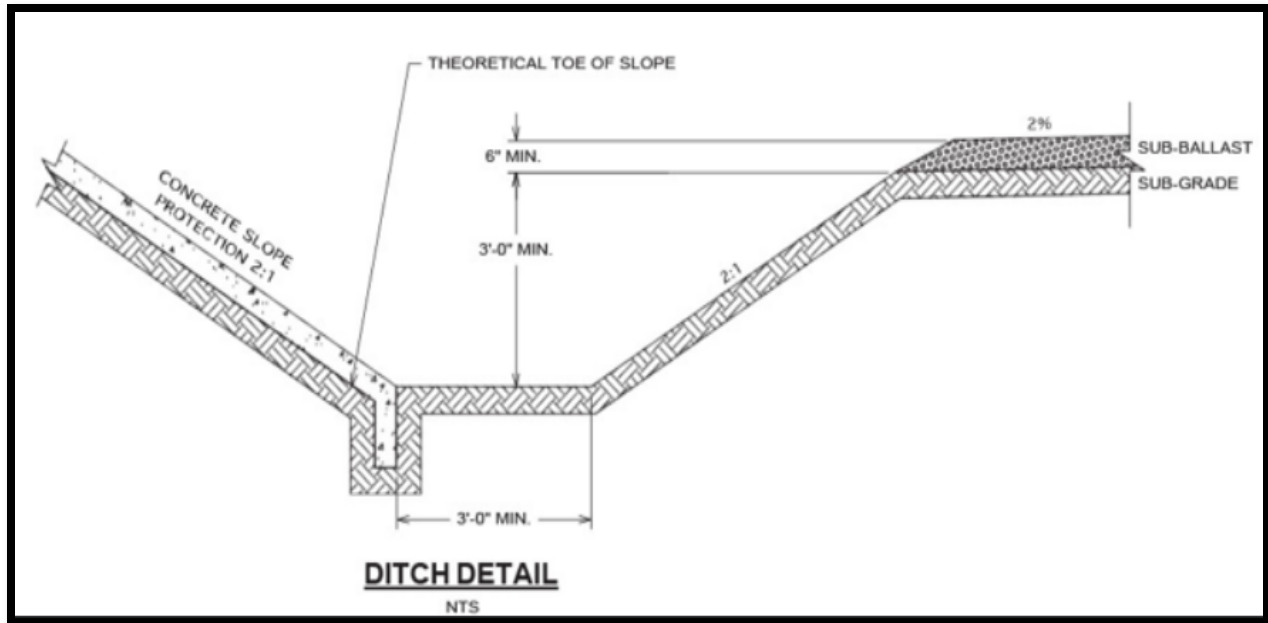
For multiple tracks, standard track centers are (15'-0") wide, access road may be required to provide (33'-0") minimum distance from centerline of track to face of pier.





The following applies to the typical cross section for bridges:

- Clear span width should account for the number of existing tracks at specific project site. Each additional track adds **(15'-0")** to the clear span width calculation.
- Horizontal dimensions shown are perpendicular to center of track.
- Crashwalls may be required based on specific parameters.
- Actual required horizontal clearances may need to be increased due to existing roadbed section. Location of parallel ditches, hydrological conditions, and future track requirements.
- Theoretical toe of slope is based on the standard roadbed section. Actual toe of slope may vary due to ground line.
- The ditch section shown is the minimum acceptable section.
- The ditch section is to be increased as required by local conditions, based on hydrological and hydraulic studies.
- Horizontal dimensions shown are the minimum which will allow the construction of Railroad standard roadbed section.



Undergrade Bridge Criteria

The AREMA Manual shall serve as the overarching authority for recommended practice in designing Railroad bridges. The intent of this document is to provide criteria which supplements, modifies and/or supersedes the applicable sections of the AREMA Manual for designing undergrade railway bridges which are to be owned and/or operated on by the Railroad. Additionally, these requirements help guide an outside party through the necessary procedures for interacting with the Railroad and delivering an acceptable structure that is constructible, inspectable, maintainable, long lasting, and reliable.

General

Bridge shall be designed in accordance with the applicable specifications from the current edition of AREMA. Applicable sections may include, but are not limited to, the following:

- Chapter 8 Concrete Structures and Foundations
- Chapter 9 Seismic Design for Railway Structures
- Chapter 15 Steel Structures

Special Considerations

- AREMA recommendations for dampproofing and deck waterproofing.
- Coating of structural steel shall be performed in accordance with AREMA Manual.
- Bridge shall be located to provide optimal Railroad geometry.

Construction Specifications

- Shall be in accordance with AREMA recommendations for fabrication and erection.

- Items not covered by shall be governed by applicable DOT specifications from the Commonwealth, District, Province, or State where the bridge is being constructed.

Non-traditional bridge systems require written notice of acceptance by the Railroad. The proposed use of such a system shall be presented for review with thorough investigation, data, and detailed engineering justification.

Bridge Layout

The general plan drawing of the bridge shall show the Railroad valuation stations at the front face of backwalls, and centerline of piers or bents, along the centerline of the bridge. Distance from front face of low milepost backwall to low milepost nearest the bridge shall also be shown. The following criteria will serve as a guide for labeling the bridge layout.

- Railroad bridges are laid out in direction of increasing milepost, increasing from left to right on plans.
- Plans should denote the Railroad direction and the nearest significant terminal or junction leading away from either end of the bridge.
- For Thru Plate and Truss bridges, the substructures are numbered starting with zero and increasing in the direction of increasing mileposts.
- Superstructures are numbered starting with 1 and increasing in the direction of increasing mileposts.
- Floor systems of thru plate girder, through truss, and deck truss spans are numbered starting with 0 and increasing in the direction of increasing mileposts.
- Bridge components are numbered from left to right facing the direction of increasing milepost.

Low mile post backwall GPS coordinates shall be detailed on plans, in degrees-minutes-seconds, or decimal format with precision to six decimal places.

For bridges on curves, the girders, abutments and piers shall be located with reference to chords.

Clearances

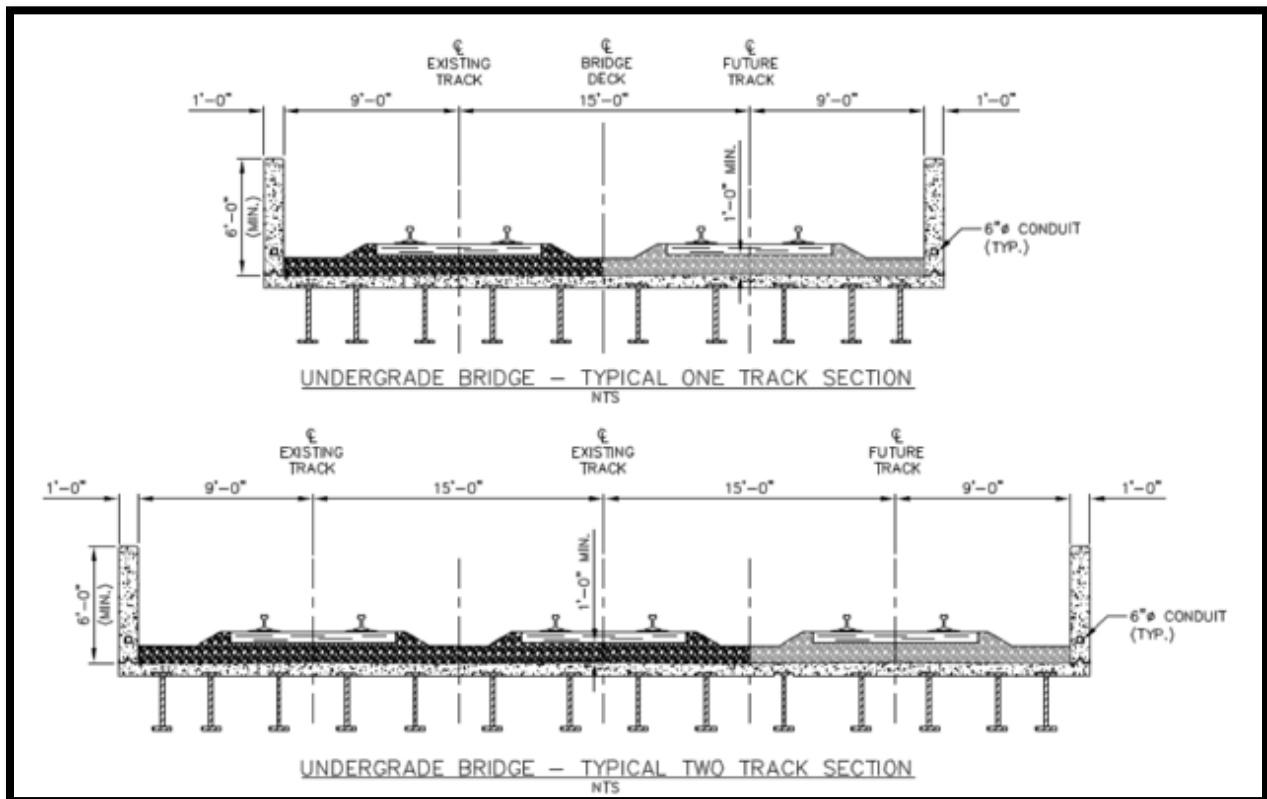
Under Bridge Vehicular Clearances

- Undergrade structures shall be designed to ensure that the structure will be protected from oversized or unauthorized loads by providing sufficient vertical clearance and protective devices. Provide a minimum vertical clearance over the entire roadway width for all new or reconstructed structures as follows:
 - **(16'-6")** for steel superstructure with 5 or more beams or 4 or more deck plate girders per track.
 - **(17'-6")** for steel through plate girders or less than 4 deck plate girders per track with bolted bottom flanges.
 - **(20'-0")** for steel through plate girders or less than 4 deck plate girders per track with welded bottom flanges.

- Vertical clearance must not be violated due to the deflection of the superstructure.
- Roadway profile and design roadway vehicle information shall be provided and considered in vertical clearance design.

Bridge Clearances

- Standard clearances on the bridge shall not be modified without written notice of approval by the Railroad. Any proposed modification shall be furnished with detailed engineering justification for review.
- Commonwealth, District, Provincial, or State clearance laws must not be violated. Legal requirements must be upheld, unless written permission for waiver is provided by the appropriate regulatory authority.
- Adequate clearance and capacity shall be provided for a future track.
- Track centers shall not be closer than (15'-0").
- Minimum horizontal clearance on the bridge shall be provided as shown below:



- Standard clearances are for tangent track and increases must be provided to account for effects from curvature and super elevation.

Design Loads

Railroad bridges shall be designed for all loads specified in AREMA.

Live loads for steel structures shall consider both the **Cooper E-80** loading and the Alternate Live Load with full diesel impact; whichever produces the greater stress. Live loads for concrete structures shall consider **Cooper E-80** loading with full diesel impact.

All bridges shall be designed with non-composite interaction between superstructure and deck. Mechanical connections shall be provided as necessary to satisfy design load requirements.

The weight of the minimum ballast depth one foot (1'-0") plus an additional two feet (2'-0") of ballast below the tie shall be included when computing the dead load of the structure.

Plans and Submittals

Preliminary Plans

- An electronic copy of type, size and location (TS&L) plans shall be submitted to the Railroad for review and acceptance. The TS&L plan shall show plan view, elevation and typical cross section of the proposed structure. Railroad acceptance must be granted before proceeding with design.
- Furnish cross sections showing the AREMA Clearance Envelope, topographic map with contours, and soil exploration data along with TS&L plans. Railroad acceptance must be granted before proceeding with design.
- The Railroad will assign a bridge designation, (Railroad, Region, Subdivision, MP) when TS&L plans are reviewed. This bridge designation shall be shown on all drawings.

Construction Work Plans

- The Railroad may require construction work plans to be submitted, particularly when work is being performed in the proximity of an active track, with Potential to Foul.
- All construction work plans shall be submitted in accordance with the Construction Submission Criteria.

Material Submissions

- Structural steel shop drawings shall be provided for review and acceptance, prior to ordering material. Welding procedures shall be submitted with the structural steel shop drawings.
- Concrete mix designs shall be submitted for review and acceptance, prior to ordering material.
- 3rd party testing reports shall be provided for review and acceptance in a timely manner.
- All other materials shall be provided in accordance with the plans. All materials shall be reviewed and approved by the Agency or its representative. Proposed changes are subject to review and acceptance. Approved material submissions shall be furnished to the Railroad for confirmation and project documentation.

Final Plans

- Provide electronic set of final signed and sealed design plans and calculations for acceptance.
- Submit special provisions or special specifications for acceptance.
- Provide an electronic set of as-built plans to the Railroad upon completion of construction. All Changes shall be noted and clearly called out on a redlined set of as-built plans. All pages shall be clearly marked “AS-BUILT” and include the date of completion.

Construction Considerations

After construction contract is awarded, a copy of the contract shall be provided to the Railroad.

Maintenance of Railroad traffic

- It is essential that the construction be performed with minimum interference to rail traffic. Continuity of safe rail operations will be required for the duration of the project.
- The Agency’s Design Engineer should contact the PPD in the preliminary design stage to determine Railroad operational requirements. The most effective method of maintaining traffic is to temporarily reroute traffic around the construction site using detour tracks. Detour tracks will be required where feasible. If detour tracks cannot be provided, the new superstructure shall be constructed adjacent to final location and rolled into place. Construction plans shall show complete details of temporary bridges and/or roll-in structure.
- A detailed construction procedure for maintaining traffic shall be shown on the plans. When construction requires total interruption of rail traffic, an estimate of the time required will be shown in the procedure. This interval must be within the approved time frame furnished by PPD.
- Prior to the start of construction, written approval from the Railroad for the construction procedure must be secured.

Bridge Decks

Walkways and Parapets

- Deck shall be a uniform ballast pan across all tracks and provide for a ballast walkway between all tracks and on the field side of the exterior tracks. Intermediate curbs shall not be permitted.
- All exterior walkways shall utilize the uniform ballast pan and be equipped with a **72-inch**-tall parapet wall, measured from top surface of bridge deck. Parapet walls should include two each six-inch ducts to accommodate signal and utility needs.
- Walkways and parapets shall be designed to satisfy the requirements specified by AREMA.

Minimum ballast depth shall be one foot (1'-0") measured from top of deck waterproofing to the bottom of tie, at the centerline of the low rail. This dimension shall be clearly labeled on cross section drawings.

On bridges, timber crossties (7" x 9" x 8'6") shall be used, spaced at 19" centers. Alternatively, concrete crossties may be used also at 20" centers or steel crossties may be used at 24" centers.

Track material shall be subject to review by the Railroad at project expense.

Steel Deck Plates

- Steel deck plates shall be shop welded with a pair of **5/16 inch** continuous fillet welds to each floor beam or deck girder. Deck units shall be shop assembled with multiple beams per unit, and areas to be field welded shall be masked and field painted after welding is complete.
- The closing deck plate between adjacent deck units shall be fillet welded to the beams with continuous **5/16-inch** fillet welds at each beam. After deck plates are welded to the beam, fill space between deck plates at joint with material compatible with deck waterproofing membrane.
- The minimum thickness of steel deck plates shall be as follows:

<u>Plate Thickness</u>	<u>Maximum Clear Distance Between Beams</u>
½ inch	1'-6"
5/8 inch	2'-0"
¾ inch	2'-4"

- For multiple deck girders with steel deck plates
 - Provide a welded field splice in the deck plate at, or near the centerline of bearing of the girders. Provide a closing deck plate from the abutments to this field splice that is normal to the girders and normal to the long direction of the main deck plates. This will avoid splicing deck plates over the back wall.
 - Outside girders shall be spaced such that deck plates will not overhang the flange of the outside girders by more than 2 inches and a concrete parapet wall shall be provided. The wall shall be securely anchored to the deck girder and have a minimum width of **12 inches**, at the top.

Concrete Decks

- Bridge deck shall have adequate anchorage to the bridge superstructure. Shear studs shall not be permitted.
- The outside edge of the slab shall be not more than (1'-6") from the centerline of the outside (fascia) girder.
- Provide a drip edge on the outside edge, bottom face of the deck slab.

Deck Drainage & Waterproofing

- Top surface of waterproofing protection shall have a minimum transverse slope of $1/8''$ per foot with a crown at centerline of the deck.
- Top surface of waterproofing protection shall have a minimum longitudinal slope of **0.5%**.
- Concrete decks shall be designed and constructed to provide the required slopes and to direct water to deck drains.
- When the deck is level or slopes less than **0.5%**, underlayment is to be used to provide required slopes.
- Deck drains shall be cast iron and downspouts shall be ductile iron. Deck drains shall have a grate or perforated cover. Downspouts shall be provided with cleanouts at each change in direction.
- All bridge decks shall be waterproofed using membrane waterproofing.
- All deck joints between spans shall be watertight.
- Waterproofing shall be applied to the entire surface of deck and bottom three feet (**3'-0''**) of inside faces of parapets or curb plates. Materials and construction to be in accordance with AREMA, Chapter 8.

Superstructure

All bridges shall be comprised of simple spans. Continuous spans are prohibited, and skewed spans are discouraged.

Design shall provide accommodations for future maintenance. Jacking locations as well as jack sizing shall be specifically denoted and laid out in the bridge plans. Jacks shall be sized to accommodate full dead load including future ballast.

Welded Plate Girders

- A full penetration groove weld shall be used for flange to web connection.
- No more than two flange section transitions will be permitted without special permission.
- When a lateral bracing system is required, as recommended by AREMA, girder connections shall be bolted.
- Jacking stiffeners are required at all end diaphragms. These locations must be specifically called out in the plans.
- Bearing stiffeners shall be welded or milled to bear for both top and bottom flanges.
- All cross frames shall be designed in accordance with AREMA recommendations.

Through Plate Girders

- Through plate girder bridges are only permitted for double track bridges. The use of intermediate girders in double track applications will not be permitted.
- Floor beam brackets (or knee braces) are stiffened diagonal plates which are bolted to the top flange of the floor beams and to vertical stiffeners on the through girder and shall be designed to satisfy AREMA recommendations.
- All stringers shall frame into floor beams.

- End floor beams and connections shall be designed such that the bridge can be jacked up by placing jacks between the end floor beams and pier or abutment. Jacking stiffeners shall be provided at points of jacking.
- Intermediate floor beams shall frame into the girder web using double connection angles and high strength bolts.
- All Stringers shall have top and bottom flanges clipped at an angle not greater than **45 degrees** to permit field removal and installation.

Substructure

Design shall provide accommodations for future maintenance. Jacking locations as well as jack sizing shall be specifically denoted and laid out in the bridge plans.

Abutments and Wing Walls

- Abutment shall be designed in accordance with recommendations of AREMA, Chapter 8.
- The minimum abutment width shall be sufficient to provide for **(15'-0")** track centers, and standard road bed section.
- Wing walls shall be designed to support 2 horizontal to 1 vertical embankment slope as well as a level approach to the bridge walkways. MSE and sheet pile walls are not permissible.
- Provide minimum clearance necessary between end of structural steel and face of backwalls to accommodate expansion, but not less than two inches at each end.
- Provide keyways and water stops at all construction joints. Water stops shall be a hollow bulb **PVC 9" X 3/8" (Bulb 3/4 inch inside diameter, 1½ inch outside diameter)** continuous across joint.
- Two feet of porous backfill, measured horizontally, shall be provided full height below sub ballast, behind all abutments and wing walls.
- Provide adequate drainage behind abutments and wing walls utilizing perforated pipe drains at the base of the abutments and wingwalls. When abutment geometry does not allow for perforated pipe drains, weep holes may be required.
- Non-perforated pipe shall be connected to the perforated pipe and drain away from the bridge with a **1% minimum slope**.

Piers

- Width of pier shall be minimum four feet **(4'-0")** width measured at the bearing seat.

Section 2.06 – Cleaning and Painting of Bridge

Summary

Requests are occasionally made by outside parties for various beautification projects, including painting of overhead and undergrade bridges. These requests are considered on a case-by-case basis by the Railroad. The cost of painting and future aesthetic maintenance will be the responsibility of the project sponsor proposing to paint the bridge.

All work over Railroad property has the potential to impact rail operations. The Railroad will review bridge painting and cleaning projects to ensure environmental and engineering standards are met. This review, flagging protection, and construction monitoring costs will be paid by the project sponsor.

Process

- Project Sponsor engages a public entity, (unless the public entity is the sponsor).
- Sponsor contacts PPD to identify objective.
- Agency/Sponsor and Railroad enter into applicable contracts.
- PPD Assigns GEC to receive and review submittals.
- Agency contractor to request ROE
- Agency/Sponsor indicates number of days on/over/around Railroad property.
- GEC supplies Estimate to Complete to include Flagmen coverage.
- GEC helps to coordinate an onsite Flagmen.
- Project work, (Onsite CEI may be required).
- Site Cleanup.
- Railroad and Agency Signoff.

General

All proposals must comply with Railroad safety, environmental regulations and must not impact Railroad property or operations. The public agency or its designee will be responsible for maintenance of the painted surfaces, including aesthetic damage caused by highway vehicles and vandalism. The Railroad will incur no costs or liabilities as a result of the project.

A written request by the party wishing to undertake such projects should be forwarded to the PPD for handling. The request should include information about the situation and the project objectives to assist with completion of the review. The following information should be included:

- The project sponsor and public agency that will execute appropriate agreements for implementation as well as future maintenance of the painted surfaces.
- Paint specifications, including color of the paint, that meet Railroad standards and methods for surface preparation, cleanup, and paint application.

- Qualifications and experience of the painting contractor. The Railroad will accept state qualified bridge painting contractors working for the responsible agency or company. Containment system clean up and disposal of all paint and other material removed from the bridge. The clean-up and disposal of material from the surface preparation for painting and actual painting must comply with all appropriate regulations.
- The materials removed during the surface preparation must not impact the surrounding area including ground, water, or air. Materials must not be stored on Railroad property.
- Control of paint overspray and vapors during application. The work must be done complying with appropriate regulations and over spray controlled to prevent damage to adjacent property and vehicles in the area.
- Containment system clean up and disposal of all paint and other material removed from the bridge. The clean-up and disposal of material from the surface preparation for painting and actual painting must comply with all appropriate regulations.
- Pictures and conceptual drawing should be submitted with the initial request from the community to simplify the initial review and comment by the Railroad.
- Work site safety plan including keeping all personnel away from the tracks and fall protection measures where required.

Section 2.07 – Quiet Zones

Summary

The Railroad will fully comply with the Train Horn Rules, (as specified by the FRA) which provides requirements for the sounding of locomotive horns when approaching public highway-rail grade crossings. The Rule also provides guidance for conditions under which a public authority with jurisdiction over the roadway crossing Railroad tracks may apply for and establish Quiet Zones. A Quiet Zone is a section of a rail line that contains one or more consecutive public crossings at which locomotive horns are not routinely sounded. (For full details on the rules, please visit the FRA web site at www.fra.dot.gov or contact the FRA's Office of Safety at **202-493-6299**). While it is the complete responsibility of completion of a Quiet Zone analysis and application rests with the public authority, it should be done in conjunction with the Railroad.

Each crossing has a unique DOT inventory identification number posted at the crossing. There is often more than one crossing on the same road. The crossing number (i.e. 654321D) must be used to identify the specific crossing in all communications with the Railroad to reduce possible confusion about the specific location. The Rule clearly defines requirements that must be satisfied by the public authority requesting that a Quiet Zone be established or continued.

Process

- Agency Contacts the FRA on Intent.
- Agency Contacts PPD on Intent.
- Agency/Sponsor issues a Legal Reimbursement Document or PE Agreement.
- PPD assigns GEC.
- GEC will schedule a diagnostic review with Agency/PPD/FRA/State DOT.
 - Please plan out your SSMs and ASMs in the FRA calculator prior to the site review.
- PPD to provide OOM for all SSMs and ASMs dictated by the review.
- Agency works with FRA to establish a Notice of Intent, (NOI).
- Agency mails NOI and FRA Calculator to PPD.
 - Please note that the Estimate for ASMs and SSMs in the Calculator to Not Account for Actual Railroad Expenses, Refer to OOM from PPD.
- All designs of ASMs and SSMs are reviewed by the Railroad at the expense of the Agency.
- All ASMs and SSMs requiring modifications to the Railroad or signal system will be designed by the Railroad at the Agency's expense, (**See Section 2.03**).
- GEC supplies Estimate to Complete, (to include Flagmen coverage if needed).
- Agency issues NTP for Construction with a Legal Reimbursement Document or Construction Agreement.
- Project work is completed, (CEI may be required).
- Railroad Places 'No Horn Signs'.

- Agency and Railroad signoff.
- Agency coordinates with FRA for final review.
- Agency works with FRA on Notice of Establishment, (NOE).
- Agency mails certified copy of NOE to FRA/PPD/and State DOT.
- Railroad complies within timeframe set in the Rule.
- FRA Database is Updated.

ATTACHMENT 3



**CONTRACTOR
SAFETY
RULES**

**Issued to all North American Subsidiaries of
Genesee & Wyoming Inc.**

Effective April 1, 2002
Revised Dec. 31, 2006

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Introduction:

These rules apply to contractors performing maintenance, repair or specialty work on or about railroad property; on other properties the railroad is responsible for and/or on property directly adjacent to the railroad track.

They do not apply to contractors providing incidental services that do not influence safety, such as janitorial services, food & drink services, laundry, or other supply services.

Contractor Responsibilities:

1. All contractor employees must be trained in the work practices necessary to safely perform his or her job.
2. Document that each contractor employee has received and understands the purpose of the Genesee & Wyoming Inc. Contractor Safety Rules.
 - The contractor must prepare a record, which contains the identity of the contractor employee, the date of the training and means used to verify that the employee understood the training.
3. Ensures that each contractor employee follows the railroad's safety rules and procedures.
4. The contractor must advise the railroad of any hazards presented by the contractor's work when they occur.
5. Unless otherwise provided in the contract, the contractor is responsible for restoring ballast, filling holes created when replacing ties and removing all debris generated as a result of the work that is being performed. Permanent or temporary safety precautions must be in place each day prior to the contractor leaving the worksite. These safety precautions are the responsibility of the contractor when providing hazard protection.
6. All applicable transportation department rules apply to contractors when rail cars are involved in the project i.e. (Riding on equipment, 3 Points of Contact, 3 Step Protection, Getting on or off equipment.)
7. All pertinent railroad safety rules and regional procedures must be reviewed prior to the commencement of work on railroad property.
8. All contractor employee injuries and all railroad property damaged by the contractor must be reported to the regional railroad's claims office and the Genesee & Wyoming Inc. claims office located in Rochester, NY at (716) 463-3406. All reports must be completed in accordance to FRA Reporting requirements.

Definitions:

Flagman: An employee designated to direct or restrict the movement of trains at a point on track to provide on-track protection for Roadway Workers. This employee must be qualified on the railroad's operating rules, roadway worker safety; and may not perform any other duties.

Foul Time: A method of establishing working limits through exclusive use of the track in which notification is given and recorded by the train dispatcher or block operator to an employee that no trains will operate within a specific segment of controlled track during a specific time period, and the required blocking devices have been placed on the control machine to protect the track fouled. Foul time must remain in effect until the employee to whom the foul time was issued has reported clear of the track.

Fouling A Track: The location of an individual or equipment in such proximity to a track that the individual or equipment could be struck by a moving train or on-track equipment, or whenever an individual or equipment is within four (4) feet of the field side of the near running rail.

Inaccessible Track: A method of establishing working limits on non-controlled track by preventing access to the working limits.

Lone Worker: An individual employee who is not being afforded On-Track Protection by another employee, who is not a member of a gang, and is not engaged in a common task with another employee.

Restricted Speed: Prepared to stop within one-half the range of vision-short of a train, obstruction, or switch improperly lined. Be on the lookout for broken rail.

Roadway Maintenance Machine: Powered equipment, other than by hand, which is being used on or near the track for maintenance, repair, construction or inspection of track; bridges; roadway; or signal, communication, or electric traction systems. These machines may have road or rail wheels or may be stationary.

Roadway Maintenance Work Train: A train that is being operated within working limits in conjunction with roadway maintenance, construction or repairs, under the direction of a designated employee in charge.

Roadway Worker: An employee, or employee of a contractor whose duties include inspection, construction, maintenance or repair of track, bridges, roadway, signal and communication systems, electric traction systems, roadway facilities or roadway maintenance machinery on or near track with the potential of fouling a track, and flagmen and watchmen affording on track protection.

Track Centers: The distance from the centerline of one track to the centerline of an adjacent track.

Gage: The distance (4 ft. 8 1/2 inches) between track rails.

Clear of Tracks: Minimum clearance of at least four feet outside the rail of all tracks, and not between main tracks.

Blue Flag Protection: A method of providing protection for people who work on, under, or between railroad rolling stock; freight cars, locomotives, etc.

1. Accident/Injury Requirements:

The contractor is required to have an employee qualified to give first aid. If a contractor employee is injured while working on railroad property, he or she should be given first aid at once. Medical assistance should be obtained as soon as possible if further care is needed.

2. Personal Protective Equipment:**a. Safety Footwear:**

- Employees whose duties require them to work on or about tracks or equipment are required to wear leather laced type shoes that cover the entire foot. These shoes must be at least six inches high, and have safety toes, must have a defined heel of not more than 1 ¼ inches in height and must have oil resistant soles.
- Shoes that are excessively worn or, do not provide ankle support, have thin, loose or smooth soles must not be worn.

b. Eye Protection requirements:

- Safety glasses must be worn at all times while on railroad property. Protect your vision by wearing safety eyewear with side shields that are clean and properly fitted.
- If you wear corrective lenses, you must wear either approved prescription safety glasses with side shields or cover-all type goggles over your personal glasses:
- Do not face welding, heating, or grinding operations unless you are wearing appropriate eye protection.
- If you are performing work near electric (arc) welding or cutting operations, wear a welding helmet. If a welding helmet is not available, move a safe distance from the operation.

c. Hearing Protection:

- Wear hearing protection when you are welding, cutting, or exposed to flying sparks from these operations. Sparks from welding or cutting can burn your inner ear.
- Wear hearing protection when working in high noise areas in accordance with the railroad's hearing conservation policy, hereby attached.

d. Respiratory Protection

- Wear respiratory protection when you are exposed to fumes, dust, mist, or vapor.

e. Protective Clothing

- Wear protective gloves and clothing when you are handling or working on a wet cell battery, handling, pouring, or using acids, toxic substances, or solvents or, handling creosote materials.

f. High-visibility Workwear

All contractors are required to wear approved high-visibility workwear when they are on duty or on the Company property. Such high-visibility workwear must be worn as the outermost layer of clothing.

- i. High-visibility workwear must be approved by the Regional Director of Safety and may consist of a vest, coveralls, T-shirt or other clothing of the prescribed color (yellow/green or orange) equipped with reflective striping as follows: a horizontal band around the waist, two vertical bands and/or an "X" on the back, and two vertical bands in front from the waist to the top of the shoulders. Stripes must be of silver or yellow reflective material and be at least 2 inches (5 cm) in width.
- ii. Vests must be properly sized and constructed with tear-away features as approved by the Regional Director of Safety.

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- ii. Vests must be properly sized and constructed with tear-away features as approved by the Regional Director of Safety.

- iii. Defective, damaged or lost workwear must be reported immediately to your supervisor and replaced before reporting for duty.
- iv. Exceptions:
 - (a.) High-visibility workwear is not required when you are in these locations:
 - Lunchroom;
 - Locker room;
 - Inside vehicles;
 - Inside railway passenger cars;
 - Inside locomotive cabs; or
 - Offices.
 - (b.) When employees are working on locomotives or other equipment inside shop buildings, high-visibility workwear is recommended. All employees working outside of shop buildings require approved high-visibility workwear.
 - (c.) Accommodations for unusual conditions will be at the discretion of the Regional Director of Safety.

3. Working On Equipment:

Do not operate or ride on any equipment unless it is in the performance of your duties and you have been properly authorized to do so. Do not jump from equipment, platforms, or other elevated places. Use steps or a ladder.

4. Keep Clear of Suspended Loads or Cables/Chains under tension:

- a. Keep clear of suspended loads.
- b. Stand clear when chains, cables or other tackle in under tension.

5. Keeping Clear of Electrical Wires:

Keep at least 12 feet away from a dangling wire or any object that may be in contact with an electrical current. Keep others away until qualified personnel are notified and take charge.

NOTE: Qualified personnel are employees or contractors who have been trained or qualified to work with electricity.

6. Working With Tools:

- a. Do not modify tools.
- b. Before you use any tool, examine it for defects. Report any defects to your immediate supervisor.
- c. Defective tools must not be used.

7. Working Around On-Track Equipment:

Expect locomotives, cars and track maintenance equipment to move on any track, in either direction, at any time. Therefore, employees must look in both directions before crossing tracks.

8. Avoiding Potential Hazards:

Example: Employees should avoid walking, stepping, resting foot on or sitting on rails, frogs, switches, guardrails, pipe or interlocking apparatus or connections.

9. Crossing Tracks:

Employees must not cross tracks closer than 50 feet from standing locomotives and cars.

10. Working Near Moving Trains:

- a. Employees should never carry objects on their shoulders when they are near moving trains.
- b. Employees should not cross in front of moving trains or equipment.
- c. Placement of Material Near Tracks.
 - Employees should place toolboxes, test equipment and other objects not less than 25 feet from the nearest track. Place all lid apparatus so that lid will open toward track and be secured in place.
 - When performing work near tracks, arrange all tools, material, equipment or other objects so that a moving train or equipment will not strike them.

11. Working Near Standing Railroad Equipment:

Employees should keep themselves and material clear of and never lean against, sit on, or otherwise rest on standing railroad equipment.

12. Working In or Near Tunnels – On Bridges or Trestles:

- a. Employees must move to a safe location when a train or equipment moves past their work location in tunnel or on bridges, trestles or overpasses.
- b. Employees working in tunnels must be protected by railroad watchmen and must occupy safety manholes when a train approaches. Employees must secure loose clothing and maintain handhold if possible until train has passed.
- c. Walking in tunnels or on bridges, trestles and overpasses should be avoided whenever possible.
 - When an employee must walk through a tunnel or across a bridge, trestle or overpass the employee must look both ways and confirm with railroad personnel that they are properly protected and that he or she can safely complete the walk through the tunnel or across the bridge, trestle or overpass before any moving rail equipment passes through the tunnel or over that bridge, trestle or overpass.
 - Extra care must be taken when crossing open floor bridges or trestles.

13. Action to take if Safe Passage of a train is at risk:

If an event occurs that would interfere with the safe passage of trains, the employee must take immediate action to stop trains by radio communication to trains or the person in charge of the track. If protection cannot be immediately ensured, or if communications fail, flag protection must be immediately provided as prescribed by the railroad's rules.

14. Protection When Fouling or Working on a Track:

- a. Trains must be fully protected against any known condition that may interfere with their safe passage.
- b. If work on or adjacent to a track will create a condition interfering with the safe passage of trains, that work must not be attempted without permission of the employee in charge of the track.
- c. On Main Tracks or where Interlocking rules are in effect, protection is required in accordance with railroad operating and safety rules.

15. Returning Track to Service:

When track is to be returned to service, the employee in charge must take the following actions:

- a. Notify the Dispatcher or railroad supervisor responsible for the safety of the track of any restrictions necessary for the safe passage of trains.
- b. Ascertain that all track cars and trains are clear of the track, and notify the Dispatcher or railroad supervisor responsible for the safety of the track that they are clear.
- c. An employee designated by the railroad must inspect the track prior to operating trains.

16. Interlocking Switches within Work Area:

Dispatchers controlling interlocking switches within the Work Area must line such switches for movements within the Work Area and must apply blocking devices to the controls of those switches. These blocking devices must not be removed without permission of the employee in charge of the Work Area. This requirement does not relieve employees operating within the Work Area from complying with interlocking signal indications.

17. Flag Protection is Required When:

- a. Work is being performed by others not hired by railroad and the work is being performed on railroad property or adjacent to railroad right of way.
- b. Work is being performed by entities hired by the railroad and the work is being performed within 25ft from the center the track.

18. Fouling Track

Whenever fouling track, the following procedures will apply:

a. Action Required Prior to Issuance:

Before fouling a track, the employee in charge must determine that no trains have been authorized to move in the direction of the point to be fouled, and must ensure that Stop Signals have been displayed and blocking devices applied by the dispatcher to controls of Switches and signals leading to the affected track to be protected.

b. Permission to Foul a Track:

Permission to foul a track must include the following information:

1. Designation of track to be fouled
2. Location of fouling (mile posts)
3. Time limit for fouling (beginning time and ending time)

Permission must be repeated by the receiving employee and confirmed by the Dispatcher or railroad supervisor responsible for track safety before it is acted upon.

c. Clearing Fouled Track.

1. Stop all equipment and vehicles on the right of way while the train is passing
2. Stay clear until you are notified that it is safe to resume work

19. Safety Precautions: When working in yards and on tracks:

- a. Keep at least 50 feet from passing trains and equipment, if possible. Face the direction from which the train is approaching. Watch for projecting, dragging, or falling objects.
- b. Do not perform work that will interfere with the safe passage of trains.
- c. Inspect all passing trains to detect a dangerous condition.
- d. Cross tracks at least 50 feet from standing locomotives or cars.
- e. Do not cross between cars standing less than 50 ft. apart.
- f. Give hand signals for movement of work train or wreck train only if you are a member of the train crew. EXCEPTION: Emergency stop signals may be given by anyone

20. Employee In Charge:

The employee in charge is responsible for taking charge of the work performed by assembled gangs and arranging protection for the gangs.

The employee in charge is responsible for the safety, instruction, and performance of all employees under his or her jurisdiction.

The employee in charge advises the foremen of the assembled gangs how each of them will protect the safety of the employees under their direction.

The employee in charge is also responsible for:

- a. Ensuring that employees comply with all applicable rules.
 - Take the track out of service, or get verbal permission to temporarily foul the track according to operating rules.
- b. If employees are too scattered to hear the watchman's warning whistle or horn, assign advance (additional) watchmen as needed.
- c. If bad weather limits visibility, use additional protective measures as needed.

21. Watchmen:Responsibilities:

The employee in charge assigns watchmen to watch for approaching trains and warn employees to clear the tracks. If a watchman has not been assigned, the employee in charge acts as a watchman.

Follow these precautions if you have been assigned as a watchman:

- a. Give your full attention to watching for trains and warning employees.
- b. Do not perform any other duties, even momentarily.
- c. If you do not have a full view of trains approaching in either direction, or if you cannot give your full attention to your duties as watchman, signal employees to clear the tracks.
- d. Do not leave your station until the employee in charge determines that protection is no longer necessary, or the employee in charge has assigned another watchman who is in position and watching for approaching trains.

Watchman Duties:

Watchmen are responsible for watching for approaching trains and signaling employees to clear the tracks. If a watchman has not been assigned, the employee in charge acts as a watchman. A watchman's duty is to watch. Follow these procedures when you are performing the duties of a watchman:

When a train approaches from either direction, warn employees in time for them to clear track at least 15 seconds before the train approaches the point of work.

NOTE: You may need to give additional warnings around noisy operations.
Example: Sounding a whistle or blowing a horn.

22. Clearing Controlled Track:

Follow this procedure for clearing on a Controlled Track, which is any track shown in the timetable as being under the control of a Dispatcher or Block Operator.

- a. Clear all tracks, if possible, keeping at least 50 feet from passing trains and equipment.
- b. If you cannot clear all tracks;
 - Clear the track on which the train is approaching and the adjacent tracks.
 - Watch for trains in both directions and determine the track on which other trains will approach. Clear enough tracks so that you will not be trapped.
- c. If you are operating equipment within the gage of the track adjacent to the track being cleared, dismount the equipment and clear the track.

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The employee in charge assigns watchmen to watch for approaching trains and warn employees to clear the tracks. If a watchman has not been assigned, the employee in charge acts as a watchman.

Follow these precautions if you have been assigned as a watchman:

- a. Give your full attention to watching for trains and warning employees.
- b. Do not perform any other duties, even momentarily.
- c. If you do not have a full view of trains approaching in either direction, or if you cannot give your full attention to your duties as watchman, signal employees to clear the tracks.
- d. Do not leave your station until the employee in charge determines that protection is no longer necessary, or the employee in charge has assigned another watchman who is in position and watching for approaching trains.

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NOTE: You may need to give additional warnings around noisy operations.
Example: Sounding a whistle or blowing a horn.

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Follow this procedure for clearing on a Controlled Track, which is any track shown in the timetable as being under the control of a Dispatcher or Block Operator.

- a. Clear all tracks, if possible, keeping at least 50 feet from passing trains and equipment.
- b. If you cannot clear all tracks;
 - Clear the track on which the train is approaching and the adjacent tracks.
 - Watch for trains in both directions and determine the track on which other trains will approach. Clear enough tracks so that you will not be trapped.
- c. If you are operating equipment within the gage of the track adjacent to the track being cleared, dismount the equipment and clear the track.

23. Working On Non-Controlled Industrial and Yard Tracks

Follow these procedures when working on and clearing Non-Controlled Track (Industrial, Yard, or any other track not controlled by a Dispatcher:

Make the working limits inaccessible to trains, engines or other on track equipment using one of the following procedures:

1. A switch lined and effectively secured in one of the following ways:
 - With a private lock on switches that will accommodate them.
 - Properly secured switch point clamp.
 - Driven spikes or wedges that require special tools to remove them.
2. Portable derail with flag.

24. Working Around Self Propelled Equipment:

Follow these safety precautions when working on or around self-propelled equipment:

- a. Use the handrail when getting on, riding on, and getting off equipment. Maintain three points of contact.
- b. Do not get on or off moving equipment.
- c. When working near or observing equipment:
 1. Perform a Job Safety Briefing and communicate with the operator of the equipment to cover the following:
 - Operating procedures.
 - Location of employees working around equipment.
 - Operator blind spots.
 - Signal to warn that equipment will move.
 2. When your duties require you to be around the equipment, you must maintain a 50-foot safe area from the equipment.
 3. If your duties require you to be within the 50-foot safe area of the equipment, perform those duties from the location established in your communication with the operator.

25. Roadway Maintenance Machine Operators

Follow these precautions when operating self propelled equipment:

- a. Communicate with employees in the vicinity of the equipment and cover;
 - Normal operating procedures including operator's blind spots.
 - Test the brakes immediately after starting.
 - Do not allow anyone to distract you or interfere with your duties.
 - Constantly look out for obstructions or unsafe conditions in the direction you are moving.
 - If you cannot see ahead or behind, designate another employee to keep a lookout for you.

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NOTICE TO CONTRACTOR – RAILROAD SPECIFICATIONS

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

NOTICE TO CONTRACTOR – RAILROAD SAFETY ORIENTATION TRAINING

The Contractor is hereby alerted that part of the work being done as part of this contract, that all individuals, including representatives and employees of the Contractor as well as any subcontractor(s) working for the Contractor, before entering onto railroad property or coming within twenty-five (25) feet of the centerline of track shall first complete **Genesee & Wyoming Roadway Worker Protection Training for Railroad Contractors** web-based training.

The Contractor shall contact the Railroad's authorized representative for information concerning Genesee & Wyoming's safety orientation training:

Roadway Worker Training, LLC 315 West Town Place
Suite 8
St. Augustine, FL 32092

Telephone: (904) 296-8088
Toll Free: (866) 479-8462
Web Site: <https://www.rrtrainers.com/>

Any cost incurred by the Contractor pertaining to the safety orientation training is non-reimbursable by the State of Connecticut.

NOTICE TO CONTRACTOR – TEMPORARY PERMIT TO ENTER UPON RAILROAD PROPERTY

The Contractor is hereby alerted that any entry or construction activities on railroad right-of-way being performed as part of this contract must be authorized by the Railroad, Genesee & Wyoming Inc. (G&W) in writing. Written authorization is obtained through a Right of Entry Permit or Contractor Occupancy/Access Agreement. The application is accessible via the link provide below:

https://gwrr.com/real_estate/accessing_property

It should be noted that “standard processing” of the application to gain temporary access upon railroad right-of-way takes approximately six to eight weeks.

The Contractor shall contact the Railroad’s authorized representative to negotiate G&W’s compensation for the preparation of the temporary permit:

Ms. Donna Killingsworth, MBA Real Estate Manager
Genesee & Wyoming Railroad Services, Inc. 13901 Sutton Park Drive
Suite 160
Jacksonville, FL 32224

Telephone: (904) 900-6286
Email: donna.killingsworth@gwrr.com

Any cost incurred by the Contractor as a result of obtaining a temporary permit to enter upon railroad right-of-way is non-reimbursable by the State of Connecticut.

Once written authorization has been obtained, the Contractor must notify G&W in writing the date(s) when work is to commence on the railroad right-of-way. Such notice must be received by G&W at least ten (10) business days in advance of the proposed work. If the terms of the temporary permit require that flagging protection by the Railroad be provided, such notice shall be submitted at least thirty (30) business days in advance of the proposed work.

The Contractor shall contact the Railroad’s authorized representative to schedule flagging services:

Mr. Chad Boutet Director, Structures
Providence & Worcester Railroad Company 75 Hammond Street
Worcester, MA 01610-1729

Office: (508) 755-4000, Ext. 252
Mobile: (774) 634-9200
Email: Chad.Boutet@gwrr.com

**NOTICE TO CONTRACTOR – TRAFFIC OPERATIONS OVER
RAILROAD-HIGHWAY GRADE CROSSING**

The Contractor will not be allowed to queue traffic over the railroad crossing at any point during the construction of the project. If, due to the nature of the Contractor's operations, queuing is unavoidable, the Contractor shall utilize the Railroad's flagging services to ensure that vehicles are kept clear of the crossing area. Subject to the approval of the Railroad and Engineer, Uniformed Flaggers and/or Police Officers, Town or State, may be used in lieu of railroad flaggers.

The Contractor shall coordinate its work with the Railroad's authorized representative:

Mr. Chad Boutet
Director, Structures
Providence & Worcester Railroad Company 75 Hammond Street
Worcester, MA 01610-1729
Office: (508) 755-4000, Ext. 252
Mobile: (774) 634-9200
Email: Chad.Boutet@gwrr.com

NOTICE TO CONTRACTOR – HAZARDOUS MATERIALS INVESTIGATIONS

A limited hazardous materials site investigation has been conducted at Bridge No. 00524, Arrigoni Bridge in Middletown, Connecticut. The scope of inspection was limited to the representative components projected for impact.

Results of the survey identified no detectable levels of lead in the painted structural steel/metal bridge components of Bridge No. 00524. Lead paint was identified on the 3' concrete posts associated with the railing system on the east side of the bridge.

Since no detectable amounts of lead in paint were identified on the structural steel/metal bridge components, any paint waste generated would be characterized as non-hazardous, non-RCRA waste. Results obtained from TCLP waste stream sampling and analysis for leachable lead from the paint on the concrete posts characterized the paint waste stream as non-hazardous, non-RCRA waste.

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

At Bridge No. 00524, various caulks on the bridge were sampled and found to contain no asbestos.

Potential Universal Waste (UW) and Connecticut Regulated Waste (CRW) light fixtures associated with roadway luminaires, the navigation light system and aviation light system were identified at the bridge.

No bird/pigeon guano accumulations or bloodborne pathogens (BBP) concerns were observed in accessible areas of the bridge.

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

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

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

- Item No. 0020903A – Lead Compliance for Miscellaneous Exterior Tasks
- Item No. 0101143A – Handling & Disposal of Regulated Items

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 electronically.

- HazMat Inspection Letter, Bridge No. 00524, Arrigoni Bridge, Middletown, CT, TRC Environmental Corporation, January 3, 2019.

NOTICE TO CONTRACTOR – QUALITY CONTROL PROGRAM

ITEM #0969053A CONTRACTOR QUALITY CONTROL PROGRAM LEVEL 2

This Contract includes the above-noted item and special provision for Contractor Quality Control Program, developed to supplement Article 1.05.03 of the standard specifications.

A minimum lump sum bid amount is included within the special provision.

The Contractor must be aware that the special provision requires that a Quality Control Manager (QCM) be proposed to the Department within thirty (30) days after Contract Award and that the written QC Program be submitted to the Department within forty-five (45) days after Contract Award.

The Contractor must also be aware of the staffing, inspection, reporting and all other requirements of the special provision.

NOTICE TO CONTRACTOR – EXISTING IMS

The Contractor is herein made aware of existing Incident Management System (IMS) conduit and appurtenances lashed on the Westbound side of the Arrigoni Bridge 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) 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 – PROPRIETARY ITEMS

The Contractor is hereby notified that the following items shall be furnished by the specific manufacturer:

<u>Item No.</u>	<u>Item Description</u>	<u>Manufacturer</u>
1113618A	Optical Fiber Cable, Single Mode, Loose Buffer Tube Cable, 36 Fiber	Corning Incorporated

NOTICE TO CONTRACTOR – ALL-INCLUSIVE DRAINAGE

ADDED SECTIONS:

2.86 – DRAINAGE TRENCH EXCAVATION

ROCK IN DRAINAGE TRENCH EXCAVATION

5.86 – CATCH BASINS, MANHOLES AND DROP INLETS

6.86 – DRAINAGE PIPES

DRAINAGE PIPE ENDS

This Contract contains the above-noted Special Provisions for all-inclusive drainage, developed to replace the following Sections in their entireties:

- Section 5.07 – *Catch Basins, Manholes and Drop Inlets*
- Section 6.51 – *Culverts*
- Section 6.52 – *Culvert Ends*

The Section 5.86 and 6.86 items include excavation and bedding material in the drainage structure, pipe and pipe end unit prices.

Section 2.05 *Trench Excavation* may be included for miscellaneous trenching, where necessary, but will not be used with all-inclusive drainage items.

Other Standard Specifications, Supplemental Specifications or Special Provisions may contain references to Articles or Subarticles from previous versions of Sections 5.07, 6.51 and 6.52 which are no longer valid.

The following Standard Specifications Sections or Supplements contain references to Articles or Subarticles from Section 2.05 which shall remain in effect:

- Section 2.06 – *Ditch Excavation*
- Section 5.06 – *Retaining Walls, Endwalls and Steps*
- Section 7.51 – *Underdrains and Outlets*
- Section 10.01 – *Trenching and Backfilling*

‘Rock in Drainage Trench Excavation’ is now defined in Section 2.86. ‘Rock in Trench Excavation’ will remain in Section 2.05 and may be used with trenching not associated with all-inclusive drainage items.

Any references to Articles beginning with “5.07,” “6.51,” or “6.52” shall refer to the pertinent topic or materials in the new Special Provisions contained herein.

NOTICE TO CONTRACTOR – MINIMUM CONCRETE COMPRESSIVE STRENGTH

The concrete strength or allowable design stress specified in the General Notes is for design purposes only. The minimum compressive strength of concrete in constructed components shall comply with the requirements of Section 6.01 Concrete for Structures.

NOTICE TO CONTRACTOR – SPECIAL EVENTS

The Contractor is hereby notified that the Travelers Golf Tournament is generally scheduled during the third week of June. The golf tournament is held at TPC River Highlands located at 1 Golf Club Road, Cromwell, CT.

The Contractor must ensure that there are no temporary lane closures on any of the routes leading to and from the TPC in Cromwell during the tournament week. Nighttime lane closures in the greater Hartford area should be reviewed on a case by case basis and only be allowed if there is no impact to the tournament attendees.

The information contained in this specification should also be followed for all years the tournament is held throughout construction.

NOTICE TO CONTRACTOR – ENERGIZED POWER LINES

The Contractor is hereby notified that Eversource has aerial facilities near Pier 6 that the Contractor needs to be aware of. These electrical lines will not be deenergized during work. The Contractor cannot operate equipment within 10' of these lines. The Contractor shall plan his work accordingly.

NOTICE TO CONTRACTOR - PORTLAND CEMENT CONCRETE (PCC) MIX CLASSIFICATIONS

SECTIONS 6.01 and M.03 MIX CLASSIFICATION EQUIVALENCY

Sections 6.01 *Concrete for Structures* and M.03 *Portland Cement Concrete* are herein revised to reflect changes to item names and nomenclature for standard Portland Cement Concrete (PCC) mix classifications. Other Special Provisions, standard specifications, plan sheets and select pay items in this Contract may not reflect this change. Refer to the Concrete Mix Classification Equivalency Table below to associate the Concrete Mix Classifications with Former Mix Classifications that may be present elsewhere in the Contract.

Concrete Mix Classification Equivalency Table

New Mix Classification (Class PCCXXXYZ ¹)	Former Mix Classification
Class PCC03340	Class "A"
Class PCC03360	Class "C"
Class PCC04460 ²	Class "F"
Class PCC04462 ²	High Performance Concrete
Class PCC04481, PCC05581	Class "S"

Table Notes:

1. See Table M.03.02-1, Standard Portland Cement Concrete Mixes, for the new Mix Classification naming convention.
2. Class PCC04462 (low permeability concrete) is to be used for the following cast-in-place bridge components: decks, bridge sidewalks, and bridge parapets.

Where called for in the Contract, **Low Permeability Concrete** shall be used, as specified in Sections 6.01 and M.03. Please pay special attention to the requirements for Class PCC04462, including:

- Submittal of a mix design developed by the Contractor and a concrete supplier **at least 90 days prior to placing the concrete**
- Testing and trial placement of the concrete mix to be developed and discussed with the Department

The Department will not consider any requests for change to eliminate the use of Low Permeability Concrete on this Project.

NOTICE TO CONTRACTOR – ARCHITECTURAL AND INDUSTRIAL MAINTENANCE COATINGS

This Contract includes the application of materials subject to the Volatile Organic Compounds (VOC) content limits stated in the Regulations of Connecticut State Agencies (RCSA) Sections 22a-174-41 and -41a. All architectural and industrial maintenance (AIM) coatings and applications of such coatings must comply with these regulations.

The Contractor shall submit a Material Safety Data Sheet/Safety Data Sheet or Product Technical Data Sheet developed by the manufacturer of each material that may be subject to the Regulations. The submittal must verify both the type of AIM and its VOC Content. VOC content shall be determined based on the formulation data supplied by the materials manufacturer.

The Contractor may only use AIM coatings that contain VOCs below the respective coating category Phase II limits specified in Table 1 if either:

- a) the coating was manufactured on or after May 1, 2018, **or**
- b) the coating is being applied after April 30, 2021.

The Contractor may use AIM coatings that contain VOCs exceeding the respective coating category Phase II limits specified in Table 1 only if all of the following four conditions are met:

- a) the coating is being applied on or before April 30, 2021,
- b) the coating contains VOCs below the applicable Phase I limits specified in Table 1,
- c) the coating was manufactured prior to May 1, 2018, **and**
- d) the coating container(s) are dated (or date coded) as such.

For any coating that is not categorized within Table 1, the Contractor shall classify the coating as follows and apply corresponding limits in Table 1.

- Registers gloss <15 on an 85-degree meter or <5 on a 60-degree meter) – Flat Coating,
- Registers gloss of ≥ 15 on an 85-degree meter and ≥ 5 on a 60-degree meter) - Nonflat Coating,
- Registers gloss of ≥ 70 on a 60-degree meter - Nonflat-High Gloss Coating.

The Contractor must close all containers of coating and solvent when not in use.

Coating container labels must display the date the coating was manufactured, the manufacturer's recommendation regarding thinning with solvent, and the coating's VOC content in grams per liter (g/L) of coating. Certain coating categories as noted in Table 1 have additional labeling requirements.

The Contractor may add additional solvent to a coating only if such addition does not cause the coating to exceed the applicable VOC limit specified Table 1. The Contractor must adhere to type(s) of solvent and maximum amount of solvent recommended by coating manufacturer. VOC content of a thinned coating shall be the VOC content as listed by the manufacturer after thinning in accordance with its recommendation.

TABLE 1		
Coating Category	Phase I	Phase II
	manufactured prior to May 1, 2018 VOC content limit (g/L)	manufactured on or after May 1, 2018 VOC content limit (g/L)
Aluminum roof coating	--- ¹	450
Antenna coating	530	--- ¹
Antifouling coating	400	--- ¹
Basement specialty coating	--- ¹	400
Bituminous roof coating	300	270
Bituminous roof primer	350	350
Bond breaker	350	350
Calcimine recoater	475	475
Clear wood coating - Clear brushing lacquer²	680	275
Clear wood coating - Lacquer^{2,3}	550	275
Clear wood coating - Sanding sealer^{2,4}	350	275
Clear wood coating - Varnish²	350	275
Concrete curing compound	350	350
Concrete or masonry sealer/ Waterproofing concrete or masonry sealer	400	100
Concrete surface retarder	780	780
Conjugated oil varnish	--- ¹	450
Conversion varnish	725	725
Driveway sealer	--- ¹	50
Dry fog coating	400	150
Faux finishing coating²	350	350
Fire resistive coating	350	350
Fire retardant coating - Clear	650	--- ¹
Fire retardant coating - Opaque	350	--- ¹
Flat coating	100	50
Floor coating	250	100
Flow coating	420	--- ¹
Form-release compound	250	250
Graphic arts coating (sign paint)	500	500
High temperature coating	420	420
Impacted immersion coating	780	780
Industrial maintenance coating²	340	250
Industrial maintenance coating	340	250
Low solids coating	120	120
Magnesite cement coating	450	450
Mastic texture coating	300	100
Metallic pigmented coating	500	500
Multi-color coating	250	250

TABLE 1		
Coating Category	Phase I	Phase II
	manufactured prior to May 1, 2018 VOC content limit (g/L)	manufactured on or after May 1, 2018 VOC content limit (g/L)
Nonflat coating	150	100
Nonflat high gloss coating²	250	150
Nuclear coating	450	450
Pre-treatment wash primer	420	420
Primer, sealer and undercoater	200	100
Quick-dry enamel	250	--- ¹
Quick-dry primer, sealer and undercoater	200	--- ¹
Reactive penetrating carbonate stone sealer²	--- ¹	500
Reactive penetrating sealer²	--- ¹	350
Recycled coating	250	250
Roof coating	250	250
Rust preventive coating²	400	250
Shellac Clear	730	730
Shellac Opaque	550	550
Specialty primer, sealer and undercoater²	350	100
Stain	250	250
Stone consolidant²	--- ¹	450
Swimming pool coating	340	340
Thermoplastic rubber coating and mastic	550	550
Traffic marking coating	150	100
Traffic marking coating	150	100
Tub and tile refinish	--- ¹	420
Waterproofing membrane	--- ¹	250
Waterproofing sealer	250	--- ¹
Wood coating²	--- ¹	275
Wood preservative	350	350
Zinc-rich primer²	--- ¹	340

1 Classify as follows and apply corresponding limits in Table 1.

- Registers gloss <15 on an 85-degree meter or <5 on a 60-degree meter) – Flat Coating,
- Registers gloss of ≥15 on an 85-degree meter and ≥5 on a 60-degree meter) – Nonflat Coating
- Registers gloss of ≥70 on a 60-degree meter – Nonflat-High Gloss Coating

2 Container must be appropriately labeled. See RCSA 22a-174-41a

3 “Clear Wood Coating – Lacquer” includes lacquer sanding sealer

4 “Clear Wood Coating - Sanding Sealer” does not include lacquer sanding sealer

-END-

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 1.03.08 - Notice to Proceed and Commencement of Work:

Change the first paragraph to read as follows:

"The Contractor shall 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 45 calendar days after the date of the execution of the Contract by the Department".

SECTION 1.05 – CONTROL OF THE WORK

Replace Article 1.05.02 with the following:

1.05.02—Contractor Submittals, Working Drawings, Shop Drawings, Product Data, Submittal Preparation and Processing - Review Timeframes, Department’s Action:

1. Contractor Submittals: The plans provided by the Department show the details necessary to give a comprehensive idea of the construction contemplated under the Contract. The plans will generally show the location, character, dimensions, and details necessary to complete the Project. If the plans do not show complete details, they will show the necessary dimensions and details, which when used along with the other Contract documents, will enable the Contractor to prepare working drawings, shop drawings or product data necessary to complete the Project.

The Contractor shall prepare submittals as Portable Document Format (PDF) files. The Contractor is also required to acquire, maintain access and use the Department’s document management system for delivery of submittals. The format, digital signing requirements, delivery processes and document tracking procedures shall be performed in accordance with this specification and the [Contractor’s Digital Submission Manual](#) (CDSM).

The submittals shall be sent to the Department’s reviewer(s), sufficiently in advance of the work detailed, to allow for their review in accordance with the review periods as specified herein (including any necessary revisions, resubmittal, and final review), and acquisition of materials, without causing a delay of the Project.

Working drawings for permanent construction, shop drawings and product data shall be submitted to the lead designer on record for that discipline. Each submittal shall be sent directly to the design contact (listed below) for the subject item. Refer to the detail estimate sheet to identify the appropriate discipline for each item.

Discipline	Submitted to:	Distribution List (CC)	
Highway (Lead Designer)	Mr. Stephen D. Hall P.E. Transportation Engineer Connecticut Department of Transportation Bureau of Engineering and Construction 2800 Berlin Turnpike P.O. Box 317546 Newington, Connecticut 06131-7546 Stephen.Hall@ct.gov	Joseph Jazwicz District Construction Project Engineer (CE) Inspector (CE)	Joseph.Jazwicz@ct.gov DOT.ConstrD1@ct.gov

<p>Landscape</p>	<p>Mr. Matthew F. Verry Transportation Landscape Designer Connecticut Department of Transportation Bureau of Engineering and Construction 2800 Berlin Turnpike P.O. Box 317546 Newington, Connecticut 06131-7546 Matthew.Verry@ct.gov</p>	<p>Stephen Hall Joseph Jazwicz District Construction Project Engineer (CE) Inspector (CE)</p>	<p>Stephen.Hall@ct.gov Joseph.Jazwicz@ct.gov DOT.ConstrD1@ct.gov</p>
<p>Traffic</p>	<p>Mr. Brett M. Stoeffler Transportation Engineer Connecticut Department of Transportation Bureau of Engineering and Construction 2800 Berlin Turnpike P.O. Box 317546 Newington, Connecticut 06131-7546 Brett.Stoeffler@ct.gov</p>	<p>Kevin McKernan Stephen Hall Joseph Jazwicz District Construction Project Engineer (CE) Inspector (CE)</p>	<p>Kevin.McKernan@ct.gov Stephen.Hall@ct.gov Joseph.Jazwicz@ct.gov DOT.ConstrD1@ct.gov</p>
<p>Traffic Electrical</p>	<p>Mr. Jesus M. Rodriguez Transportation Engineer Connecticut Department of Transportation Bureau of Engineering and Construction 2800 Berlin Turnpike P.O. Box 317546 Newington, Connecticut 06131-7546 Jesus.Rodriguez@ct.gov</p>	<p>Stephen Hall Joseph Jazwicz District Construction Project Engineer (CE) Inspector (CE) Traffic Electrical</p>	<p>Stephen.Hall@ct.gov Joseph.Jazwicz@ct.gov DOT.ConstrD1@ct.gov DOT.TrafficElectrical@ct.gov</p>

Discipline	Submitted to:	Distribution List (CC)	
Structures	Mr. Bryan H. Reed P.E. Transportation Engineer Connecticut Department of Transportation Bureau of Engineering and Construction 2800 Berlin Turnpike P.O. Box 317546 Newington, Connecticut 06131-7546 Bryan.Reed@ct.gov	Michael Lajoie Stephen Hall Joseph Jazwicz District Construction Project Engineer (CE) Inspector (CE)	Micheal.JP.Lajoie@ct.gov Stephen.Hall@ct.gov Joseph.Jazwicz@ct.gov DOT.ConstrD1@ct.gov
Illumination	Mr. Jon Andrews Transportation Engineer Connecticut Department of Transportation Bureau of Engineering and Construction 2800 Berlin Turnpike P.O. Box 317546 Newington, Connecticut 06131-7546 Jon.Andrews@ct.gov	Mark Bear Stephen Hall Joseph Jazwicz District Construction Project Engineer (CE) Inspector (CE)	Mark.Bear@ct.gov Stephen.Hall@ct.gov Joseph.Jazwicz@ct.gov DOT.ConstrD1@ct.gov

2. Working Drawings: When required by the Contract or when ordered to do so by the Engineer, the Contractor shall prepare and submit the working drawings, signed, sealed and dated by a qualified Professional Engineer licensed to practice in the State of Connecticut, for review. The drawings shall be delivered sufficiently in advance of the work detailed, to allow for their review in accordance with the review periods specified herein (including any necessary revisions, resubmittal, and final review).

There will be no direct payment for furnishing any working drawings, procedures or supporting calculations, but the cost thereof shall be considered as included in the general cost of the work.

a. Working Drawings for Permanent Construction: The Contractor shall supply to the Assistant District Engineer a certificate of insurance in accordance with 1.03.07 at the time that the working drawings for the Project are submitted.

The Contractor's designer, who prepares the working drawings, shall secure and maintain at no direct cost to the State a Professional Liability Insurance Policy for errors and omissions in the minimum amount of \$2,000,000 per error or omission. The Contractor's designer may elect to obtain a policy containing a maximum \$250,000 deductible clause, but if the Contractor's designer should obtain a policy containing such a clause, they shall be liable to the extent of at least the deductible amount. The Contractor's designer shall obtain the appropriate and proper

endorsement of its Professional Liability Policy to cover the indemnification clause in this Contract, as the same relates to negligent acts, errors or omissions in the Project work performed by them. The Contractor's designer shall continue this liability insurance coverage for a period of

- (i) 3 years from the date of acceptance of the work by the Engineer, as evidenced by a State of Connecticut, Department of Transportation form entitled "Certificate of Acceptance of Work," issued to the Contractor; or
- (ii) 3 years after the termination of the Contract, whichever is earlier, subject to the continued commercial availability of such insurance.

b. Working Drawings for Temporary Construction: The Contractor shall submit drawings, calculations, procedures and other supporting data to the Assistant District Engineer.

3. Shop Drawings: When required by the Contract, or when ordered to do so by the Engineer, the Contractor shall prepare and deliver shop drawings to the Designer for review. Review timeframes and submission locations are as specified herein.

There will be no direct payment for furnishing any shop drawings, but the cost thereof shall be considered as included in the general cost of the work.

4. Product Data: When required by the Contract, or when ordered to do so by the Engineer, the Contractor shall prepare and deliver product data.

The Contractor shall submit the product data in a single submittal for each element or group of elements of construction.

The Contractor shall mark each copy of the product data submittal to show applicable choices and options. Where product data includes information on several products that are not required, copies shall be marked to indicate the applicable information. Product data shall include the following information and confirmation of conformance with the Contract to the extent applicable: manufacturer's printed recommendations, compliance with recognized trade association standards, compliance with recognized testing agency standards, application of testing agency labels and seals, notation of coordination requirements, Contract item number, and any other information required by the individual Contract provisions.

There will be no direct payment for furnishing any product data, but the cost thereof shall be considered as included in the general cost of the work.

5. Submittal Preparation and Processing – Review Timeframes: The Contractor shall allow 30 calendar days for submittal review by the Department, from the date receipt is acknowledged by the Department's reviewer. For any submittals marked with "Revise and Resubmit" or "Rejected," the Department is allowed an additional 20 calendar days for review of any resubmissions.

An extension of Contract time will not be authorized due to the Contractor's failure to transmit

submittals sufficiently in advance of the work to permit processing.

The furnishing of shop drawings, working drawings or product data, or any comments or suggestions by the Designer or Engineer concerning shop drawings, working drawings or product data, shall not relieve the Contractor of any of its responsibility for claims by the State or by third parties, as per 1.07.10.

The furnishing of the shop drawings, working drawings and product data shall not serve to relieve the Contractor of any part of its responsibility for the safety or the successful completion of the Project construction.

- 6. Department's Action:** The Designer or Engineer will review each submittal, mark each with a self-explanatory action stamp, and return the stamped submittal promptly to the Contractor. The Contractor shall not proceed with the part of the Project covered by the submittal until the submittal is marked "No Exceptions Noted" or "Exceptions as Noted" by the Designer or Engineer. The Contractor shall retain sole responsibility for compliance with all Contract requirements. The stamp will be marked as follows to indicate the action taken:
- a. If submittals are marked "No Exceptions Noted," the Designer or Engineer has not observed any statement or feature that appears to deviate from the Contract requirements. This disposition is contingent on being able to execute any manufacturer's written warranty in compliance with the Contract provisions.
 - b. If submittals are marked "Exceptions as Noted" the considerations or changes noted by the Department's Action are necessary for the submittal to comply with Contract requirements. The Contractor shall review the required changes and inform the Designer or Engineer if they feel the changes violate a provision of the Contract or would lessen the warranty coverage.
 - c. If submittals are marked "Revise and Resubmit," the Contractor shall revise the submittals to address the deficiencies or provide additional information as noted by the Designer or Engineer. The Contractor shall allow an additional review period as specified in 1.05.02-5.
 - d. If submittals are marked "Rejected," the Contractor shall prepare and submit a new submittal in accordance with the Designer's or Engineer's notations. The resubmissions require an additional review and determination by the Designer or Engineer. The Contractor shall allow an additional review period as specified in 1.05.02-5.

7. Painting Methods and Ornamental Features – Middletown: All painting methods and ornamental features of traffic signal equipment must be submitted to the following representative for the City of Middletown for approval.

Tom Nigosanti
 Middletown Public Works – Engineering Division
 245 deKovan Drive
 Middletown, Connecticut 06457
 (860) 638-4850
Tom.Nigosanti@MiddletownCT.Gov

Once all submittals have been approved and stamped by the City, the contractor shall upload a copy of the approved documents to the Department's document management system.

SECTION 1.06 – CONTROL OF MATERIALS

Article 1.06.01 - Source of Supply and Quality:

Add the following:

Traffic Signal Items:

For the following items the contractor shall submit a complete description of the item, shop drawings, product data sheets and other descriptive literature which completely illustrates such items presented for formal review. Such review shall not change the requirements for a certified test report and materials certificate as may be called for. All documents shall be grouped into one separate file for each group of items as indicated by the Roman numerals below (for example, one pdf file for all of the pedestal items). The documents for all of the items in the discipline shall be submitted at one time to the appropriate contact (noted in Section 1.05), unless otherwise allowed by the engineer.

- I. 10080XX – Rigid Metal Conduit
- II. 11020XX – Aluminum Pedestals
- III. 1102048A – Ornamental Aluminum Pedestal
- IV. 11050XXA – Traffic Signals, Span Mounted - LEDs, Housings and Hardware
11051XXA – Traffic Signals, Mast Arm Mounted - LEDs, Housings and Hardware
- V. 11060XXA – Pedestrian Signals - LEDs, Housings, and Hardware
11070XXA – Accessible Pedestrian Signal & Detector - Button, Housings & Sign (Type)
- VI. 1108115A – Full Actuated Controller, 8-Phase – Cabinet and Components
- VII. 11XXXXXA – Optical Pre-Emption - Emitter, Detector, Phase Selector and Chassis
1114201A – Auxiliary Equipment Cabinet
- VIII. 1111600A – Extension Bracket
11122XXA – Vehicle Detection - Camera Assembly, Processor and Monitor
- IX. 111339XA – Cable closure (Type)
- X. 1113XXXXA – Cable - Control Cable, Comm., CAT6, VC, Detector Cable (optical)

Illumination Items:

For the following materials the Contractor shall submit a complete description of the item consisting of the latest manufacturer shop drawing(s) which completely illustrates the material presented for formal approval. The submitted shop drawing(s) shall clearly call-out all material

and operational properties for the item specific to the project. Such approval shall not change the requirements for a certified test report and materials certificate as may be called for.

Light Standards	Precast Foundation
Conductors	Service Items
Luminaires	Temporary Illumination Unit
Conduit	Aerial Cable
Cable in Duct	Handhole
Fuses and Fuse Holders	Junction Box
Navigation Lights	Aviation Lights

Required shop drawings for all items listed above shall be submitted in one package at the same time. Please note: the list of items above is a “general” list of items. Certain items listed may or may not be present in a specific project. Please consult the Detailed Estimate sheet for project specific items.

Incident Management System 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, product 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 product data sheets 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	Camera Lowering Device Assembly
Hand holes and covers	Remote Control Flashing Lights
Pullboxes and pullbox covers	Service Cabinets
Fiber Optic Modems	Meter Sockets
Camera power supply	Conductors
Traffic Flow Monitors	Fiber Optic Cable
Cast Iron Handhole Cover	Fiber Patch Cords
Cast Iron Junction Box	Fiber Optic Connectors
Fiberglass Junction Box	Fiber Optic Splice Enclosures
Traffic Management System Cabinets	Optical Fiber Termination Patch Panels
Traffic Management System Mini-hub Cabinets	Optical Video/Data Transmitter
Auxiliary Termination Cabinets	Optical Video/Data Receiver
Transformers	Network Customer Service Unit
Steel CCTV Poles	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

- 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.
- Camera Assembly. Schematics of the wiring between the camera and the equipment cabinet shall also be provided.
- Camera Video Cables, Data Cables, Power Cables and Connectors.
- Modify Existing Operations Center Control System including all materials, schematics, diagrams and drawings.
- Motorists Aid Variable Message Signs, cabinets, cables, diagrams, schematics etc.

Article 1.06.05 - Shipping Materials: Add the following:.

Incident Management System Items:

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 8.5 ft. (2,590 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 48 ft. (14,630 mm), without a permit.

Vehicle Height (Section 14-264) - The height of a vehicle, with its load, is limited to 13.5 ft. (4,110 mm), without a permit.

Vehicle Weight (Section 14-267a(b)(7)) - The gross vehicle weight (weight of vehicle including its load) is limited to 80,000 lbs. (36,280 kg) on 5 axles for vehicles with a 51 ft. (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 22,400 lbs. (10,160 kg) or in the case of axles spaced less than 6 ft. (1,828 mm) apart, 18,000 lbs. (8,160 kg).

On Department projects, in accordance with the Commissioner’s policy, any member or component, either temporary or permanent, that measures 120 ft. (36,570 mm) or less and weighs no greater than 120,000 lbs. (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 20,000 lbs. (9,070 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 lbs. (9,070 kg).

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

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

Article 1.06.07 - Certified Test Reports and Materials Certificate.

Add the following:

Illumination Items:

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

Light Standards

Anchor Bolts

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

Light Standards Conductors Cable in Duct

Luminaires Anchor Bolts

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

Delete Article 1.07.07 in its entirety and replace it with the following:

1.07.07—Safety and Public Convenience: The Contractor shall conduct the Project work at all times in such a manner as to ensure the least possible obstruction to traffic. In a manner acceptable to the Engineer, the Contractor shall provide for the convenience and interests of the general public; the traveling public; parties residing along or adjacent to the highway or Project Site; and parties owning, occupying or using property adjacent to the Project Site, such as commuters, workers, tenants, lessors and operating agencies.

Notwithstanding any other Contract provision, the Contractor shall not close to normal pedestrian or vehicular traffic any section of road, access drive, parking lot, sidewalk, station platform, railroad track, bus stop, runway, taxiway, occupied space within a Site, or occupied space within a building, except with the written permission of the Engineer.

All equipment, materials, equipment or material storage areas, and work areas must be placed, located, and used in ways that do not create a hazard to people or property, especially in areas open to public pedestrian or vehicular traffic. All equipment and materials shall be placed or stored in such a way and in such locations as will not create a hazard to the traveling public or reduce sight lines. In an area unprotected by barriers or other means, equipment and materials must not be stored within 30 feet of any traveled way.

The Contractor must always erect barriers and warning signs between any of its work or storage areas and any area open to public, pedestrian, or vehicular traffic. Such barriers and signs must comply with all laws and regulations, including any applicable codes.

The Contractor must arrange for temporary lighting, snow and ice removal, security against vandalism and theft, and protection against excessive precipitation runoff within its Project work and storage areas, and within other areas specifically designated in the Contract.

In addition to meeting the requirements of Section 9.71, the Contractor shall take all precautions necessary and reasonable for the protection of all persons, including, but not limited to, employees of the Contractor or the Department, and for the protection of property, until the Engineer notifies the Contractor in writing that the Project or the pertinent portion of the Project has been completed to the Engineer's satisfaction.

The Contractor shall comply with the safety provisions of applicable laws, including building and construction codes and the latest edition of the CFR. The Contractor must make available for reference in its field office, throughout the duration of the Project, a copy of the latest edition and all supplements of the CFR pertaining to OSHA.

The Contractor shall make available to the Contractor's employees, subcontractors, the Engineer, and the public, all information pursuant to OSHA 29 CFR Part 1926.59 and The

SECTION 1.07

Hazard Communication Standard 29 CFR 1910.1200, and shall also maintain a file on each job site containing all MSDS for products in use at the Project. These MSDS shall be made available to the Engineer upon request.

The Contractor shall observe all rules and regulations of the Federal, State, and local health officials. Attention is directed to Federal, State, and local laws, rules, and regulations concerning construction safety and health standards. The Contractor shall not require any worker to work in surroundings or under conditions that are unsanitary, hazardous, or dangerous to the worker's health or safety.

Safety Plan: Before starting work on the Project, the Contractor shall submit to the Engineer a written Safety and Health Plan (hereinafter referred to as the "Plan"). The Plan shall meet or exceed the minimum requirements of this Subsection and any applicable State or Federal regulations.

The Plan shall apply to any work under the Contract whether such work is performed, by way of example and not limitation, by the Contractor's forces, subcontractors, suppliers, or fabricators.

The Plan shall be prepared by the Contractor and submitted to the Engineer for review before the actual start of work on the Project. Within ten (10) calendar days of receipt, the Engineer will determine whether or not the Plan meets the requirements of this Specification. If the Plan does not meet the requirements of this Specification, it will be returned for revision. Work on the Project may not proceed until the Engineer has accepted the Plan. Nothing herein shall be construed, however, to relieve the Contractor from responsibility for the prosecution of the Project.

The Plan shall conform to the following general format:

1. General Introduction.

- a. Description.** The general introduction of the Plan shall include a statement by the Contractor describing its commitment to maintain a safe work environment for its employees, Department representatives, and the public. Implementation procedures and company policies relative to safety shall be summarized or referenced in the Plan.
 - i. The Plan shall include the names, addresses, and telephone numbers of the Contractor's Project Manager, Project superintendent and/or its designee for safety oversight, all competent persons, and the traffic control coordinator. Any changes to the safety management and oversight for the Project shall be promptly communicated to all concerned.
 - ii. The Plan shall provide guidelines for protecting all personnel from hazards associated with Project operations and activities.
 - iii. The Plan shall establish the policies and procedures that are necessary for the Project to be in compliance with the requirements of OSHA and other State

and Federal regulatory agencies with jurisdiction, rules, regulations, standards, or guidelines in effect at the time the work is in progress.

- b. Responsibility, Identification of Personnel, and Certifications.** The Contractor is solely responsible for creating, implementing, and monitoring the Plan.
 - i. The Contractor shall identify and designate on-site supervisory level personnel who shall be responsible for implementing and monitoring the Plan at all times throughout the duration of the Project and shall have authority to take prompt corrective measures to eliminate hazards including the ability to stop work activities.
 - ii. Documentation of training provided to the on-site supervisory level personnel shall be included as part of the Plan.
 - iii. For any work activities wherein the Contractor has identified a competent person as defined by OSHA, that person shall be capable of identifying existing and predictable hazards and have the authority to take prompt corrective measures to eliminate the hazards, including the ability to stop work activities.
 - iv. Documentation of the qualifications of such competent persons identified, including any certifications received, shall be included as part of the Plan.
 - v. The Contractor shall further identify the qualified safety professional responsible for developing the Plan and shall provide that person's qualifications for developing the Plan which shall include, but not be limited to, education, training, certifications, and experience in developing this type of Plan.
 - vi. The Plan shall contain a certification executed by the qualified safety professional that developed the Plan, stating that the Plan complies with OSHA and other applicable State and Federal regulatory agencies with jurisdiction, rules, regulations, standards, or guidelines in effect at the time the work is in progress.

2. Elements of the Plan. The Plan shall address, but not be limited to, the following elements:

- a. Management Safety Policy and Implementation Statement.**
 - i. The Plan shall describe in detail the means by which the Contractor shall implement and monitor the Plan. Implementation and monitoring shall also mean that the Plan shall be a document with provision for change to update the Plan with new information on a yearly basis at a minimum and shall include new practices or procedures, changing site and environmental conditions, or other situations that could adversely affect site personnel. The Plan shall provide guidelines for protecting all personnel from hazards associated with Project operations and activities.
- b. Emergency Telephone Numbers.**
- c. Personnel Responsibilities.**
 - i. Management responsibilities
 - ii. Responsibilities of Supervisor(s)
 - iii. Site safety officer(s) responsibilities
 - iv. Employee responsibilities
 - v. Competent person(s) as defined by OSHA responsibilities
- d. Training.**

- i. Regulatory
 - ii. Documentation
 - iii. Site hazard assessment -Daily employee awareness of site operations
- e. Safety Rules.**
- i. General safety rules
 - ii. Personal protective equipment
 - iii. Housekeeping
- f. Safety Checklists.**
- i. Project safety-planning checklist
 - ii. Emergency plans and procedures checklist
 - iii. Documentation checklist
 - iv. Protective materials and equipment checklist
- g. Traffic Control Coordinator Inspections.**
- i. Responsible person
 - ii. Frequency
 - iii. Documentation of actions taken
- h. Record Keeping.**
- i. OSHA 200 log
- i. Reporting.**
- i. Accident(s)
 - ii. On site
 - iii. Legal notice requirement
 - iv. Public liability
 - v. Property damage
 - vi. Department of Labor
 - vii. Hazard Communications
- j. Additional Procedures for Project Specific Situations as Applicable.**
- i. Compressed gas cylinders
 - ii. Confined spaces
 - iii. Cranes
 - iv. Crystalline silica (stone, masonry, concrete, and brick dust)
 - v. Electrical
 - vi. Equipment operators
 - vii. Fall protection
 - viii. Hand and power tools
 - ix. Hearing conservation
 - x. Highway safety
 - xi. Lead health and safety plan
 - xii. Lock out/tag out
 - xiii. Materials handling, storage, use, and disposal
 - xiv. Areas of environmental concern
 - xv. Night work
 - xvi. Personal protective equipment
 - xvii. Project entry and exit
 - xviii. Respiratory protection

- xix. Sanitation
- xx. Signs, signals, and barricades
- xxi. Subcontractors
- xxii. Trenching

3. Appendix for Environmental Health and Safety Plan (HASP). If environmental hazards are identified in the Contract, an Environmental HASP shall be included in an appendix to the Plan, or in a separate document. References to any Environmental HASP shall be included within the Plan, where appropriate.

The Plan shall be kept on the site and shall apply and be available to all workers and all other authorized persons entering the work site. Copies of all updates to the Plan shall be promptly supplied to the Engineer.

If at any time during the Project the Engineer determines that the Contractor is not complying with the requirements of this provision or the updated Plan, the Contractor shall correct such deficiencies immediately. Failure to remediate such deficiencies may result in suspension of the Contractor's operations until the deficiencies have been corrected. Suspensions ordered due to safety deficiencies will not be considered compensable or excusable delays.

The Contractor is responsible for implementation of the Plan. Pursuant to Article 1.07.10, the Contractor shall indemnify, and save harmless the State from any and all liability related to the Plan in proportion to the extent that the Contractor is held liable for same by an arbiter of competent jurisdiction.

The Contractor shall allow onto the Project site any inspector of OSHA or other legally responsible agency involved in safety and health administration upon presentation of proper credentials, without delay and without the presentation of an inspection warrant.

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."

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

Add the following sentence to the last paragraph:

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

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

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

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

Please provide the electrical service request number provided by the power company. This is a Work Request (WR) Number provided by Eversource (formerly Northeast Utilities [CL&P]). For State-owned traffic signals in CL&P territory, contact the Department's Traffic Electrical Unit to obtain the WR Number.

SECTION 1.08 – PROSECUTION AND PROGRESS

Article 1.08.03 - Prosecution of Work:

Add the following:

The Contractor shall stake the limits of the concrete sidewalks and ramps in conjunction with staking the locations of foundations to ensure that pedestrian push buttons will be located appropriately and will be accessible from a landing area.

The Contractor will not be allowed to install traffic signal or pedestrian heads until the controllers are on hand and ready for installation. Once installation of this equipment commences, the Contractor shall complete this work in a most expeditious manner.

The Contractor shall notify the project engineer on construction projects, or the district permit agent on permit jobs, when all traffic signal work is completed. This will include all work at signalized intersections including loop replacements, adjusting existing traffic signals or any relocation work including handholes. The project engineer or district permit agent will notify the Division of Traffic Engineering and City of Middletown to coordinate a field inspection of all work. Refer to Section 10.00 – General Clauses For Highway Illumination And Traffic Signal Projects, Article 10.00.10 and corresponding special provision.

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 that will interfere with the described traffic operations on all project roadways as follows:

Route 66 (Main Street)

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

Route 66 (Washington Street)

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

Route 17 (Hartford Avenue)

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

Route 17 & Route 66

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

Main Street (South of the intersection with Washington Street)

No Daily Restrictions.

SR 545 (Washington Street)

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

All Other Roadways

No Daily Restrictions.

Night Work Restrictions (82-320)

The hours between 9:00 p.m. and 6:00 a.m. are considered “Night Work” for all roadways.

Night work will not be permitted on all roadways north of Washington Street. Excepted therefrom will be paving and milling operations, replacement of the bridge membrane, and bridge patching work on Bridge No. 05630 as approved by the Engineer, during which the Contractor will be allowed to work during this time. The Contractor shall notify the Engineer 14 days in advance of the anticipated start of night work.

Traffic Signals

Loop detectors disturbed by the Contractor’s operation shall be made operational or temporary detection must be provided within 24 hours of the termination of the existing loop detectors.

STAGE CONSTRUCTION

Stage Construction Project No. 82-320 (Saint John’s Square and Main Street Intersection Improvements)

The Contractor is required to follow the sequence of construction as shown in the Highway Design plans (SEQ-01 thru SEQ-11). The Contractor will not be allowed to perform any work on any subsequent sequence plan without first completing work on all prior sequence plan(s) or without approval from the Engineer to revise the sequence of construction.

Stage Construction Project No. 82-312 Arrigoni Bridge (Bridge No. 00524, Route 66 and Route 17 over Connecticut River)

During stage construction, the number of lanes and lane widths will be considered to be as shown on the Maintenance and Protection of Traffic Plans and Cross-Sections contained in the contract plans.

LANE CLOSURE RESTRICTIONS

It is anticipated that work on adjacent projects may be ongoing simultaneously with this project. The Contractor shall be aware of those projects so that coordination is maintained for proper traffic flow at all times on all project roadways and this coordination is acceptable to the Engineer.

OTHER LIMITATIONS

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

No roadway, with the exception of transition areas, shall be open to traffic unless the appropriate pavement markings have been installed. The transition areas shall have pavement markings applied immediately upon opening to traffic.

Longitudinal dropdowns greater than 2 inches will not be allowed during those periods when the maximum number of lanes of through traffic is required. The Contractor shall temporarily provide a 1:4 traversable slope of suitable material in those areas where a longitudinal dropdown exists. The cost of furnishing, installing and removing this material shall be included in the contract lump sum for "Maintenance and Protection of Traffic."

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 (worknight). All transverse height differentials on all roadway surfaces shall be tapered to negate any "bump" to traffic as specified elsewhere in this Contract or as approved by the Engineer. Material for this taper shall be as approved by the Engineer.

The Contractor will not be permitted to laterally cross any expressway with construction vehicles. Construction vehicles shall merge with the mainline traffic flow and utilize existing interchanges.

All temporary concrete barriers, other protective systems and traffic control devices as called for by the contract or ordered by the Engineer must be on-hand and available in sufficient quantity for immediate installation prior to any stage change.

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.

The Contractor shall note that the deadlines dates listed below have been developed due to the serious condition of the existing bridge deck and sidewalks, and the effect that prolonged stage construction has on the travelling public, emergency services, and adjacent residents and businesses. These deadline dates shall be identified as critical milestones on the Contractor’s submitted calendar day chart. The Contractor shall schedule all contract work to allow completion of the project as a whole within the total contract time, and shall complete the phases noted below by the deadline dates.

Project No. 82-312

<u>PHASE</u>	<u>DEADLINE</u>
Stage 1 Deck and Sidewalk Replacement	210 days from NTP
Stage 2 Deck Replacement	180 days from Stage 1 Milestone
Stage 3 Deck and Sidewalk Replacement	180 days from Stage 2 Milestone

Project No. 82-320

All work is to be completed 200 days from the end of the 2019/2020 winter shutdown period.

Extensions to the deadlines dates are governed by Section 1.08.08 and shall only be granted to the extent that the Engineer deems to be fair and reasonable.

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 1.10 – ENVIRONMENTAL COMPLIANCE

Article 1.10.03 Water Pollution Control:

Add the following after Required Best Management Practices Number 13.

14. The Contractor is hereby notified that the Bald Eagle (*Haliaeetus leucocephalus*) may be located within the vicinity of this project. The bald eagle is a state threatened species and is also protected under both the Federal Bald and Golden Eagle Protection Act, and the Federal Migratory Bird Treaty Act. The bald eagle has adapted to life in urban settings and is becoming a common visitor in winter, particularly at favored locations along the Connecticut River, Housatonic River, and large lakes/reservoirs. In the winter, bald eagles may congregate into groups called communal winter roosts in order to conserve energy, take advantage of protective habitat, and be closer to food sources. The bald eagle is typically associated with large diameter trees (30 inch DBH or greater) for nest building and roosting purposes. Though somewhat tolerant of human activity, bald eagles can be negatively affected if work is too close to an active nest or winter roost. For this reason, special conditions regarding the location and timing of work around eagle usage areas must be adhered to.

In order to protect this species, construction activities will not be allowed to take place within 600 feet of a confirmed nest or winter roost as follows:

- Bald eagle nesting areas: construction activities will not be allowed to take place within 600 feet of a confirmed nest between February 1st and August 1st.
- Winter roost areas: construction activities will not be allowed to take place within 600 feet of a confirmed winter roost area between December 1st and March 31st.

Construction activities will be allowed within project areas that are outside the 600 foot buffer.

Additionally, the cutting of large trees (30 inch DBH or greater) shall be reviewed and approved by the Engineer in coordination with the Department's Office of Environmental Planning (OEP) staff. Any change in construction sequencing or timing of proposed work in the project area, which might disturb bald eagles must be coordinated through the Engineer.

The time period and approximate areas of the project expected to be subject to these restrictions based on the best available eagle activity information are attached. Prior to the start of work and during the project, areas subject to these restrictions may be updated based on confirmed nest/winter roost information and shall be provided by the OEP. Exact locations of nests/winter roosts will not be provided in order to further protect the species.

The Contractor shall, through the Engineer, at least 10 days prior to the commencement of any construction activities, arrange for a CT DOT Environmental Inspector from the OEP or their authorized delegate to be available to meet and identify the approximate roost and/or nest location as well as discuss proper protocol for maintaining environmental commitments made to the protection of this species and habitat.

This species is protected by State and Federal law which prohibit killing, harming, taking, harassing, or keeping them in your possession. Workers shall be notified of the existence of bald eagles in the area and be apprised of the laws protecting them. Photographs of, and the laws protecting, bald eagles shall be posted in the Contractor's and DOT field offices (species ID sheets will be provided by OEP). Any observations of this species are to be immediately reported to the Engineer.

15. The peregrine falcon (*Falco peregrinus*) is a State threatened species and Connecticut's largest falcon, measuring up to 20 inches. Adults are slate gray above and pale underneath with fine bars and spots of black; they have long pointed wings with a narrow tail. Young falcons have the same composition but are darker underneath and browner all over. Peregrine falcons have adapted to life in urban settings. In Connecticut, they sometimes utilize bridges for nesting and brood rearing purposes. Peregrines will actively and aggressively defend the nest. The peregrine will attack anyone or anything that comes within the area of its nest. The peregrine falcon nesting season occurs between the months of April and July. For this reason, special conditions regarding the timing of work on the structures, and immediate area that have nesting falcons must be adhered to.

In order to protect this species and project personnel, any construction and/or inspection activities which are within 500 feet of an identified nest shall not be permitted during nesting season (between April 1st and July 31st.) Any change in construction sequencing or timing affecting work within 500 feet of a known nest shall not be permitted.

The Contractor shall, through the Engineer, at least 10 days prior to the commencement of any construction activities, arrange for a CT DOT Environmental Inspector from the Office of Environmental Planning (OEP) or their authorized delegate to be available to meet and identify the nest location as well as discuss proper protocol for maintaining environmental commitments made to the protection of this species and habitat.

This species is protected by State laws which prohibit killing, harming, taking, or keeping them in your possession. Workers shall be notified of the existence of peregrine falcons in the area and be apprised of the laws protecting them. Photographs of, and the laws protecting, peregrine falcons shall be posted in the Contractor's and DOT field offices (species ID sheets will be provided by OEP). Any observations of this species are to be immediately reported to the Department.

General

SECTION 2.86 – DRAINAGE TRENCH EXCAVATION, ROCK IN DRAINAGE TRENCH EXCAVATION

2.86.01—Description

2.86.03—Construction Methods

2.86.04—Method of Measurement

2.86.05—Basis of Payment

2.86.01—Description: Drainage trench excavation consists of the excavation necessary for the proper installation of drainage structures, pipes, pipe ends and any other incidental drainage items.

It shall include earth and rock excavation, removal of existing pipes, dewatering, backfill, and disposal of materials; to the trench limits described herein, to the dimensions shown on the plans, or as directed by the Engineer.

Classifications:

- (1) **Drainage Trench Excavation** will include only the excavation necessary for the construction of the drainage items and the removals specified above.
- (2) **Rock in Drainage Trench Excavation**, insofar as it applies to drainage trench excavation, shall be defined as **1/2 cubic yard or more** in volume of the following obstructions removed from the limits of the drainage trench:
 - (a) rock in definite ledge formation
 - (b) boulders, or portions of boulders
 - (c) cement masonry structures
 - (d) concrete or reinforced concrete structures
 - (e) reinforced concrete pipe
 - (f) subsurface concrete pavement or concrete base

The removal shall be as indicated or directed from within the limits defined in 2.86.03 for drainage trench excavation.

2.86.03—Construction Methods:

(1) Drainage Trench Excavation Limits:

Horizontal Limits: Trench widths for pipes, pipe ends, pipe-arches, and drainage structures shall be as follows:

- (a) 2 feet greater than the nominal inside diameter of circular pipe or nominal inside span of elliptical pipe or pipe-arch for such diameters or spans of less than 30 inches
- (b) 3 feet greater than the nominal inside diameter of circular pipe or the nominal inside span of elliptical pipe or pipe-arch for such diameters or spans that are 30 inches or greater
- (c) 4 feet greater than the nominal inside diameter or nominal horizontal inside span for pipe-arches fabricated from structural plates
- (d) 2 feet beyond the neat lines of all exterior or foundation walls of drainage structures

Vertical Limits: Trench depths shall extend vertically as follows:

- (a) From the bottom of the trench to the bottom of the roadway excavation, or in areas away from roadway excavation, to the top of existing ground surface.
- (b) Where drainage pipe is to be laid in a fill area, the embankment shall be placed and

compacted to a minimum elevation 12 inches above the top of the proposed pipe, whereupon the drainage trench excavation shall be performed and the pipe installed.

- (2) **Drainage Trench Excavation:** Drainage trench excavation shall be made in conformity with the requirements of the plans, or as directed by the Engineer. The Contractor shall furnish and employ such shores, braces, pumps, or ancillary equipment as needed for the proper protection of property, proper completion of the work, as well as safety of the public and employees of both the Contractor and the Department. All bracing and shoring shall be removed when no longer required for the construction or safety of the work. When required, the Contractor shall provide or have on the Site at all times any OSHA certification for equipment to be used, per 1.07.07. For support of trenches greater than 10 feet in depth, working drawings shall be submitted, in accordance with 1.05.02. The Contractor shall control erosion and sedimentation at trench locations and ensure that pumped water from the drainage excavation is discharged in accordance with the requirements of 1.10.

Where a firm foundation is not encountered at the grades established due to unsuitable material, such as soft, spongy, or unstable soil, the unsuitable material shall be removed and replaced with approved backfill, thoroughly compacted in lifts not to exceed 6 inches, for the full trench width. The Engineer shall be notified prior to removal of the unsuitable material in order to determine the depth of removal necessary.

After the excavation is complete, the Contractor shall notify the Engineer and no drainage structure or material shall be placed in the excavated area until the Engineer has approved the depth of excavation and the character of the foundation material.

(3) **Rock in Drainage Trench Excavation:**

- (a) Rock in Drainage Trench Excavation - Ledge: When rock in definite ledge form is encountered, the Contractor shall excavate a minimum of 12 inches below the bottom of the proposed pipe or drainage structure; and this depth shall be filled with bedding material (as specified in M.08.03-1) below the proposed pipe; or granular fill (as specified in M.02.01) below the proposed drainage structure, which shall be thoroughly compacted in lifts not to exceed 6 inches.
- (b) Rock in Drainage Trench Excavation - Boulders: When boulders are encountered, the Contractor shall remove them from the trench and if backfill is required, the void shall be filled with bedding material, surplus excavated material (as specified in 2.02.03-8) or granular fill which shall be thoroughly compacted in lifts not to exceed 6 inches.
- (c) Rock in Drainage Trench Excavation –Structures: When cement masonry, concrete or reinforced concrete structures are encountered within the drainage trench limits, the Contractor shall remove the structure in its entirety or as directed by the Engineer, and if backfill is required, the void shall be filled with bedding material, surplus excavated material or granular fill which shall be thoroughly compacted in lifts not to exceed 6 inches.

- (4) **Backfill:** Suitable material excavated from the drainage trench shall be used as backfill material prior to consideration of using any other source of backfill. Backfill material used shall be of a quality satisfactory to the Engineer and shall be free from large or frozen lumps, wood and other extraneous material. Rock fill or stones larger than 5 inches shall not be placed within 1 foot of the drainage structure or pipe. The grading shall be completed to the lines shown on the plans, or as ordered, by refilling to the required

elevation with approved material, placed in layers not to exceed 6 inches in depth after compaction, which shall be thoroughly compacted with equipment approved by the Engineer.

All surplus or unsuitable material shall be removed and disposed of as directed. Should additional material be required for backfilling, it may be obtained from the Project surplus excavation in accordance with 2.02.03-8 or from borrow pits, gravel pits, or elsewhere as directed by the Engineer.

2.86.04—Method of Measurement:

Drainage Trench Excavation: Drainage trench excavation will not be measured for payment. If granular fill or borrow is required to replace unsuitable material it will be measured for payment as directed by the Engineer.

Rock in Drainage Trench Excavation: If any material meeting the definition of Rock in Drainage Trench Excavation is encountered, the Contractor shall strip it of sufficient overlying material to allow for proper measurement and shall then notify the Engineer that the rock surface is ready for measurement. If the Contractor fails to give such notice, the Engineer will presume that the measurements taken at the time the Engineer first saw the material in question will give the true quantity of excavation.

Rock in Drainage Trench Excavation will be measured according to the classification provided in 2.86.01 and within the drainage trench excavation limits provided in 2.86.03.

For the removal of underground obstructions, as classified in 2.86.01-2, the measurement shall be the actual volume of rock removed (1/2 cubic yard or more) as approved by the Engineer.

Rock in Drainage Trench Excavation will not be measured for payment in fills.

Bedding Material or other suitable fill, as specified in 2.86.03(3), used to fill voids after rock is excavated will not be measured for payment.

2.86.05—Basis of Payment:

Drainage Trench Excavation: There will be no direct payment for drainage trench excavation required for the installation of drainage pipes, pipe ends, catch basins, drop inlets, manholes, and other drainage structures, or any other incidental drainage work including materials, tools, equipment and labor necessary to complete the drainage trench excavation in conformity with the plans or as directed by the Engineer.

There will be no direct payment for backfill or disposal of surplus material necessary for the satisfactory completion of this work.

There will be no direct payment made for shoring, bracing, dewatering, or for material or equipment necessary for the satisfactory completion of the work.

Where called for on the plans to install temporary earth retaining systems for the support of existing facilities, pavement, utilities, or for other constraints, payment will be made in accordance with such items in the Contract.

If granular fill or borrow is used to replace unsuitable material, payment will be made at the respective Contract unit prices, or in the absence of such items in the Contract, as Extra Work in accordance with 1.04.05.

Rock in Drainage Trench Excavation: When rock, conforming to the description in 2.86.01 is encountered within the limits of drainage trench excavation, its removal will be classified and paid for at the Contract unit price per cubic yard for "Rock in Drainage Trench Excavation 0' –

10' Deep," or "Rock in Drainage Trench Excavation 0' – 20' Deep," as the case may be.

Those portions of drainage trench excavation classified and paid for as "Rock in Drainage Trench Excavation" of the various depths will be the actual volumes of rock excavated within the limits for drainage trench excavation, at the applicable bottom depth price.

Where no item or items for "Rock in Drainage Trench Excavation" at the applicable depth appear in the proposal and rock is encountered in drainage trench excavation, its removal will be paid for as Extra Work in accordance with 1.04.05.

When excavation is necessary in fill, no such excavation will be paid for as "Rock in Drainage Trench Excavation."

When excavation is necessary for any purpose other than drainage-related items, no such excavation will be paid under this item.

Bedding material or any other suitable material used to fill voids vacated by excavated rock will not be paid for but shall be included in the unit price per cubic yard for "Rock in Drainage Trench Excavation."

Pay Item	Pay Unit
Rock in Drainage Trench Excavation 0' - 10' Deep	c.y.
Rock in Drainage Trench Excavation 0' - 20' Deep	c.y.

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

- 1. Material Documentation**
- 2. Transportation of Mixture**
- 3. Paving Equipment**
- 4. Test Section**
- 5. Transitions for Roadway Surface**
- 6. Spreading and Finishing of Mixture**
- 7. Longitudinal Joint Construction Methods**
- 8. Contractor Quality Control (QC) Requirements**
- 9. Temperature and Seasonal Requirements**
- 10. Field Density**
- 11. Acceptance Sampling and Testing**
- 12. Density Dispute Resolution Process**
- 13. Corrective Work Procedure**
- 14. Protection of the Work**
- 15. Cut Bituminous Concrete Pavement**

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, placement and compaction of a uniform textured, non-segregated, smooth bituminous concrete pavement to the grade and cross section shown on the plans.

The following terms as used in this specification are defined as:

Bituminous Concrete: A composite material consisting of prescribed amounts of asphalt binder and aggregates. Asphalt binder may also contain additives engineered to modify specific properties and/or behavior of the composite material. References to bituminous concrete apply to all of its forms, such as those identified as hot-mix asphalt (HMA) or polymer-modified asphalt (PMA).

Bituminous Concrete Plant (Plant): A structure where aggregates and asphalt binder are combined in a controlled fashion into a bituminous concrete mixture suitable for forming pavements and other paved surfaces.

Course: A continuous layer (a lift or multiple lifts) of the same bituminous concrete mixture placed as part of the pavement structure.

Density Lot: The total tonnage of all bituminous concrete placed in a single lift which are:

PWL density lots = When the project total estimated quantity per mixture is larger than 3,500 tons

Simple Average density lots = When the project total estimated quantity per mixture is 3,500 tons or less

Disintegration: Erosion or fragmentation of the pavement surface which can be described as

polishing, weathering-oxidizing, scaling, spalling, raveling, or formation of potholes.

Dispute Resolution: A procedure used to resolve conflicts between the Engineer and the Contractor's results that may affect payment.

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

Job Mix Formula (JMF): A recommended aggregate gradation and asphalt binder content to achieve the required mixture properties.

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

Percent Within Limits (PWL): The percentage of the lot falling between the Upper Specification Limit (USL) and the Lower Specification Limit (LSL).

Polymer Modified Asphalt (PMA): A bituminous concrete mixture containing a polymer-modified asphalt binder and using a qualified warm mix technology.

Production Lot: The total tonnage of a bituminous concrete mixture from a single source that may receive an adjustment.

Production Sub Lot: Portion of the production lot typically represented by a single sample.

Quality Assurance (QA): All those planned and systematic actions necessary to provide CTDOT the confidence that a Contractor will perform the work as specified in the Contract.

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) Technology: A qualified additive or technology that may be used to produce a bituminous concrete at reduced temperatures and/or increase workability of the mixture.

4.06.02—Materials: All materials shall meet 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.

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 Project Specifications.

4.06.03—Construction Methods

1. Material Documentation: All vendors producing bituminous concrete must have Plants with automated vehicle-weighting scales, storage scales, and material feeds capable of producing a delivery ticket containing the information below.

- a. State of Connecticut printed on ticket.
- b. Name of Producer, identification of Plant, and specific storage silo if used.
- c. Date and time.
- d. Mixture Designation, mix type and level. Curb mixtures for machine-placed curbing must state "curb mix only."

- e. If WMA Technology is used, “-W” must be listed following the mixture designation.
- f. Net weight of mixture loaded into the vehicle. (When RAP and/or RAS is used, the moisture content shall be excluded from mixture net weight.)
- g. Gross weight (equal to the net weight plus the tare weight or the loaded scale weight).
- h. Tare weight of vehicle (daily scale weight of the empty vehicle).
- i. Project number, purchase order number, name of Contractor (if Contractor other than Producer).
- j. Vehicle number - unique means of identification of vehicle.
- k. For Batch Plants: individual aggregate, recycled materials, and virgin asphalt max/target/min weights when silos are not used.
- l. For every mixture designation: the running daily and project total delivered and sequential load number.

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

The Contractor must notify the Engineer immediately if, during production, there is a malfunction of the weight recording system in the automated Plant. Manually written tickets containing all required information will be allowed for no more than 1 hour.

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

2. Transportation of Mixture: The mixture shall be transported in vehicles that are clean of all foreign material, excessive coating or cleaning agents, and that have no gaps through which material might spill. Any material spilled during the loading or transportation process shall be quantified by re-weighing the vehicle. The Contractor shall load vehicles uniformly so that segregation is minimized. Loaded vehicles shall be tightly covered with waterproof covers acceptable to the Engineer. Mesh covers are prohibited. The cover must minimize air infiltration. Vehicles found not to be in conformance shall not be loaded

Vehicles 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 and allowable weights of all vehicles transporting mixture. The State reserves the right to check the gross and tare weight of any vehicle. If the gross or tare weight varies from that shown on the delivery ticket by more than 0.4%, the Engineer will recalculate the net weight. The Contractor shall correct the discrepancy to the satisfaction of the Engineer.

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

Vehicle body coating and cleaning agents must not have a deleterious effect on the mixture. The use of solvents or fuel oil, in any concentration, is prohibited for the coating of vehicle bodies.

For each delivery, the Engineer shall be provided a clear, legible copy of the delivery ticket.

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 or cleaning of equipment is prohibited in any location on the Project where fuel or solvents might come in contact with paved areas or areas to be paved. Solvents used 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 of areas paved or to be paved.

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 (minimum length 20 feet).

Rollers: All rollers shall be self-propelled and designed for compaction of bituminous concrete. Roller types shall include steel wheeled, pneumatic, or a combination thereof. Rollers that operate in a dynamic mode shall have drums that use a vibratory or oscillatory system or combination. Vibratory rollers shall be equipped with indicators for amplitude, frequency, and speed settings/readouts to measure the impacts per foot during the compaction process. Oscillatory rollers 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 equipped with wide-tread compaction tires capable of exerting an average contact pressure from 60 to 90 psi uniformly over the surface. The Contractor shall furnish documentation to the Engineer regarding tire size, pressure and loading to confirm that the proper contact pressure is being developed and that the loading and contact pressure are uniform for all wheels.

Lighting: For paving operations which will be performed during hours of darkness the paving equipment shall be equipped with lighting fixtures as described below or with an approved equal. Lighting shall minimize glare to passing traffic. The lighting options and minimum number of fixtures are listed in Tables 4.06-1 and 4.06-2.

TABLE 4.06-1: Minimum Paver lighting

Option	Fixture Configuration	Fixture Quantity	Requirement
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 25feet behind paving machine
2	Type D Balloon	2	Mount over screed area

TABLE 4.06-2: Minimum Roller Lighting

Option	Fixture Configuration	Fixture Quantity	Requirement
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 minimum output of 50,000 lumens and emit light equally in all directions.

Material Transfer Vehicle (MTV): A MTV shall be used when placing bituminous concrete surface course (a lift or multiple lifts) as indicated in the Contract except as noted on the plans or as directed by the Engineer. In addition, continuous paving lengths of less than 500 feet may not require the use of a MTV as determined by the Engineer.

The MTV must be a vehicle specifically designed for the purpose of delivering the bituminous concrete mixture from the delivery vehicle 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:

1. The make and model of the MTV.
2. The individual axle weights and axle spacing for each piece of paving equipment (haul vehicle, MTV and paver).
3. A working drawing showing the axle spacing in combination with all 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 approval by the Engineer. The same 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 meet the criteria below unless otherwise specified.

Permanent Transitions: Defined as any gradual change in pavement elevation that remains as a permanent part of the work.

A transition shall be constructed no closer than 75 feet from either side of a bridge expansion joint or parapet. All permanent transitions, leading and trailing ends shall meet the following length requirements:

Posted Speed Limit	Permanent Transition Length Required
> 35 mph	30 feet per inch of elevation change
35 mph or less	15 feet per inch of elevation change

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: Defined as a transition that does not remain a permanent part of the work.

All temporary transitions shall meet the following length requirements:

Posted Speed Limit	Temporary Transition Length Required
> 50 mph	Leading Transition: 15 feet per inch of vertical change (thickness) Trailing Transition: 6 feet per inch of vertical change (thickness)
40, 45 or 50 mph	Leading and Trailing: 4 feet per inch of vertical change (thickness)
35 mph or less	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 meet the greater than 50 mph requirements shown above.

6. Spreading and Finishing of Mixture: Prior to the placement of the mixture, the underlying base course shall be brought to the plan grade and cross section within the allowable tolerance.

Immediately before placing a bituminous concrete lift, a uniform coating of tack coat shall be applied to all existing underlying pavement surfaces and on the exposed surface of a wedge joint. Such surfaces shall be clean and dry. Sweeping or other means acceptable to the Engineer shall be used.

The mixture shall not be placed whenever the surface is wet or frozen.

Tack Coat Application: The tack coat shall be applied by a pressurized spray system that results in uniform overlapping coverage at an application rate of 0.03 to 0.05 gal./s.y. for a non-milled surface and an application rate of 0.05 to 0.07 gal./s.y. 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 gal /s.y. The Engineer must approve the equipment and the method of measurement prior to use. The material for tack coat shall be heated to 160°F ± 10°F and shall not be further diluted.

Tack coat shall be allowed sufficient time to break prior to any paving equipment or haul vehicles driving on it.

The Contractor may request to omit the tack coat application between bituminous concrete layers that have not been exposed to traffic and are placed during the same work shift. Requests to omit tack coat application on the upper and lower surfaces of a wedge joint will not be considered.

Placement: The 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 mixture, 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, maintained throughout placement, and shall not be removed until all associated work including density testing is completed.

The mixture temperature will be verified by means of a probe or infrared type of thermometer. The placement temperature range shall be listed in the quality control plan (QCP) for placement and meet the requirements of Table M.04.03-4. Any HMA material that falls outside the specified temperature range as measured by a probe thermometer may be rejected.

The Contractor shall inspect the newly placed pavement for defects in 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 impracticable 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 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 average thickness of the lift exceeds that shown on the plans beyond the tolerances shown in Table 4.06-3, the Engineer will calculate the thickness adjustment in accordance with Article 4.06.04.

TABLE 4.06-3: Thickness Tolerances

Mixture Designation	Lift Tolerance
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 Section.

- b) Area: Where the width of the lift exceeds that shown on the plans by more than the specified thickness, the Engineer will calculate the area 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 Engineer will calculate the weight adjustment in accordance with Article 4.06.04.

Transverse Joints: All transverse joints shall be formed by saw-cutting to expose the full thickness of the lift. Tack coat shall be applied to the sawn face immediately prior to additional mixture being placed.

Compaction: The Contractor shall compact the mixture to meet the density requirements as stated in Article 4.06.04 and eliminate all roller marks without displacement, shoving cracking, or aggregate breakage.

When placing a lift with a specified thickness less than 1 1/2 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.

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:

Each lift of the surface course shall not vary more than 1/4 inch from a Contractor-supplied 10 foot straightedge. For all other lifts of bituminous concrete, the tolerance shall be 3/8 inch. Such tolerance will apply to all paved areas.

Any surface that exceeds these tolerances shall be corrected by the Contractor at its own expense.

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 1 1/2 inches to 3 inches. S1.0 mixtures shall be excluded from using Method I. Method II - Butt Joint (see Figure 4.06-2) shall be used for lifts less than 1 1/2 inches or greater than 3 inches. 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 1/4 inch at any location.

Method I - 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 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

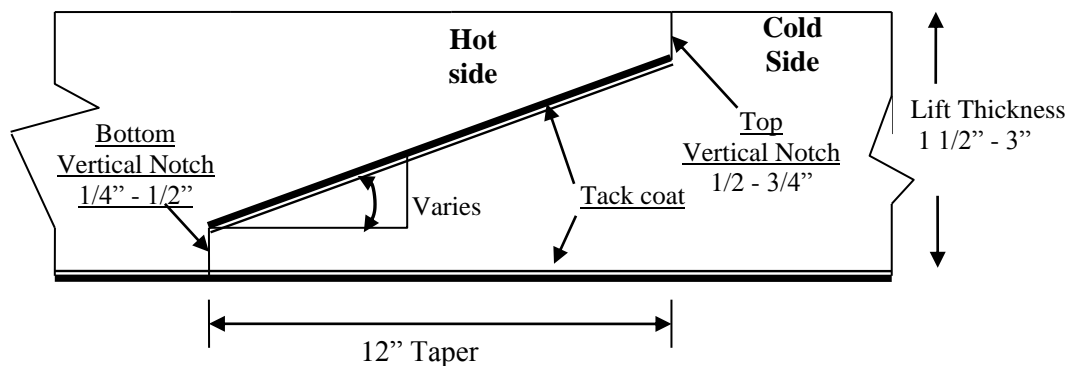
the Engineer.

The taper portion of the wedge joint shall be evenly compacted using equipment other than the paver or notch wedge joint device. The compaction device shall be the same width as the taper and not reduce the angle of the wedge or ravel the top notch of the joint during compaction.

When placed on paved surfaces, the area below the sloped section of the joint shall be treated with tack coat. The top surface of the sloped section of the joint shall be treated with tack coat prior to placing the completing pass.

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

Figure 4.06-1: Notched Wedge Joint (Not to Scale)



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

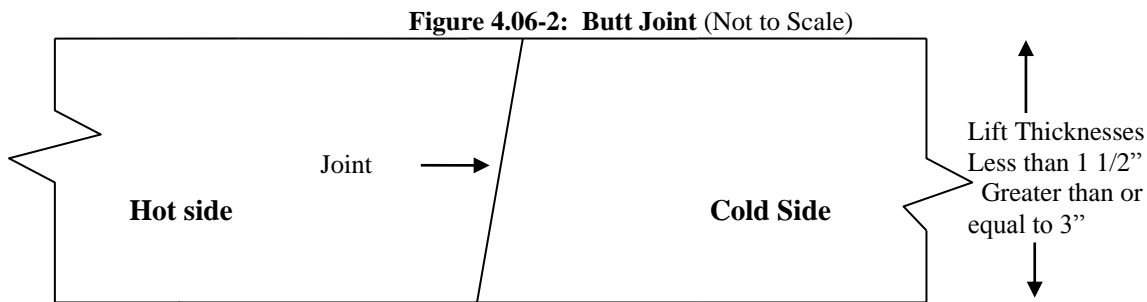
The Engineer reserves the right to define the paving limits when using a wedge joint that will be exposed to traffic.

If Method I cannot be used on those lifts which are 1 ½ inches to 3 inches, Method III may be substituted according to the requirements below for “Method III - Butt Joint with Hot Poured Rubberized Asphalt Treatment.”

Method II - Butt Joint:

When adjoining passes are placed, the Contractor shall use the end gate to create 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). During placement of multiple lifts, the longitudinal joint shall be constructed in such a manner that it is located at least 6 inch from the joint in the lift immediately below. The joint in the final lift shall be at the centerline or at lane lines. The end gate on the paver should be set so there is an overlap onto the cold side of the joint.

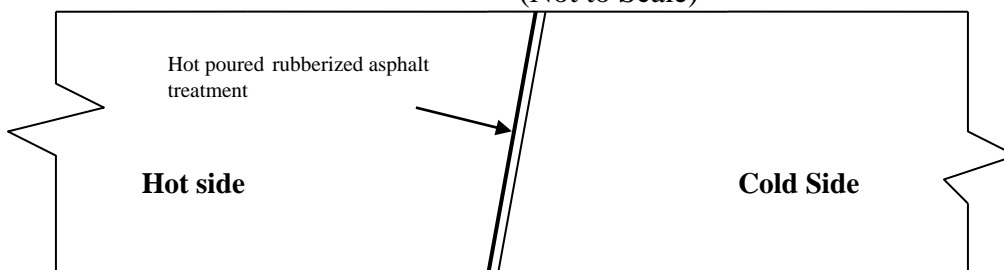
The Contractor shall not allow any butt joint to be incomplete at the end of a work shift unless otherwise allowed by the Engineer. When using this method, the Contractor is not allowed to leave a vertical edge exposed at the end of a work shift and must complete paving of the roadway full width “curb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



Method III - Butt Joint with Hot Poured Rubberized Asphalt Treatment:

If Method I 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 use Method III as a substitution in those locations. There shall be no additional measurement or payment made when Method III is substituted for Method I. 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
(Not to Scale)



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 D6690, 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 (QCP) and must address the actions, inspection, or sampling and testing necessary to keep the production and placement operations in control, to determine when an operation has gone out of control and to respond to correct the situation in a timely fashion.

The Standard QCP for production shall consist of the quality control program specific to the production facility.

There are 3 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 4.06.03-9 “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.

The QCPs shall also include the name and qualifications of any outside testing laboratory performing any QC functions on behalf of the Contractor. The QC Technician performing in-place density testing shall be NETTCP certified as a paving inspector.

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 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

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 1 mat core and 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’s 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 Subarticle 4.06.03-10.

9. Temperature and Seasonal Requirements: Paving, including placement of temporary pavements, shall be divided into 2 seasons, “In-Season” and “Extended-Season.” In-Season paving occurs from May 1 to October 14, and Extended Season paving occurs from October 15 to April 30. The following requirements shall apply unless otherwise authorized or directed by the Engineer:

- Mixtures shall not be placed when the air or subbase temperature is less than 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. Field Density The Contractor shall obtain cores for the determination of mat and longitudinal joint density of bituminous concrete pavements. Within five calendar days of placement, mat and joint cores shall be extracted on each lift with a specified thickness of 1 1/2 inches or more. Joint cores shall not be extracted on HMA S1.0 lifts.

The Contractor shall extract cores from random locations determined by the Engineer in accordance with ASTM D3665. Four (4) or six (6) inch diameter cores shall be extracted for S0.25, S0.375 and S0.5 mixtures; 6 inch diameter cores shall be required for S1.0 mixtures. The Contractor shall coordinate with the Engineer to witness the extraction, labeling of cores, and filling of the core holes.

Each lift will be separated into lots as follows:

- a. **Simple Average Density Lots:** For total estimated quantities below 2,000 tons, the lift will be evaluated in one lot which will include the total paved tonnage of the lift and all longitudinal joints between the curb lines.
For total estimated quantities between 2,000 and 3,500 tons, the lift will be evaluated in two lots in which each lot will include approximately half of the total tonnage placed for the full paving width of a lift including all longitudinal joints between the curb lines.
- b. **PWL Density Lots:** Mat density lots will include each 3,500 tons of mixture placed within 30 calendar days. Joint density lots will include 14,000 linear feet of constructed joints. Bridge density lots will always be analyzed using simple average lot methodology.
- c. **Partial Density Lot (For PWL only):** A mat density lot with less than 3,500 tons or a joint density lot with less than 14,000 linear feet due to:
 - completion of the course; or
 - a lot spanning 30 calendar days.

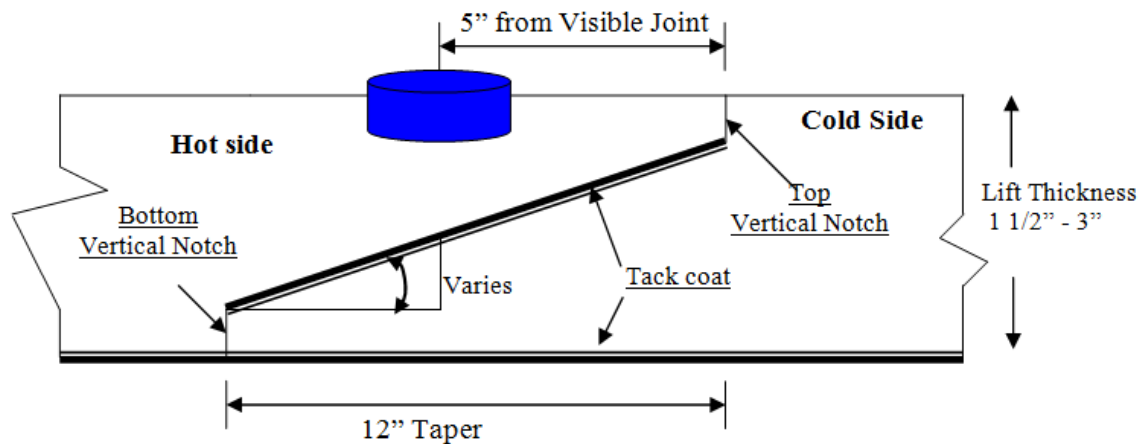
Prior to paving, the type and number of lot(s) will be determined by the Engineer. Noncontiguous areas such as highway ramps may be combined to create one lot.

After the lift has been compacted and cooled, the Contractor shall cut cores to a depth equal to or greater than the lift thickness and shall remove them without damaging the lift(s) to be tested. 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.

A mat core shall not be located any closer than 1 foot from the edge of a paver pass. If a random number locates a core less than 1 foot from any edge, the location will be adjusted by the Engineer so that the outer edge of the core is 1 foot from the edge of the paver pass.

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 (Figure 4.06-4).

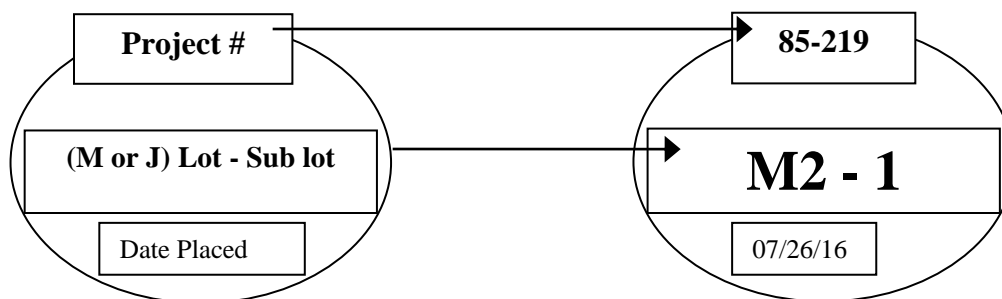
Figure 4.06-4: Notched Wedge Joint Cores (Not to Scale)



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

The cores shall be labeled by the Contractor with the Project number, date placed, lot number, and sub-lot number. The core’s label shall include “M” for a mat core and “J” for a joint core. For example, a mat core from the first lot and the first sub-lot shall be labeled with “M1 – 1.” A mat core from the second lot and first sub-lot shall be labeled “M2-1” (see Figure 4.06-5). The Engineer shall fill out a MAT-109 to accompany the cores. The Contractor shall deliver the cores and MAT-109 to the Department’s Central Lab. The Contractor shall use a container approved by the Engineer. The container shall have a lid 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 handling and transportation. Once the cores and MAT-109 are in the container the Engineer will secure the lid using security seals at the removable hinges(s) and at the lid opening(s). The security seals’ identification number must be documented on the MAT-109. All sealed containers shall be delivered to the Department’s Central Lab within two working days from time of extraction. Central Lab personnel will break the security seal and take possession of the cores.

Figure 4.06-5: Labeling of Cores



Each core hole shall be filled within 4 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 shall be compacted to 1/8 inch above the finished pavement.

Simple Average Density Lots:

A standard simple average density lot is the quantity of material placed within the defined area excluding any bridge decks.

A combo simple average density lot is the quantity of material placed within the defined area including bridge decks less than or equal to 500 feet long.

A bridge simple average density lot is the quantity of material placed on a bridge deck longer than 500 feet.

The number of cores per lot shall be determined in accordance with Table 4.06-4. If a randomly selected mat or joint core location is on a bridge deck, the core is to be obtained on the bridge deck in addition to the core(s) required on the bridge deck.

The number of cores per lot shall be determined in accordance with Table 4.06-5. Multiple bridge decks can be combined into one lot if the paving and underlying conditions are comparable. If multiple bridge decks are combined into a single bridge lot, at least one mat and joint core shall be obtained on each bridge.

The longitudinal locations of mat cores within a standard, combo, or bridge lot containing multiple paving passes will be determined using the combined length of the paving passes within the lot.

TABLE 4.06-4: Number of Cores per Lot (Simple Average)

Lot Type	No. of Mat Cores		No. of Joint Cores	
Standard Lot < 500 Tons	3		3	
Standard Lot ≥ 500 Tons	4		4	
Combo Lot < 500 Tons	2 plus	1 per bridge (≤ 300')	2 plus	1 per bridge (≤ 300')
Combo Lot ≥ 500 Tons ⁽¹⁾	4 plus	2 per bridge (301' – 500')	4 plus	2 per bridge (301' – 500')

TABLE 4.06-5: Number of Core per Bridge Density Lot (Simple Average)

Length of Bridge(s) (Feet)	Minimum No. of Mat Cores	Minimum No. of Joint Cores
< 500	2	2
501 – 1,500	3	3
1,501 – 2,500	4	4
2,501 and greater	5	5

PWL Density Lots:

A PWL mat density lot is 3,500 tons of material placed within the defined area excluding any

bridges. One mat core will be obtained per every 500 tons placed.

A PWL joint density lot is 14,000 linear feet of longitudinal joint excluding any joints on bridge decks. One joint core will be obtained per every 2,000 linear feet of joint.

Bridge density lots will always be analyzed as using the simple average lot methodology. The number of cores per lot shall be determined in accordance with Table 4.06-5. Multiple bridge decks can be combined into one lot if the paving and underlying conditions are comparable. If multiple bridge decks are combined into a single bridge lot, at least one mat and joint core shall be obtained on each bridge.

11. Acceptance Sampling and Testing: Sampling shall be performed in accordance with ASTM D3665 or a statistically-based procedure of stratified random sampling approved by the Engineer.

Plant Material Acceptance: The Contractor shall provide the required sampling and testing during all phases of the work in accordance with M.04. The Department will verify the Contractor's acceptance test results. Should any test results exceed the specified tolerances in the Department's current QA Program for Materials, the Contractor's test results for a subject lot or sub lot may be replaced with the Department's results for the purpose of calculating adjustments. The verification procedure is included in the Department's current QA Program for Materials.

Density Acceptance: The Engineer will perform all acceptance testing in accordance with AASHTO T 331. The density of each core will be determined using the daily production'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.

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 five calendar days of the notification of the test results. No request for dispute resolution will be allowed unless the Contractor provides quality control results from samples taken prior to and after finish rolling, and within the timeframe described in 4.06.03-8 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 core or set of core samples per disputed lot. The core samples must be extracted no later than seven calendar days from the date of the Engineer's authorization. All such core samples shall be extracted and the core hole filled using the procedure outlined in 4.06.03-10.

a) **Simple Average Lots:** The Contractor may only dispute any simple average lot that is adjusted at or below 95 percent payment. The number and location (mat, joint, or structure) of the cores taken for dispute resolution must reflect the number and location of the original cores. The location of each core shall be randomly located within the respective original sub lot. The dispute resolution results shall be combined with the original results and averaged for determining the final in-place density value.

b) PWL Lots: The Contractor may dispute any PWL subplot when the PWL falls below 50% calculated in accordance with section 4.06.04.2.b. An additional random core in the subplot may be taken to validate the accuracy of the core in question. The Department will verify the additional core test result and may average the original test result with the additional core result for purpose of calculating adjustments.

13. Corrective Work Procedure:

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) Any corrective courses placed as the final wearing surface shall match the specified lift thickness after completion.

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.

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*: Bituminous concrete will be measured for payment as the amount of material in tons placed as determined by the net weight on the delivered tickets and adjusted by area, thickness and weight as follows:

Quantity Adjustments: Adjustments may be applied to the placed bituminous concrete quantities that will be measured for payment using the following formulas:

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

Actual Area (SY) = [(Measured Length (ft)) x (Avg. of width measurements (ft))] ÷ 9 s.f./SY

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 (inch) of the lift being placed.

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

Where: L = Length (ft)

(t) = Actual thickness (inches)

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

- b) Thickness: If the actual average 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:

$$\text{Quantity Adjusted for Thickness (T}_T) = A \times t_{adj} \times 0.0575 = (-) \text{ tons}$$

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

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

$$\text{Quantity Adjusted for Weight (T}_W) = \text{GVW} - \text{DGW} = (-) \text{ tons}$$

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

2. Bituminous Concrete Adjustment Cost:

- a) Production Lot Adjustment: An adjustment may be applied to each production lot as follows:
- i. Non-PWL Production Lot (less than 3,500 tons):
 The adjustment values in Tables 4.06-6 and 4.06-7 will be calculated for each sub lot based on the Air Void (AV) and Asphalt Binder Content (PB) test results for that sub lot. The total adjustment for each day's production (lot) will be computed as follows:

$$\text{Tons Adjusted for Superpave Design (T}_{SD}) = [(\text{AdjAV}_t + \text{AdjPB}_t) / 100] \times \text{Tons}$$

Where: AdjAV_t: Percent adjustment for air voids
 AdjPB_t: Percent adjustment for asphalt binder
 Tons: Weight of material (tons) in the lot adjusted by 4.06.4-1

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

Where: AdjAV_t = Total percent air void adjustment value for the lot
 AdjAV_i = Adjustment value from Table 4.06-6 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.04.03-2

TABLE 4.06-6: Adjustment Values for Air Voids

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

Percent Adjustment for Asphalt Binder = AdjPB_t = [(AdjPB₁ + AdjPB₂ + AdjPB_i + ... + AdjPB_n)] / n

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

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

n = number of binder tests in a production lot

TABLE 4.06-7: Adjustment Values for Binder Content

Adjustment Value (AdjAV _i) (%)	<u>S0.25, S0.375, S0.5, S1</u> Pb
0.0	JMF Pb ± 0.3
- 10.0	≤ JMF Pb - 0.4 or ≥ JMF Pb + 0.4

ii. PWL Production Lot (3500 tons or more):

For each lot, the adjustment values will be calculated using PWL methodology based on AV, VMA, and PB test results. The results will be considered as being normally distributed and all applicable equations in AASHTO R 9 and AASHTO R 42 Appendix X4 will apply.

Only one test result will be considered for each sub lot. The specification limits are listed in M.04.

For AV, PB, and voids in mineral aggregate (VMA), the individual material quantity characteristic adjustment (Adj) will be calculated as follows:

For PWL between 50 and 90%: Adj(AV_t or PB_t or VMA_t) = (55 + 0.5 PWL) - 100

For PWL at and above 90%: Adj(AV_t or PB_t or VMA_t) = (77.5 + 0.25 PWL) - 100

Where: AdjAV_t = Total percent AV adjustment value for the lot

AdjPB_t = Total percent PB adjustment value for the lot

AdjVMA_t = Total percent VMA adjustment value for the lot

A lot with PWL less than 50% in any of the 3 individual material quality characteristics will be evaluated under 1.06.04.

The total adjustment for each production lot will be computed using the following formula:

Tons Adjusted for Superpave Design (T_{SD}) = [(0.5AdjAV_t + 0.25AdjPB_t + 0.25 AdjVMA_t) / 100] X Tons

- Where Tons: Weight of material (tons) in the lot adjusted by 4.06.4-1
- iii. Partial Lots:
 - Lots with less than 4 sub lots will be combined with the prior lot. If there is no prior lot with equivalent material or if the last test result of the prior lot is over 30 calendar days old, the adjustment will be calculated as indicated in 4.06.04-2.a)i.
 - Lots with 4 or more sub lots will be calculated as indicated in 4.06.04-2.a)ii.

Production Lot Adjustment: $T_{SD} \times \text{Unit Price} = \text{Est. (Pi)}$

Where: Unit Price = Contract unit price per ton per type of mixture
 Est. (Pi)= Pay Unit in dollars representing incentive or disincentive per lot

- b) Density Lot Adjustment: An adjustment may be applied to each density lot as follows:
 - i. Simple Average Density Lot (less than 3500 tons) and Bridge Lots:

The final lot quantity shall be the difference between the total payable tons for the Project and the sum of the previous lots. 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.

Tons Adjusted for Density (T_D) = $[(P_{AM} \times 0.50) + (P_{AJ} \times 0.50)] / 100 \times \text{Tons}$

Where: T_D = Total tons adjusted for density for each lot
 P_{AM} = Mat density percent adjustment from Table 4.06-8
 P_{AJ} = Joint density percent adjustment from Table 4.06-9
 Tons: Weight of material (tons) in the lot adjusted by 4.06.4-1

TABLE 4.06-8: Adjustment Values for Pavement Mat density

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

Notes:

- ⁽¹⁾ ACRPD = Average Core Result Percent Density
- ⁽²⁾ All Percent Adjustments to be rounded to the second decimal place; for example round 1.667 to 1.67.

TABLE 4.06-9: Adjustment Values for Pavement Joint Density

Average Core Result	Percent Adjustment (Bridge and Non-Bridge) ⁽¹⁾⁽²⁾
Percent Joint Density	
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)

Notes:

⁽¹⁾ ACRPD = Average Core Result Percent Density

⁽²⁾ All Percent Adjustments to be rounded to the second decimal place; for example round 1.667 to 1.67

Additionally, any subplot with a density result below 87% will be evaluated under 1.06.04.

ii. PWL Density Lot (3,500 tons or more):

For each lot, the adjustment values will be calculated using PWL methodology based on mat and joint density test results. Only one result will be included for each subplot. The results will be considered as being normally distributed and all applicable equations in AASHTO R 9 and AASHTO R 42 Appendix X4 will apply.

The specification limits for the PWL determination are as follows:

Mat Density: 91.5-98%

Joint Density: 90-98%

For mat and joint density, the individual percent adjustment (PA) will be calculated as follows:

For PWL between 50 and 90%: $PA_{(M \text{ or } J)} = 0.25 * PWL - 22.50$

For PWL at and above 90%: $PA_{(M \text{ or } J)} = 0.125 * PWL - 11.25$

Where: PA_M = Total percent mat density adjustment value for the PWL mat density lot

PA_J = Total percent joint density adjustment value for the PWL joint density lot

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.

A lot with PWL less than 50% will be evaluated under 1.06.04.

The total adjustment for each PWL mat density lot will be computed as follows:

Tons Adjusted for Mat Density (T_{MD}) = $(PA_M / 100) \times \text{Tons}$

Where: Tons= Weight of material (tons) in the lot adjusted by 4.06.4-1.

The total adjustment for each PWL joint density lot will be computed as follows:

Tons Adjusted for Joint Density (T_{JD}) = $(PA_J / 100) \times J_Tons$

Tons Adjusted for Joint Density will be calculated at the end of each project or project phase.

Where: $J_Tons = \text{Tons in project or phase adjusted by 4.06.4} - 1 \times \frac{\text{Lot joint length}}{\text{joint length in project or phase}}$

All bridge density lot adjustments will be evaluated in accordance with 4.06.04-2.b)i.

Additionally, any subplot with a density result below 87% will be evaluated under 1.06.04.

iii. Partial Lots:

Lots with less than 4 sub lots will be combined with the prior lot. If there is no prior lot with equivalent material and placement conditions or if the last test result of the prior lot is over 30 calendar days old, the mat and joint individual adjustments will be calculated in accordance to Tables 4.06-8 and 4.06-9. T_{MD} and T_{JD} will be calculated as indicated in 4.06.04-2.b)i.

Lots with 4 or more sub lots will be calculated as indicated in 4.06.04-2.b)ii.

Density Lot Adjustment (Simple Average Lots): $T_D \times \text{Unit Price} = \text{Est. (Di)}$

Density Lot Adjustment (PWL Lots): $(T_{MD} \text{ or } T_{JD}) \times \text{Unit Price} = \text{Est. (DMi or DJi)}$

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

Est. (Di)= Pay Unit in dollars representing incentive or disincentive per simple average density lot

Est. (DMi)= Pay Unit in dollars representing incentive or disincentive per PWL mat lot

Est. (DJi)= Pay Unit in dollars representing incentive or disincentive per PWL joint lot

Additionally, any subplot with a density result below 87% will be evaluated under 1.06.04.

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

The quantity of material used for the installation of temporary transitions will 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 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 4.06.03.

a. Container Method – Material furnished in a container will be measured to the nearest 1/2 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 1/2 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. Vehicle Method

- i. Measured by Weight: The number of gallons furnished will be determined by weighing the material on calibrated scales furnished by the Contractor. To convert weight to gallons, one of the following formulas will be used:

Tack Coat (gallons at 60°F) = Measured Weight (pounds) / Weight per gallon at 60°F

Tack Coat (gallons at 60°F) = 0.996 x Measured Weight (pounds) / Weight per gallon at 77°F

- ii. Measured by automated metering system on the delivery vehicle:

Tack Coat (gallons at 60°F) = 0.976 x Measured Volume (gallons).

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: This adjustment will be calculated using the formulas shown below if all of the measured adjustments in 4.06.04-2 are not equal to zero. A positive or negative adjustment will be applied to monies due the Contractor.

Production Lot: $\Sigma \text{ Est (Pi)} = \text{Est. (P)}$

Density Lot (Simple Average Lots): $\Sigma \text{ Est (Di)} = \text{Est. (D)}$

Density Lot (PWL): $\Sigma \text{ Est (DMi)} + \Sigma \text{ (DJi)} = \text{Est. (D)}$

Bituminous Concrete Adjustment Cost= Est. (P) + Est. (D)

Where: Est. ()= Pay Unit in dollars representing incentive or disincentive in each production or density lot calculated in 4.06.04-2

The Bituminous Concrete Adjustment Cost item, if included in the bid proposal or estimate, is not to be altered in any manner by the Bidder. If the Bidder should alter the amount shown, the altered figure will be disregarded and the original estimated cost will be used for the Contract.

3. Transitions for Roadway Surface: The installation of permanent transitions will be paid under the appropriate item used in the formation of the transition. The quantity of material used for the installation of temporary transitions will 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 2.02.05.
5. Material for tack coat will be paid for at the Contract unit price per gallon at 60°F for "Material for Tack Coat."
6. The Material Transfer Vehicle (MTV) will be paid at the Contract unit price per ton for "Material Transfer Vehicle."

Pay Item	Pay Unit
HMA S*	ton
PMA S*	ton
Bituminous Concrete Adjustment Cost	est.
Material for Tack Coat	gal.
Material Transfer Vehicle	ton

SECTION 5.86 – CATCH BASINS, MANHOLES AND DROP INLETS

5.86.01—Description

5.86.02—Materials

5.86.03—Construction Methods

5.86.04—Method of Measurement

5.86.05—Basis of Payment

5.86.01—Description: The work under this Section shall consist of furnishing, preparing, and installing catch basins, manholes and drop inlets (and also the removal, abandonment, alteration, reconstruction, or conversion of such existing structures) in conformity with the lines, grades, dimensions and details shown on the plans.

This Section shall also include resetting or replacing catch basin tops as well as manhole frames and covers.

5.86.02—Materials: The materials for this work shall meet the following requirements:

Drainage structures shall meet the requirements of M.08.02 and shall utilize concrete with a 28-day minimum compressive strength of 4000 psi.

Galvanizing shall meet the requirements of M.06.03.

Mortar shall meet the requirements of M.11.04.

Butyl rubber joint seal shall meet the requirements of ASTM C990.

Granular fill, if necessary, shall meet the requirements of M.02.01.

Protective compound material shall be a type appearing on the Department's Qualified Products List and be acceptable to the Engineer, as specified in M.03.09.

5.86.03—Construction Methods: Drainage trench excavation, including rock in drainage trench excavation and backfilling, shall be performed in accordance with 2.86.03 and the requirements of the plans.

Where a drainage structure is to be installed below the surface, a drainage trench shall be excavated to the required depth, the bottom of which shall be graded to the elevation of the bottom of the proposed drainage structure or to ensure a uniform foundation for the structure.

Where a firm foundation is not encountered at the grades established due to unsuitable material, such as soft, spongy, or unstable soil, the unsuitable material shall be removed and replaced with approved granular fill, thoroughly compacted in lifts not to exceed 6 inches. The Engineer shall be notified prior to removal of the unsuitable material in order to determine the depth of removal necessary.

When rock, as defined in 2.86.01-2, is encountered, work shall be performed in accordance with 2.86.03 and the requirements of the plans.

When a drainage structure outside of proposed drainage trench limits is to be removed, it shall be completely removed and all pipes shall be removed or plugged with cement masonry.

When a drainage structure is to be abandoned, the structure shall be removed to a depth 2 feet below the subgrade or as directed by the Engineer. The floor of the structure shall be broken and all pipes shall be plugged with cement masonry.

Drainage structures shall be constructed in accordance with the plans and the requirements contained herein for the character of the work involved. The provisions of 6.02.03 pertaining to bar reinforcement shall apply except that shop drawings need not be submitted for approval unless called for in the plans, Contract or directed by the Engineer. Welding shall be performed in accordance with the applicable sections of the AWS Structural Welding Code, D1.1.

When it becomes necessary to increase the horizontal dimensions of manholes, catch basins and drop inlets to sizes greater than those shown on the plans in order to provide for multiple pipe installations, large pipes or for other reasons, the Contractor shall construct such manholes, catch basins and drop inlets to modified dimensions as directed by the Engineer.

The surfaces of the tops of all catch basins, and drop inlets shall be given a coat of protective compound material, at the manufacturer's recommended application rate, immediately upon completion of the concrete curing period.

All masonry units shall be laid in full mortar beds.

Metal fittings for catch basins, manholes or drop inlets shall be set in full mortar beds or otherwise secured as shown on the plans.

All inlet and outlet pipes shall be set flush with the inside face of the wall of the drainage structure as shown on the plans. The pipes shall extend through the walls for a sufficient distance beyond the outside surface to allow for satisfactory connections, and the concrete or masonry shall be constructed around them neatly to prevent leakage along their outer surfaces.

When constructing a new drainage structure within a run of existing pipe, the section of existing pipe disturbed by the construction shall be replaced with new pipe of identical type and size extending from the drainage structure to the nearest joint of the existing pipe in accordance with 6.86.03 or as directed by the Engineer.

Backfilling shall be performed in accordance with 2.86.03.

Frames, covers and tops which are to be reset shall be removed from their present beds, the walls or sides shall be rebuilt to conform to the requirements of the new construction and the frames, covers and tops shall be reset as shown on the plans or as directed by the Engineer.

5.86.04—Method of Measurement:

Drainage Trench Excavation: In accordance with 2.86.04, excavation for drainage trench will not be measured for payment but shall be included in the Contract unit price for the type of structure being installed.

Rock in Drainage Trench Excavation: Rock in Drainage Trench Excavation will be measured in accordance with the drainage trench excavation limits described in 2.86.03.

Manholes, Catch Basins and Drop Inlets will be measured as separate units.

Resetting of Manholes, Catch Basins and Drop Inlets will be measured as separate units.

Replacement of frames, covers, and tops will be measured as a unit for catch basin top or manhole frame and cover.

Conversion of drainage structures as specified on the plans, or as directed by the Engineer, including structure reconstruction will be measured for payment as a unit.

Removal or abandonment of drainage structures outside of drainage trench excavation limits, as defined in 2.86.03, will be measured as separate units.

There will be no measurement or direct payment for the application of the protective compound material, the cost of this work shall be considered as included in the general cost of the work.

Measurement for payment for work and materials involved with installing pipes to connect new drainage structures into a run of existing pipe will be as provided for under the applicable Contract items in accordance with 6.86.04.

There will be no measurement or direct payment for plugging existing pipes with cement masonry, the cost of this work will be considered as included in the general cost of the work.

5.86.05—Basis of Payment:

Drainage Trench Excavation for the installation of proposed structures described herein will be paid for under the respective drainage Contract item(s) for which the excavation is being performed, in accordance with the provisions of 2.86.05.

Rock in Drainage Trench Excavation will be paid for in accordance with the provisions of 2.86.05.

Manholes and Catch Basins will be paid for at the Contract unit price for each "Manhole," or "Catch Basin," of the type specified, at "0' to 10' Deep" or "0' to 20' Deep," complete in place, which price shall include all excavation, backfill, materials, equipment, tools and labor incidental thereto.

Drop Inlets will be paid for at the Contract unit price for each "Drop Inlet," of the type specified, complete in place, which price shall include all excavation, backfill, materials, equipment, tools and labor incidental thereto.

Manholes, Catch Basins and Drop Inlets constructed to modified dimensions as directed by the Engineer, will be paid for as follows:

Where the interior floor area has to be increased to accommodate existing field conditions, as measured horizontally at the top of the base of the completed structure, and does not exceed 125% of the interior floor area as shown on the plans for that structure, then the structure shall be paid for at the Contract unit price for each "Manhole," "Catch Basin," or "Drop Inlet" of the type specified. Where the floor area is greater than 125%, the increase in the unit price for the individual structure shall be in direct proportion to the increase of the completed structure interior floor area as compared to the interior floor area as shown on the plans for that structure. Such increased unit price shall include all excavation, materials, equipment, tools, and labor incidental to the completion of the structure.

Reset Units will be paid for at the Contract unit price each for "Reset Manhole," "Reset Catch Basin," or "Reset Drop Inlet," of the type specified, respectively, complete in place, which price shall include excavation, cutting of pavement, removal and replacement of pavement structure, and all materials, equipment, tools and labor incidental thereto, except when the work requires reconstruction greater than 3 feet, measured vertically, then the entire cost of resetting the unit will be paid for as Extra Work in accordance with the provisions of 1.04.05.

Frames, Covers, and Tops when required in connection with reset units, will be paid for at the Contract unit price each for such "Manhole Frame and Cover" or "(Type) Catch Basin Top," complete in place, including all incidental expense; or when no price exists, the furnishing and placing of such material will be paid for as Extra Work in accordance with the provisions of 1.04.05.

When the catch basin top has a stone or granite curb in its design, the curb or inlet shall be included in the cost of the "(Type) Catch Basin Top."

Conversion of drainage structures will be paid for at the Contract unit price each for "Convert Catch Basin to (Type) Catch Basin," "Convert Catch Basin to (Type) Manhole," or "Convert Manhole to (Type) Catch Basin," complete in place, which price shall include excavation, cutting of pavement, removal and replacement of pavement, backfill, all alterations to existing structure, all materials including catch basin frame and grate of the type specified, or manhole frame and cover, all equipment, tools and labor incidental thereto.

The maximum change in elevation of frame under these items shall not exceed 3 feet. Greater depth changes, if required, shall be paid for as Extra Work, in accordance with 1.04.05.

Removal or abandonment of drainage structures outside of drainage trench excavation limits as defined in 2.86.03 will be paid for at the Contract unit price each for "Remove Drainage Structure – 0' to 10' Deep," "Remove Drainage Structure – 0' to 20' Deep," or "Abandon Drainage Structure," which price shall include excavation, cutting of pavement, removal and replacement of pavement, backfill, and all equipment, tools and labor incidental thereto.

Pay Item	Pay Unit
(Type) Catch Basin – 0' to 10' Deep	ea.
(Type) Catch Basin – 0' to 20' Deep	ea.
Manhole (Size) – 0' to 10' Deep	ea.
Manhole (Size) – 0' to 20' Deep	ea.
(Type) Drop Inlet	ea.
Reset Catch Basin	ea.
Reset Manhole	ea.
Reset Drop Inlet	ea.
Convert Catch Basin to (Type) Catch Basin	ea.
Convert Catch Basin to (Type) Manhole	ea.
Convert Manhole to (Type) Catch Basin	ea.
Manhole Frame and Cover	ea.
(Type) Catch Basin Top	ea.
Remove Drainage Structure – 0' to 10' Deep	ea.
Remove Drainage Structure – 0' to 20' Deep	ea.
Abandon Drainage Structure	ea.

SECTION 6.01 – CONCRETE FOR STRUCTURES

Replace Section 6.01 in its entirety with the following:

6.01.01—Description

6.01.02—Materials

6.01.03—Construction Methods

6.01.04—Method of Measurement

6.01.05—Basis of Payment

6.01.01—Description: This item shall include concrete for use in new construction, surface repair or structural repair of bridges and culverts, walls, catch basins, drop inlets and other incidental construction. The concrete shall be composed of Portland cement, pozzolans, fine and coarse aggregate, admixtures and water, prepared and constructed in accordance with these specifications, at the locations and of the form dimensions and class shown on the plans, or as directed by the Engineer.

The use of concrete from dry batch or central mixed plants is permitted for all concrete mixtures.

6.01.02—Materials: The materials for this work shall meet the requirements of M.03. Surface or structural repair concrete shall be documented on the delivery ticket, as required in 6.01.03-II-3(a), as having the plastic properties necessary for confined placement to ensure appropriate workability for consolidation within the forms.

6.01.03—Construction Methods:

I. Concrete Quality Control (QC) Requirements: For all bridge deck and bridge parapet construction, the Contractor must demonstrate to the Engineer that the materials and work that will be provided by their field staff, subcontractors, and suppliers meets Contract specification requirements.

This effort shall be documented with a **Concrete Quality Control Plan (CQCP)** and shall address the communication with all parties, on-site inspection, sampling and testing frequency necessary to keep the production, placement and finishing operations in control, to determine when an operation has gone out of control and anticipated procedure to correct the situation in a timely manner.

1. General – provide an overview of the means and methods anticipated to perform the work including any anticipated conditions that may need additional attention (such as seasonal conditions requiring heating or cooling of concrete)
2. Contractor Organization – address authority levels/duties by position and name of persons holding those positions; include those who have decision making authority with regard to quality control, materials, sampling and testing who can be contacted by the Engineer
3. Concrete Mix Design – identify concrete supplier(s); provide copies of all applicable mix designs to field staff; and address submittal timeframe
4. Transportation and Delivery of Concrete – identify the supplier’s plant capacity and ability to ensure continuous delivery to the Project to meet the requirements of the mix design and a corrective procedure if it does not meet Project requirements; include a provision for the addition of admixtures and follow up testing
5. Placement and Finishing of Concrete – identify and describe:

- (a) placement equipment
 - (b) placement method(s) to be used (chute, pump, hopper or other)
 - (c) starting point and direction of placement (logistical sequencing)
 - (d) slip forming, formwork, stay-in-place forms or other forming method(s)
 - (e) joint construction method(s)
 - (f) process and documentation that the elevations, base, forms, reinforcement (including support chairs and ties), utility inserts or any other appurtenance installations have been inspected by the Contractor prior to concrete placement
 - (g) equipment and method(s) to be used for vibrating and consolidating concrete
 - (h) procedure for verifying adequate consolidation and how segregation will be addressed
 - (i) schedule and method(s) to be used for finishing all exposed surfaces
6. Curing of Concrete – describe schedule and method(s) for curing of concrete and how the method(s) will be monitored and maintained
7. Contractor QC testing – identify person(s) or firms responsible for Contractor QC testing and provide copies of their certification(s) (see 6.01.03-5), and testing facility location(s). In addition, describe the process used for communication between the QC testing personnel and the Contractor project staff; describe what measures will be taken when test results are out of compliance; this shall include what increased frequency of testing is to be performed to verify that concrete properties are in compliance; the threshold at which time placement ceases; describe what protective measures will be used in case of unforeseen weather
8. The CQCP shall include the name and qualifications of a Quality Control Manager (QCM) provided by the Contractor. The QCM shall be responsible for the administration of the CQCP, and any modifications that may become necessary. The QCM shall have the ability to direct all Contractor personnel on the Project during concreting operations and must communicate directly with the concrete supplier. At a minimum the QCM shall be certified as a **Concrete Transportation Construction Inspector by the American Concrete Institute (ACI)**.
9. The CQCP must include a provision for pre-placement meeting(s) to be held with representatives of the Engineer, the concrete supplier, the QCM and the Contractor’s field staff supervising the work.
- (a) Timing and number of the meeting(s) will be determined by the complexity of the mix design or placement.
 - (b) Non-Standard mix designs that require trial placements will be discussed at the Preconstruction Meeting to remind the Contractor of the time needed for testing. Additional meeting(s) should be scheduled at least 90 days prior to first use of non-standard mix designs, to allow suppliers to perform trial batches and testing.
 - (c) Discussions shall include the configuration and specific application that the concrete will be used for, plastic properties and workability, any mix design challenges, trial placement procedures and subsequent trial results, timing and quantities. Refer to 6.01.03-II-6(e) for additional requirements.
10. The CQCP shall be submitted to the Engineer and concrete supplier for review and comment a minimum of 30 days prior to production or placement. Production and placement shall not occur until all comments of the Engineer and supplier have been addressed by the Contractor. Changes to the CQCP based on data not available at time of submittal may be added via addendum.

11. The Contractor shall provide the Engineer QC test results within 48 hours after testing or inspection in a format acceptable to the Engineer. The Contractor shall also maintain complete records of all QC tests.

Review of the CQCP does not relieve the Contractor of its responsibility to comply with the Project specifications. The Contractor may modify the CQCP 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.

II. New Construction:

1. Falsework and Forms: Falsework is considered to be any temporary structure which supports structural elements of concrete, steel, masonry or other material during the construction or erection. Forms are to be considered to be the enclosures or panels which contain the fluid concrete and withstand the forces due to its placement and consolidation. Forms may in turn be supported on falsework.

This work shall consist of the construction and removal of falsework and forms that are designed by the Contractor in the execution of the work, and whose failure to perform properly could adversely affect the character of the Contract work or endanger the safety of adjacent facilities, property, or the public. Forms shall be mortar tight. Forms and falsework shall be of sufficient rigidity and strength to safely support all loads imposed and to produce in the finished structure the lines and grades indicated in the Contract documents. Forms shall also impart the required surface texture and rustication and shall not detract from the uniformity of color of the formed surfaces. Forms shall be made of wood, steel or other material approved by the Engineer.

(a) Design: The design of falsework and formwork shall conform to the *AASHTO Guide Design Specifications for Bridge Temporary Works*, or to other established and generally accepted design codes such as ACI Standard *ACI 347-Recommended Practice for Concrete Formwork* or specific form or falsework manufacturer specifications. When other than new or undamaged materials are used, appropriate reductions in allowable stresses, and decreases in resistance factors or imposed loads shall be used for design.

(b) Loads: The design of the falsework and forms shall be based on load factors specified in the *AASHTO LRFD Bridge Design Specifications* and all applicable load combinations shall be investigated. The design load for falsework shall consist of the sum of appropriate dead and live vertical loads and any horizontal loads.

As a minimum, dead loads shall include the weight of the falsework and all construction material to be supported. The combined unit weight of concrete, reinforcing and pre-stressing steel, and forms that is supported shall be assumed to be not less than:

1. Normal-weight concrete: 0.16 kip/ft³
2. Lightweight concrete: 0.13 kip/ft³

Live loads shall consist of the actual weight of any equipment to be supported, applied as concentrated loads at the points of contact and a uniform load of not less than 0.02 kip/ft² applied over the area supported, plus 0.075 kip/ft applied at the outside edge of deck overhangs.

The horizontal load used for the design of the falsework bracing system shall be the sum of the horizontal loads due to equipment; construction sequence including unbalanced hydrostatic forces from fluid concrete and traffic control devices; stream flow, when

applicable; and an allowance for wind. However, in no case shall the horizontal load to be resisted in any direction be less than 2% of the total dead load.

For post-tensioned structures, the falsework shall also be designed to support any increase in or redistribution of loads caused by tensioning of the structure. Loads imposed by falsework onto existing, new, or partially completed structures shall not exceed those permitted in 6.01.03-II-12, Application of Loads.

- (c) **Working Drawings:** The working drawings for falsework and formwork shall be prepared in accordance with 1.05.02 whenever the falsework or formwork exceeds 14.0 feet high or whenever vehicular, marine, or pedestrian traffic may travel under or adjacent to the falsework or formwork. Working drawings shall include the sequence, method and rate of placement of the concrete.

Manufacturer catalog cuts or written installation procedures shall be provided for any clips, braces, hangers or other manufactured parts used with the formwork or falsework.

- (d) **Construction:** Forms and falsework shall be built true to lines and grades shall be strong, stable, firm, mortar-tight and adequately braced or tied, or both. They shall be designed and constructed to withstand all loads and pressures including those imposed by plastic concrete, taking full account of the stresses due to the rate of placement, effect of vibration and conditions brought about by construction methods. Forms and falsework shall be constructed to compensate for variations in camber of supporting members and allow for deflections.

Falsework and formwork shall be chamfered at all sharp corners, unless otherwise ordered or permitted, and shall be given a slight bevel or draft in the case of projections to ensure satisfactory removal. Materials for falsework and formwork and their supports, ties and bracing, shall be of the type, quality and strength to achieve the structural requirements. Form material in contact with concrete shall provide the finished concrete surface smoothness as specified in 6.01.03-II-10, Finishing Concrete Surfaces, and shall have a uniform appearance.

Falsework and formwork shall be treated with form oil or other release agent approved by the Engineer before the reinforcing steel is placed or self-releasing forms approved by the Engineer may be used. Release agents which will adhere to or discolor the concrete shall not be used.

Falsework and formwork for concrete surfaces exposed to view shall produce a smooth surface of uniform texture, free of voids, indentations, protrusions and bulges. Panels lining falsework and formwork shall be arranged so that the joint lines form a symmetrical pattern conforming to the general lines of the structure. The same type of form-lining material shall be used throughout each element of a structure. Falsework and formwork shall be sufficiently rigid so that the undulation of the concrete surface shall not exceed 1/4 inch when checked with a 4 foot straightedge or template.

For non-exposed surfaces the falsework and formwork shall be sufficiently rigid so that the undulation of the concrete surface shall not exceed 1/2 inch when checked with a 4 foot straightedge or template.

Metal ties and anchors to hold the falsework and formwork in alignment and location shall be so constructed that the metal work can be removed to a depth of at least 2 inches from the concrete surface without damage to the concrete. All cavities resulting from the removal of metal ties shall be filled after removal of forms with cement mortar of the same

proportions used in the body of the work or other materials approved by the Engineer, and the surface finished smooth and even, and if exposed in the finished work, shall be similar in texture and color of adjacent surfaces. With permission of the Engineer, the Contractor need not remove from the underneath side of bridge decks portions of metal devices used to support reinforcing steel providing such devices are of material, or are adequately coated with material, that will not rust or corrode. When coated reinforcing steel is required, all metal ties, anchorages, or spreaders that remain in the concrete shall be of corrosion-resistant material or coated with a dielectric material.

Forms shall be clean and clear of all debris. For narrow walls and columns where the bottom of the form is inaccessible, an access opening will be allowed in the form and falsework for cleaning out extraneous material.

(e) Vacant

- (f) Bridge Decks:** After erection of beams and prior to placing falsework and forms, the Contractor shall take elevations along the top of the beam at the points shown on the plans or as directed by the Engineer. The Contractor shall calculate the haunch depths and provide them to the Engineer a minimum of 7 days prior to installing the falsework and forms. The Contractor shall also provide calculations for the setting of the overhang brackets based on the final beam deflection. These calculations shall be based on the final proposed deck grade and parapet elevations.

Falsework or formwork for deck forms on girder bridges shall be supported directly on the girders so that there will be no appreciable differential settlement during placing of the concrete. Girders shall be either braced and tied to resist any forces that would cause rotation or torsion in the girders caused by the placing of concrete for diaphragms or decks, or shown to be adequate for those effects. Unless specifically permitted, welding of falsework support brackets or braces to structural steel members or reinforcing steel shall not be allowed.

- (g) Stay-In-Place Metal Forms for Bridge Decks:** These forms may be used if shown in the Contract documents or approved by the Engineer. Prior to the use of such forms and before fabricating any material, the Contractor shall submit working drawings to the Engineer for review in accordance with 1.05.02. These drawings shall include the proposed method of form construction, erection plans including placement plans, attachment details, weld procedure(s), material lists, material designation, gage of all materials, and the details of corrugation. Also, copies of the form design computations shall be submitted with the working drawings. Any changes necessary to accommodate stay-in-place forms, if approved, shall be at no cost to the Department.

The metal forms shall be designed on the basis of the dead load of the form, reinforcement and the plastic concrete, including the additional weight of concrete [considered to be equivalent to the weight imposed by an additional concrete thickness equal to 3% of the proposed deck thickness, but not to exceed 0.3 inch] due to the deflection of the metal forms, plus 50 psf for construction loads. The allowable stress in the corrugated form and the accessories shall not be greater than 0.725 times the yield strength of the furnished material and the allowable stress shall not exceed 36,000 psi. The span for design and deflection shall be the clear distance between edges of the beams or girders less 2 inches and shall be measured parallel to the form flutes. The maximum deflection under the weight of plastic concrete, reinforcement, and forms shall not exceed 1/180 of the form

span or 0.5 inches, whichever is less. In no case shall the loading used to estimate this deflection be less than 120 psf. The permissible form camber shall be based on the actual dead load condition. Camber shall not be used to compensate for deflection in excess of the foregoing limits. The form support angles shall be designed as a cantilever and the horizontal leg of the form support angle shall not be greater than 3 inches.

No stay-in-place metal forms shall be placed over or be directly supported by the top flanges of beams or girders. The form supporting steel angles may be supported by or attached to the top flanges.

Stay-in-place metal forms shall not be used in bays where longitudinal slab construction joints are located, under cantilevered slabs such as the overhang outside of fascia members, and bridges where the clearance over a salt-laden body of water is less than 15 feet above mean high water level.

Welding to the top flanges of steel beams and girders is not permitted in the areas where the top flanges are in tension, or as indicated on the plans. Alternate installation procedures shall be submitted addressing this condition.

Drilling of holes in pre-stressed concrete beams or the use of power-actuated tools on the prestressed concrete beams for fastening of the form supports to the pre-stressed concrete beams will not be permitted. Welding of the reinforcing steel to the pre-stressed units is not permitted.

All edges of openings cut for drains, pipes, and similar appurtenances shall be independently supported around the entire periphery of the opening. All fabricated stay-in-place metal forms shall be unloaded, stored at the Project Site at least 4 inches above the ground on platforms, skids or other suitable supports and shall be protected against corrosion and damage and handled in such a manner as to preclude damage to the forms. Damaged material shall be replaced at no additional cost to the State.

Any exposed form or form support metal where the galvanized coating has been damaged, shall be thoroughly cleaned, wire brushed, then coated with 2 coats of Zinc Dust – Zinc Oxide primer, FS No. TT-P-641d, Type II or another product acceptable to the Engineer.

The forms shall be installed from the topside in accordance with the manufacturer's recommended installation procedures. The form supports shall ensure that the forms retain their correct dimensions and positions during use at all times. Form supports shall provide vertical adjustment to maintain design slab thickness at the crest of corrugation, to compensate for variations in camber of beams and girders and to allow for deflections. Stay-in-place metal forms shall have a minimum depth of the form valley equal to 2 inches. The forms shall have closed tapered ends. Lightweight filler material shall be used in the form valleys.

All field cutting shall be done with a steel cutting saw or shears including the cutting of supports, closures and cutouts. Flame cutting of forms is not permitted.

All welding shall be performed by Department-certified welders in accordance with the Welding subarticle in 6.03. Welding of forms to supports is not permitted.

The steel form supports shall be placed in direct contact with the flange of stringer or floor beam flanges and attached by bolts, clips, welding where permitted, or other approved means. Form sheets shall not be permitted to rest directly on the top of the stringer or floor beam flanges. The forms shall be securely fastened to form supports with self-drilling fasteners and shall have a minimum bearing length of 1 inch at each end. In the areas

where the form sheets lap, the form sheets shall be securely fastened to one another by fasteners at a maximum spacing of 18 inches. The ends of the form sheets shall be securely attached to the support angles with fasteners at a maximum spacing of 18 inches or 2 corrugation widths, whichever is less.

The depth of the concrete slab shall be as shown on the plans and the corrugated forms shall be placed so that the top of the corrugation will coincide with the bottom of the deck slab. No part of the forms or their supports shall protrude into the slab. All reinforcement in the bottom reinforcement mat shall have a minimum concrete cover of 1 inch unless noted otherwise on the plans.

The completed stay-in-place metal form system shall be sufficiently tight to prevent leakage of mortar. Where forms or their installation are unsatisfactory in the opinion of the Engineer, either before or during placement of the concrete, the Contractor shall correct the defects before proceeding with the work.

- (h) Construction Joints:** Construction joints other than those shown on the plans will not be permitted without prior approval of the Engineer. In joining fresh concrete to concrete that has already set, the work already in place shall have all loose and foreign material removed, and the surface roughened and thoroughly drenched with water.

All reinforcing steel shall extend continuously through joints. Where unplanned construction joints may be needed, they shall be constructed as directed by the Engineer.

- (i) Expansion and Contraction Joints:** Expansion and contraction joints shall be constructed at the locations and in accordance with the details specified in the Contract. The forming of joint openings shall be dimensioned in accordance with the joint manufacturer's design requirements. Joints include open joints, filled joints, joints sealed with sealants, joints reinforced with steel armor plates or shapes, paraffin coated joints, and joints with combinations of these features.

Open joints shall be placed at locations designated on the plans and shall be formed by the insertion and subsequent removal of templates of wood, metal or other suitable material. The templates shall be so constructed that their removal may be readily accomplished without damage to the work.

Filled joints shall be made with joint filler, the materials for which shall meet the requirements of the plans and of these specifications.

For mechanical joint systems, the concrete shall be placed in such a manner that does not interfere with the movement of the joint.

- (j) Pipes, Conduits and Utility Installations:** The Contractor shall coordinate the installation of pipes, conduits and utilities as shown on the plans and in accordance with the Contract or as directed by the Engineer. The openings accommodating such pipe, conduit and utility installations shall be incorporated into the formwork by the Contractor.

- (k) Anchorages:** Anchor bolts and systems shall be set to the requirements of the plans and Contract. Anchor bolts and systems shall be clean and free of dirt, moisture or other foreign materials at the time of installation. The anchor bolts and systems shall be installed prior to placing concrete.

With the Engineer's approval, the Contractor may install anchorages after placement and setting of the concrete or in formed holes. The anchorages shall be installed into drilled or formed holes having a diameter and a depth suitable to receive the bolts in accordance with the grout manufacturer's requirements. Such holes shall be located to avoid damage to the

existing reinforcement. All holes shall be perpendicular to the plane surface. The Contractor shall take every precaution necessary to prevent damage to the concrete due to freezing of water or grout in anchor bolt holes.

- (l) **Ornament or Reverse Moulds:** Ornamental work, when so noted on the plans, shall be formed by the use of reverse moulds. These moulds shall be produced by a qualified manufacturer approved by the Engineer. They shall be built in accordance with the general dimensions and appearance shown on the plans. The Contractor shall submit all detailed drawings, models, or carvings for review by the Engineer before the moulds are made.

The Contractor shall be responsible for their condition at all times, and shall be required to remove and replace any damaged or defective moulds at no additional cost to the State.

The surfaces of the moulds shall be given a coating of form release agent to prevent the adherence of concrete. Any material which will adhere to or discolor the concrete shall not be used.

Form Liners, if required, shall be installed as specified elsewhere.

- (m) **Removal of Falsework and Forms:** The Contractor shall consider the location and character of the structure, the weather, the materials used in the mix, and other conditions influencing the early strength of the concrete when removing forms and falsework.

Methods of removal likely to cause damage to the concrete surface shall not be used.

Supports shall be removed in such a manner as to permit the structure to uniformly and gradually take the stresses due to its own weight. For structures of 2 or more spans, the sequence of falsework release shall be as specified in the Contract or approved by the Engineer.

Removal shall be controlled by field-cured cylinder tests. The removal shall not begin until the concrete has achieved 75% of the design compressive strength. To facilitate finishing, side forms carrying no load may be removed after 24 hours with the permission of the Engineer, but the curing process must be continued for 7 days.

When the results of field-cured cylinder tests are unavailable, the time periods listed in Table 6.01.03-1, exclusive of days when the temperature drops below 40°F, may govern the removal of forms.

Table 6.01.03-1 Time Restrictions for Removal of Formwork

Structure Element	Minimum Time Period
Arch Centers, centering under beams, pier caps, and unsupported elements	14 days
Slabs on grade, Abutments and Walls	24 hours
Columns	2 days
Bridge Decks	28 days

The Contractor may submit for review and approval by the Engineer, alternate methods to determine the in-place strength of the concrete for removal of forms and falsework.

- 2. Protection from Environmental Conditions:** The concrete shall be protected from damage due to weather or other environmental conditions during placing and curing periods. In-place concrete that has been damaged by weather conditions shall be either repaired to an acceptable condition or removed and replaced as determined by the Engineer.

- (a) **Rain Protection:** The placement of concrete shall not commence or continue unless

adequate protection satisfactory to the Engineer is provided by the Contractor.

- (b) **Hot Weather Protection:** When the ambient air temperature is above 90°F, the forms, which will come in contact with the mix shall be cooled to below 90°F for a minimum of 1 hour prior to and 1 hour after completion of the concrete placement by means of a water spray or other methods satisfactory to the Engineer.
- (c) **Cold Weather Protection:** When there is a probability of ambient air temperature below 40°F during placement and curing, a Cold-Weather Concreting Plan shall be submitted to the Engineer for review and comment. The Plan shall detail the methods and equipment, including temperature measuring devices that will be used to ensure that the required concrete and air temperatures are maintained.
1. Placement: The forms, reinforcing steel, steel beam flanges, and other surfaces which will come in contact with the mix shall be heated to a minimum of 40°F, by methods satisfactory to the Engineer, for a minimum of 1 hour prior to, and maintained throughout, concrete placement.
 2. Curing: For the first 6 days, considered the initial cure period, the concrete shall be maintained at a temperature of not less than 45°F and the air temperature surrounding the structure shall be maintained at a temperature of not less than 60°F. When the concrete mix includes pozzolans or slag, the initial cure period shall be increased to 10 days. After the initial cure period, the air surrounding the structure shall be maintained above 40°F for an additional 8 days. If external heating is employed, the heat shall be applied and withdrawn gradually and uniformly so that no part of the concrete surface is heated to more than 90°F or caused to change temperature by more than 20°F in 8 hours. The Engineer may reduce or increase the amount of time that the structure must be protected or heated based on an indication of in-place concrete strength acceptable to the Engineer.
- (d) **Additional Requirements for Bridge Decks:** Prior to the application of curing materials, all the concrete placed on bridge decks shall be protected from damage due to rapid evaporation by methods acceptable to the Engineer. During periods of low humidity (less than 60% relative humidity), sustained winds of 25 mph or more, or ambient air temperatures greater than 80°F the Contractor shall provide written details of additional measures to be taken during placement and curing.
- Protection may include increasing the humidity of the surrounding air with fog sprayers and employing wind-breaks or sun-shades. Additional actions may include reduction of the temperature of the concrete prior to placement, scheduling placement during the cooler times of days or nights, or any combination of these actions.
- (e) **Concrete Exposed to Salt Water:** No Construction joints shall be formed between the levels of extreme low water and extreme high water or the upper limit of wave action as determined by the Engineer.
- 3. Transportation and Delivery of Concrete:** All material delivered to the Project shall be supplied by a producer qualified in accordance with M.03. The producer shall have sufficient plant capacity and trucks to ensure continuous delivery at the rate required to prevent the formation of cold joints.
- (a) **Material Documentation:** All vendors producing concrete must have their weigh scales and mixing plant automated to provide a detailed ticket. Delivery tickets must include the following information:

1. State of Connecticut printed on ticket
2. Name of producer, identification of plant
3. Date and time of day
4. Type of material
5. Cubic yards of material loaded into truck
6. Project number, purchase order number, name of Contractor (if Contractor other than producer)
7. Truck number for specific identification of truck
8. Individual aggregate, cement, water weights and any admixtures shall be printed on plant tickets
9. Water/cement ratio, and
10. Additional water allowance in gallons based on water/cement ratio for mix

A State inspector may be present to monitor batching or weighing operations.

The Contractor shall notify the Engineer immediately if, during the production day, there is a malfunction of the recording system in the automated plant or weigh scales.

Manually written tickets containing all required information may be allowed for up to 1 hour after malfunction provided they are signed by an authorized representative of the producer.

- (b) Transportation of Mixture:** Trucks delivering concrete shall be qualified in accordance with M.03.

If the concrete mix arrives at the Project with a slump lower than allowed by specification, water may be considered as a means to temper concrete to bring the slump back to within specification. This tempering may only be done prior to discharge with the permission of the Engineer. The quantity of water in gallons added to the concrete cannot exceed the allowance shown on the delivery ticket.

The concrete shall be completely discharged into the forms within 1-1/2 hours from the batch time stamped on the delivery ticket. This time may be extended if the measured temperature of the concrete is below 90°F. This time may also be reduced if the temperature of the concrete is over 90° F. Rejected concrete shall be disposed of by the Contractor at no cost to the State.

The addition of chemical admixtures or air entrainment admixtures at the Project Site, to increase the workability or to alter the time of set, will only be permitted if prior approval has been granted by the Engineer. The addition of air entrainment admixtures at the Project Site will only be permitted by the producer's quality control staff. The Contractor is responsible for follow-up quality control testing to verify compliance with the Specifications.

4. Acceptance Testing and Test Specimens: The Contractor shall furnish the facilities and concrete required for sampling, transport to the testing location in the field, performing field testing and for casting sample cylinders for compressive-strength determinations. The Department will furnish personnel for sampling and casting Acceptance specimens and the number of specimens required will be determined by the Engineer. The equipment for the Department's testing is provided for elsewhere in the Contract.

- (a) Temperature, Air Content and Slump:** Field testing in accordance with AASHTO T-23, "Making and Curing Concrete Test Specimens in the Field" will be performed at the point of placement and at a frequency determined by the Engineer.

- (b) **Acceptance Testing and Compressive Strength Specimens:** Concrete samples are to be taken at the point of placement into the forms or molds. Representatives of the Engineer will sample the mix.

Table 6.01.03-2 Plastic Properties of Portland Cement Concrete

Standard Mix Class	Air Content	Slump ³	Concrete Temperature
PCC0334Z ¹ (3300 psi)	6.0 +/- 1.5%	As submitted	60°-90° F
PCC0336Z ¹ (3300 psi)			
PCC0446Z ¹ (4400 psi)			
PCCXXX8Z ¹	7.5 +/- 1.5%	As submitted	
Modified Standards ²	6.0 +/- 1.5% ²	As submitted	
Special Provision Mix ⁴	As specified	As submitted	
¹ "Z" denotes the Exposure Factor 0, 1 or 2 as described in Table M.03.02-1a			
² Modifications to Standard Mixes, including mixes placed by pumping, shall be reviewed by the Engineer prior to use. These include but are not limited to the use of chemical admixtures such as high range water reducing (HRWR) admixtures and the use of coarse aggregate sizes for that class not specified in M.03.			
³ If the <u>only</u> modification is the addition of HRWR, the maximum allowable slump shall be 7 inches.			
⁴ All concrete mixes with a mix design strength not shown in the table must be approved by the Engineer on a case-by-case basis. Limits on the plastic properties and strength requirements of these mixes are listed in the Specifications.			

The Contractor shall provide and maintain facilities on the Project Site, acceptable to the Engineer, for sampling, transporting the initial sample, casting, safe storage and initial curing of the concrete test specimens as required by AASHTO T-23. This shall include but not be limited to a sampling receptacle, a means of transport of the initial concrete sample from the location of the concrete placement to the testing location, a level and protected area of adequate size to perform testing, and a specimen storage container capable of maintaining the temperature and moisture requirements for initial curing of Acceptance specimens. The distance from the location of concrete placement to the location of testing and initial curing shall be 100 feet or less, unless otherwise approved by the Engineer.

The specimen storage container described in this section is in addition to the concrete cylinder curing box provided for elsewhere in the Contract.

After initial curing, the test specimens will be transported by Department personnel and stored in the concrete cylinder curing box until they can be transported to the Division of Materials Testing for strength evaluation.

- (c) **Sampling Procedure for Pumping:** It is the responsibility of the Contractor to provide concrete that meets specification at the point of placement.

Samples of concrete shall be taken at the discharge end of the pump at the point of placement with the exception of underwater concrete. The Contractor may submit an alternate location to provide a sample from the discharge end of the pump with verification showing that the characteristics of the mix will not be altered from that of which would have been attained at the point of placement. The Engineer will review the documentation and other extenuating circumstances when evaluating the request.

In the case of underwater concrete the Contractor shall submit the proposed sampling location with the submittals required in 6.01.03-II-6(f).

(d) Additional field testing: Additional field testing such as density and yield measurements may be required at the time of placement as determined by the Engineer.

5. Progression Cylinders and Compressive Strength Specimens: Progression Cylinders outlined in this section are field cured compressive strength specimens taken for information related to when a structure or segment of a structure can be loaded or put into service, adequacy of curing and protection of concrete in the structure, or when formwork or shoring may be removed from the structure. The information produced from strength results of Progression Cylinders will not be considered for acceptance of the concrete.

The personnel, equipment, and molds for sampling, casting, curing and testing of Progression Cylinders shall be furnished by the Contractor at no expense to the Department.

Sampling, casting, and field curing of the specimens shall be performed in accordance with AASHTO T23 by an ACI Concrete Field Testing Technician Grade 1 or higher and will be witnessed by a representative of the Department.

The sample shall be taken at the point of placement into the forms or molds from 1 or more of the same truck loads that an Acceptance sample is taken from.

A minimum of 2 of cylinder results will be used to determine in-place strength.

Compression testing shall be performed in accordance with AASHTO T 22 by personnel approved by the Engineer.

A Certified Test Report in accordance with 1.06.07 shall be provided to the Engineer reporting the Progression Cylinder test results. A copy of the results of the compressive strength testing shall be provided to the Engineer at least 24 hours prior to any Project activity that the results may control.

6. Handling and Placing Concrete: Concrete shall be handled, placed, and consolidated by methods acceptable to the Engineer that will not segregate the mix and shall result in a dense homogeneous concrete. The methods used shall not cause displacement of reinforcing steel or other materials to be embedded in the concrete. Concrete shall not be placed until the forms and all materials have been inspected by the Engineer. All mortar from previous placements, debris, and foreign material shall be removed from the forms and steel prior to commencing placement. The forms and subgrade shall be thoroughly moistened with water immediately before concrete is placed. All water that has ponded within the forms shall also be removed. Temporary form spreader devices shall not be left in place.

All laitance or unsound material shall be removed before placing substructure concrete onto the surface of any concrete placed underwater.

Placement of concrete for each section of the structure shall be performed continuously between construction or expansion joints as shown on the plans. The delivery rate, placing sequence and methods shall be such that fresh concrete is always placed and consolidated against previously placed concrete before initial set has occurred. The temperature of the concrete mixture during placement shall be maintained between 60°F and 90°F. During and after placement of concrete, care shall be taken not to damage the concrete or break the bond with reinforcing steel. Platforms for workers and equipment shall not be supported directly on any reinforcing steel. Forces that may damage the concrete shall not be applied to the forms or reinforcing steel.

- (a) **Sequence of Placement:** The sequence of placement shall be in accordance with the Contract or as permitted by the Engineer.

Concrete for integral horizontal members, such as caps, slabs, or footings shall not be placed until the concrete for the columns, substructure, culvert walls and similar vertical members has achieved sufficient strength as stated in 6.01.03-II-1(m).

The concrete in arches shall be placed in such a manner as to load the formwork uniformly and symmetrically.

The base slab or footings of cast-in-place box culverts shall reach sufficient strength before the remainder of the culvert is constructed.

- (b) **Placement Methods:** The Contractor shall notify the Engineer at least 24 hours in advance of intention to place concrete.

Vibrators shall not be used to shift the fresh concrete horizontally. Vibrators shall be adequate to consolidate the concrete and integrate it with the previous lift.

The rate of concrete placement must not produce loadings that exceed those considered in the design of the forms.

The use of chutes and pipes for conveying concrete into the forms must be reviewed by the Engineer. Chutes shall be clean, lined with smooth watertight material and, when steep slopes are involved, shall be equipped with baffles or reverses. When the discharge must be intermittent, a hopper or other device for regulating the discharge shall be provided.

Aluminum shall not be permanently incorporated into the concrete unless otherwise specified.

When placing operations involve dropping the concrete more than 5 feet, the Contractor shall take action to prevent segregation of the mix and spattering of mortar on steel and forms above the elevation of the lift being placed. This restriction shall not apply to cast-in-place pilings.

When using stay-in-place forms, concrete shall not be dropped more than 3 feet above the top of the forms, and the concrete shall be discharged directly over the beams or girders.

- (c) **Pumping:** The Contractor shall use equipment specifically manufactured to pump concrete mixes and that meets the needs of the specific concrete placement.

- (d) **Consolidation:** Unless otherwise specified, all concrete, except concrete placed under water, shall be sufficiently consolidated by mechanical vibration immediately after placement.

The Contractor shall provide a sufficient number of commercially available mechanical immersion type vibrators to properly consolidate the concrete immediately after it is placed in the forms unless external form vibrators are used. The Contractor shall have an adequate number of operable vibrators available in case of breakdown.

External form vibrators may be used if submitted prior to concrete placement and reviewed by the Engineer.

Vibration shall not be applied directly to the reinforcement or hardened concrete. Special care shall be taken in placing and consolidating concrete around ornamental moulds, form liners and other embedded items. The vibrator shall not touch these items at any time.

- (e) **Additional Requirements for Bridge Decks:** At least 15 days before the erection of the screed rails, the Contractor shall submit screed erection plans, grades and sequence of concrete placement and proposed rate of placing concrete for review by the Engineer.

These plans shall include details of equipment to be used in the placement and finishing of the concrete, including the number and type of personnel who will be engaged in placing the concrete. The screed equipment shall be a commercially available vibratory system. The use of wooden screeds is prohibited.

When setting screed rails for mechanical finishing, the Contractor shall take into consideration and make proper allowances for the deflection of the bridge superstructure due to all operations.

Screed and runway supports shall not be located on any stay-in-place metal form sheets, form supports or reinforcing steel. The Contractor shall operate the mechanical screed at least 24 hours prior to actual placement of the concrete to verify deck survey and equipment operations to the satisfaction of the Engineer.

A Pre-Placement Meeting shall be held on the project site with Contractor, Engineer and concrete supplier 48 hours before the concrete deck pour. The Pre-Placement Meeting will document and include discussion on the following topics:

1. Schedule:

- (a) Deck pour sequence
- (b) Daily start and finish times for concrete delivery
- (c) Anticipated completion time

2. Key Personnel:

- (a) Concrete placement foreman
- (b) Total number of personnel involved in deck pour and their roles during the pour
- (c) Concrete supplier
- (d) Concrete pump truck operator/service
- (e) Discuss QC/QA

3. Placement:

- (a) List of approved delivery trucks per pour
- (b) Pre-wetting forms prior to placement
- (c) Placement sequence
- (d) Rate of concrete placement and vibrator process
- (e) Monitor concrete temperature during placement
- (f) Transverse joint bulkheads
- (g) Approved concrete low-permeability mix design

4. Curing:

- (a) Curing materials (burlap, quilted blankets, etc.)
- (b) Means for pre-soaking curing materials.
- (c) Foggers
- (d) Soaker hoses
- (e) White Plastic Sheeting
- (f) Water source and supply tanks

Concrete shall be deposited in a uniform manner across the entire width being placed, and only 2 passes of the transverse screed will be permitted over a given deck area, unless otherwise allowed by the Engineer.

If the Contractor proposes to place concrete outside of daylight hours, an adequate lighting system must be provided.

Concrete shall be deposited in accordance with the placement sequence as noted on the plans. If no sequence is indicated, the Contractor shall provide a placement sequence to the Engineer for review. The placement sequence shall proceed in such a manner that the total deflection or settlement of supporting members, and the final finishing of the surface will occur before the initial set of the concrete takes place.

At construction joints, concrete shall not be placed against the previously placed concrete for at least 12 hours unless otherwise allowed by the Engineer.

- (f) Underwater Placement:** Concrete may only be placed under water within a cofferdam unless otherwise specified in the Contract or allowed by the Engineer. Placement shall begin following inspection and acceptance of the depth and character of the foundation material by the Engineer.

Underwater concrete mixes are considered non-standard designs and shall be submitted to the Engineer for approval. Typically a minimum of 10% additional cement than comparable non-underwater mixes will be required.

Underwater concrete shall be placed continuously with the surface of the concrete kept as horizontal as practical. To ensure thorough bonding, each succeeding layer shall be placed before the preceding layer has taken initial set. For large concrete placements, more than 1 tremie or pump shall be used to ensure compliance with this requirement.

Mass concrete placement requirements, outlined in 6.01.03-II-6(g), do not apply to underwater concrete.

To prevent segregation, underwater concrete shall be placed in a compact mass, in its final position, by means of a tremie, concrete pump, or other approved method and shall not be disturbed. Still water shall be maintained at the point of deposit. Cofferdams shall be vented during the placement and curing of the concrete to equalize the hydrostatic pressure and thus prevent flow of water through the concrete.

If a tremie is used, the method of depositing the concrete shall be detailed in a submission to the Engineer as a working drawing for review. The tube shall have watertight couplings and shall permit the free movement of the discharge end over the area of the work.

- (g) Mass concrete placement:** Mass concrete placement shall be defined as any placement, excluding underwater concrete placement, in which the concrete being cast has dimensions of 5 feet or greater in each of 3 different directions. For placements with a circular cross-section, a mass concrete placement shall be defined as any placement that has a diameter of 6 feet or greater and a height of 5 feet or greater. For all mass concrete placements, the mix temperature shall not exceed 85°F as measured at point of discharge into the forms.

Any special concrete mix design proposed by the Contractor to meet the above temperature requirements shall be submitted to the Engineer for review.

7. Finishing Plastic Concrete: Unless otherwise specified in the Contract, after concrete has been consolidated and prior to final curing, all surfaces of concrete that are not placed against forms shall be struck-off to the planned elevation or slope. The surface shall be finished by floating with an acceptable tool. While the concrete is still in a workable state, all construction and expansion joints shall be tooled with an edger. Joint filler shall be left exposed. For requirements on float finish, refer to 6.01.03-II-10, Finishing Concrete Surfaces.

After completion of the placing and finishing operation and for at least 12 hours after the concrete has set, the Contractor shall not operate any equipment in the immediate vicinity of the

freshly placed concrete if, in the opinion of the Engineer, it could cause excessive vibration, movement or deflection of the forms.

The addition of water to the surface of the concrete to assist in finishing operations will not be permitted.

(a) Bridge Decks: After the concrete has been consolidated and brought to the proper elevation by the screed machine, it shall be finished by use of a suitable float. The Contractor shall not disturb the fresh concrete after it has been finished. All finishing work, including the application of the fog spray and placement of the curing mats, shall be performed from work bridges supported above the deck surface. A work bridge shall be made available to the Engineer for inspection of the concrete work.

Surfaces that are to be covered with a waterproofing membrane shall be finished to a smooth surface, free of mortar ridges and other projections and in accordance with the membrane manufacturer's recommendations.

Unless otherwise noted in the Contract, the concrete wearing surfaces shall be given a skid-resistant texture by dragging, brooming, tining, or by a combination of these methods. These methods shall be done after floating and at such time and in such manner that the desired texture will be achieved while minimizing displacement of the larger aggregate particles.

1. **Dragging:** The surface shall be finished by dragging a seamless strip of damp burlap over the surface. The burlap to be dragged shall consist of sufficient layers and have sufficient length in contact with the concrete to slightly groove the surface. The burlap shall be drawn longitudinally along the surface in a slow manner so as to leave an even texture. The burlap shall be kept damp, clean, and free of particles of hardened concrete. The Contractor may propose an alternate material for the Engineer's consideration.
2. **Tining:** Tining shall be in a transverse direction using a wire broom, comb, or float having a single row of tines or fins. The tining grooves shall be between 1/16 inch and 3/16 inch wide and between 1/8 inch and 3/16 inch deep, spaced 1/2 inch to 3/4 inch on centers. Tining shall be discontinued 12 inches from the curb line on bridge decks. The area adjacent to the curbs shall be given a light broom finish longitudinally. As an alternative, tining may be achieved using a machine designed specifically for tining or grooving concrete pavements.

The transverse grooving shall be performed when the grooves can be formed to a maximum depth of 3/16 inch with relative ease and without the walls of the grooves closing in on each other. The tining shall be aligned so as to prevent overlapping of grooves in any 2 successive transverse passes. The Contractor shall measure the depth of the grooves in the presence of the Engineer with an appropriate device to ensure compliance.

(b) Surface Testing and Correction: The completed surface shall be constructed in accordance with grades and cross slopes shown on the plans. The entire surface shall be checked by the Contractor in the presence of the Engineer, with an acceptable 10 foot straightedge.

1. The surface shall not vary more than +/- 1/8 inch over 10 feet for decks which will not be covered with an overlay.
2. The surface shall not vary more than +/- 1/4 inch over 10 feet for decks which will be

covered with an overlay.

Variations greater than these, which, in the opinion of the Engineer, may adversely affect the riding qualities of the surface shall be corrected, and this shall be done at the expense of the Contractor. The Contractor shall submit a corrective procedure to the Engineer for review and approval. The procedure shall correct such irregularities by methods such as, but not limited to, concrete planing or grooving.

8. Bearing Surfaces: Concrete surfaces under metallic masonry plates and elastomeric bearings shall have a float finish. After the concrete has set, the area which will be in contact with the masonry plate shall be ground as necessary to provide full and even bearing. The finished surface shall not vary from a straightedge laid on the surface in any direction within the limits of the masonry plate by more than 0.0625 inch. Surfaces which fail to conform shall be ground or filled until acceptable to the Engineer.

9. Curing Concrete: All newly placed concrete shall be cured so as to prevent loss of water by use of the methods specified. The Engineer may request that the Contractor furnish a curing plan.

The duration of the initial and final curing period in total shall continue uninterrupted for a minimum of 7 days.

(a) Curing Methods:

1. Forms-In-Place Method: Formed surfaces of concrete may be cured by retaining the forms in place without loosening. During periods of hot weather, water shall be applied to the forms until the Engineer determines that it is no longer required.
2. Water Method: Exposed concrete surfaces shall be kept continuously wet by ponding, spraying, or covering with materials that are kept continuously and thoroughly wet. Such materials may consist of cotton mats, multiple layers of burlap, or other approved materials that do not discolor or otherwise damage the concrete.
3. Waterproof Cover Method: This method shall consist of covering exposed surfaces with a waterproof sheet material to prevent moisture loss from the concrete. The concrete shall be wet at the time the cover is installed. The sheets shall be of the widest practicable width and adjacent sheets shall overlap a minimum of 6.0 inches to form a waterproof cover of the entire concrete surface and shall be adequately secured. Broken or damaged sheets shall be immediately repaired and the concrete shall be remoistened.

(b) Additional Requirements for Bridge Decks:

Curing Plan: The Contractor shall submit to the Engineer, at least 14 days prior to the placement of concrete for the bridge deck, a detailed curing plan that describes the following:

- A. the initial and final curing durations,
- B. equipment and materials to be used for curing concrete and monitoring concrete temperature,
- C. and proposed primary and secondary water and heat sources
 1. Initial Curing Period: A water fog spray shall be used by the Contractor from the time of initial placement until the final curing period begins. 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.

Should atmospheric conditions render the use of fog spray impractical, the Contractor shall request approval from the Engineer to use a curing compound that meets the requirements of M.03 in lieu of a fog spray. The application shall be in accordance with the manufacturer's recommendation and be compatible with the membrane waterproofing.

2. Final Curing: After completion of finishing and as soon as any bleed water has dissipated and the concrete reaches sufficient strength to avoid marring, the Final curing period shall begin and the entire concrete surface shall be covered with water-retaining materials such as cotton mats, multiple layers of burlap, or other materials approved by the Engineer. Materials used shall be kept saturated by means of an acceptable sprinkler or wetting system.

The Contractor may cover the wet water-retaining material with a suitable polyethylene film to minimize evaporation during the curing period. The use of the polyethylene film does not relieve the Contractor from maintaining saturation of the curing materials.

3. Temperature Monitoring: The internal temperature of the concrete shall be monitored with a calibrated continuous recording thermometer for a minimum of 7 days. The air temperature at the concrete surface or the air temperature between the concrete surface and its protective covering shall be monitored with a minimum of 1 recording thermometer.

The number and placement of the thermometers will be determined by the Engineer. A minimum of 2 thermometers per concrete placement shall be provided by the Contractor.

The following types of thermometers shall be used to monitor curing temperatures:

- i) Continuously Recording Thermometer: The thermometer shall be capable of continuously recording temperatures within a range of -4°F to 122°F for a minimum of 24 hours.
- ii) Maximum–Minimum Recording Thermometer: For all placements, the thermometer shall be capable of recording maximum and minimum temperatures in a range of -4°F to 122°F.

10. Finishing Concrete Surfaces: Any minor repairs due to fins, bulges, offsets and irregular projections shall be performed immediately following the removal of forms. For areas of newly placed concrete that are honeycombed or segregated the Contractor shall provide a written corrective procedure for review by the Engineer prior to the work being performed. Construction and expansion joints in the completed work shall be left carefully tooled and free of mortar and concrete. The joint filler shall be left exposed for its full length with clean and true edges.

The cavities produced by form ties and all other holes, broken corners or edges, and other defects shall be cleaned, saturated with water, pointed and trued with a mortar conforming to M.11.04. Cement similar in color to the exposed surface being repaired shall be added to the mortar. Mortar used in pointing shall be used within 1 hour of mixing. The concrete shall be finished as defined below if required and the cure continued as previously specified in 6.01.03-II-9, Curing Concrete.

Finishing work shall not interrupt the curing period unless permitted by the Engineer. The curing period may be extended to provide the minimum total number of days required.

Concrete surface finishes shall be classified as follows:

- (a) **Float Finish:** This finish shall be achieved by placing an excess of material in the form and removing or striking off of such excess forcing the coarse aggregate below the mortar surface. Concave surfaces in which water will be retained will not be allowed. After the concrete has been struck off, the surface shall be thoroughly worked and floated. Before this last finish has set, the surface shall be lightly stripped with a fine brush to remove the surface cement film, leaving a fine-grained, smooth, but sanded texture. Curing, as specified elsewhere, shall follow. Any surfaces that will support appurtenances such as light standards, railing, or fences shall be finished in accordance with 6.01.03-II-8, Bearing Surfaces.
- (b) **Rubbed Finish:** The initial rubbing shall only be allowed within 3 days after placement. The entire surface shall be thoroughly wet with a brush and rubbed with a No. 16 Carborundum Stone or an abrasive of equal quality, bringing the surface to a paste. The rubbing shall be continued sufficiently to remove all form marks and projections, producing a smooth, dense surface without pits or irregularities. The paste formed by the rubbing may be finished by stripping with a clean brush, or it may be spread uniformly over the surface and allowed to re-set. If all or portions of the rubbed surface are unacceptable to the Engineer or a rubbed finish is not provided within 3 days after removal of forms, the Contractor will be directed to provide a grout clean down finish.
- (c) **Grout Clean-Down Finish:** As soon as all cavities have been filled as required elsewhere and the cement mortar has set sufficiently, grout clean-down shall be performed. All burrs, unevenness, laitance, including that in air holes, and any other material which will adversely affect the bond of the grout to the concrete, shall be removed by acceptable methods. This cleaning shall be done from the top or uppermost part of the surface to be finished to the bottom.

A mixture of a fine aggregate and Portland cement shall be thoroughly blended while dry. The proportions shall be such that when mixed with the proper amount of water, the color will match that of the concrete to be finished. Water shall be added to this mixture in an amount which will bring the grout to a workable thick paint-like consistency.

The surface to be treated shall be thoroughly wetted with a sufficient amount of water to prevent the absorption of water from the grout. Grout shall then be applied to the wetted surface before setting of the grout occurs. Grout which has set shall not be re-tempered and shall be disposed of by the Contractor at no cost to the State.

The grout shall be uniformly applied over the entire surface, completely filling all air bubbles and holes. Immediately after applying the grout, the surface shall be floated with a suitable float, scouring the surface vigorously. While the grout is still plastic, all excess grout shall be removed.

After the final rubbing is completed and the surface has dried, it shall be rubbed to remove loose powder and shall be left free from all unsound patches, paste, powder, and objectionable marks. Wetting, application and removal of excess grout shall be completed in 1 work shift.

All finished surfaces shall be cured for a minimum of 24 hours. Horizontal surfaces shall have a float finish and vertical exposed surfaces shall have a rubbed finish. A grout clean down finish may be substituted for a rubbed finish as noted in this section or as directed by the Engineer.

11. Mortar, Grout, Epoxy and Joint Seal:

- (a) **Mortar and Grout:** This work consists of the making and placing of mortar and grout. At least 48 hours prior to the planned use, a copy of the installation instructions and MSDS sheets shall be provided to the Engineer for review and concurrence of their applicability and for verification of proper hole sizes in concrete structures. Such uses include mortar for filling under masonry plates, mortar used to fill voids and repair surface defects, grout used to fill sleeves for anchor bolts, and mortar and grout for other such uses where required or approved.

Concrete areas to be in contact with the mortar or grout shall be cleaned of all loose or foreign material that would in any way prevent bond, and the concrete surfaces shall be flushed with water and allowed to dry until no free-standing water is present.

The mortar or grout shall completely fill and shall be tightly packed into recesses and holes, on surfaces, under structural members, and at other locations specified. After placing, all surfaces of mortar or grout shall be cured as previously specified in 6.01.03-II-9(a)-2, for a period of not less than 3 days.

- (b) **Epoxy:** The epoxy shall be prepared and placed in accordance with the manufacturer's directions and with the equipment prescribed by the manufacturer. Instructions furnished by the supplier for the safe storage, mixing, handling and application of the epoxy shall be followed. Contents of damaged or previously opened containers shall not be used.

- (c) **Joint Seal:** This work consists of sealing joints where shown on the plans or as otherwise directed by the Engineer.

Before placement of the sealing material, the joints shall be thoroughly cleaned of all scale, loose concrete, dirt, dust or other foreign matter. Projections of concrete into the joint space shall be removed. The joint shall be clean and dry before the sealing compound is applied.

The joint sealant shall be prepared and placed in accordance with the manufacturer's directions and with the equipment prescribed by the manufacturer. The sealing compound shall be flush with, or not more than 1/8 inch above the adjacent surface of concrete, cutting off all excess compounds after the application. The joints shall be sealed in a neat and workmanlike manner and when the work is completed, the joints shall effectively seal against infiltration of moisture and water.

The Contractor shall arrange for, and have present at the commencement of the joint-sealing operation, a technically competent manufacturer's representative knowledgeable in the methods of installation of the sealant. The Contractor shall also arrange to have the representative present at such other times as the Engineer may request.

- (d) **Closed Cell Elastomer:** The closed cell elastomer shall be of the thickness specified and installed as shown on the plans and shall be in accordance with M.03.08-6.

12. Application of Loads: Loads shall not be applied to concrete structures until the concrete has attained sufficient strength and, when applicable, sufficient pre-stressing and post tensioning has been completed, so that damage will not occur. The means to determine when the concrete has attained sufficient strength shall be the use of Progression cylinders as defined elsewhere in this specification, or other means approved in advance by the Engineer.

- (a) **Earth Loads:** The placement of backfill shall not begin until the concrete is cured and has reached at least 80% of its specified strength unless otherwise permitted by the Engineer.

The sequence of placing backfill around structures shall minimize overturning or sliding forces and flexural stresses in the concrete.

- (b) Construction Loads:** Light materials and equipment may be hand carried onto bridge decks only after the concrete has been in place at least 24 hours providing curing is not interfered with and the surface texture is not damaged.

Prior to the concrete achieving its specified compressive strength, any other live or dead loads imposed on existing, new, or partially completed portions of structures, shall not exceed the reduced load carrying capacity of the structure, or portion of structure. The Contractor may be required to submit calculations to the Engineer that verify these requirements are being met. The compressive strength of concrete ($f'c$) to be used in computing the load-carrying capacity shall be the smaller of the actual field compressive strength at the time of loading or the specified design strength of the concrete. The means to determine the actual field compressive strength shall be approved by the Engineer.

For post-tensioned structures, no live or dead loads shall be allowed on any span until the steel for that span has been tensioned.

- (c)** Precast concrete or steel girders shall not be placed on substructure elements until the substructure concrete has attained 85% of its specified strength.

No load shall be allowed on mortar or grout that has been in place less than 72 hours.

- (d) Traffic Loads:** The concrete deck will not be opened to traffic until at least 14 days after the last placement of deck concrete and until such concrete has attained its specified strength.

13. Dispute Resolution: The basis of any dispute resolution is side-by-side and quality control testing by the Contractor or the Contractor's representative. The Contractor and Engineer should perform independent testing on the material to reasonably establish the true characteristics of the material at the time of delivery. Absent of Contractor QC testing, the Engineer's test results will apply to the quantity of concrete represented by the sample, not to exceed 75 c.y.

Air Content: Contractor QC Testing must be performed by personnel qualified by The American Concrete Institute as an ACI Concrete Field Testing Technician Grade 1 or higher and performed in accordance with AASHTO T-23. If the Contractor's test results vary from those of the Engineer, the Contractor shall immediately notify the Engineer of the difference and work cooperatively to determine the reasonable cause and recognize the valid test. Should there be agreement, the result of the valid test will be used for acceptance and adjustment purposes for that lot of material. Should there not be an agreement as to the valid test, an additional set of tests should be performed. Results of all valid tests on the same lot may be averaged and used for acceptance and adjustment purposes. Should the Contractor wish to perform additional QC testing on subsequent material, the lot sizes may be adjusted to the amount of material included in that specific delivery. Any such QC testing must be witnessed and agreed to by the Engineer.

Compressive Strength: Contractor QC testing for compressive strength must be performed in accordance with AASHTO T-22 by personnel approved by the Engineer. Samples used to dispute the Engineer's test results must be made simultaneously and from the same batch of concrete. Should the Contractor wish to pursue a dispute resolution with regard to compressive strength, the Contractor shall submit in writing to the Engineer all test results, control charts, or other documentation that may be useful in determining if the specific lot(s) of material met the Contract specifications. The Engineer will consider the submittal and may average specific test results on the disputed lot(s) for acceptance and adjustment purposes. Destructive testing of any

kind on the placed concrete structure will not be allowed.

III. Additional Requirements for Surface Repairs and Structural Repairs

1. Work Area Access and Shielding: Prior to removal of existing concrete, the Contractor shall provide access to the anticipated work areas so that the inspector and the Contractor may together determine and delineate the exact limits and locations of the work.

The Contractor shall design, furnish, install and remove a shield(s) to prevent debris from entering areas adjacent or beneath the work. The Contractor shall submit working drawings to the Engineer in accordance with 1.05.02. The shield(s) shall be maintained by the Contractor and remain in place during all phases of the repair work.

2. Concrete Removal: The perimeter of each area to be repaired shall be saw cut as shown on the plans. All concrete within that area shall be removed to at least 1 inch beneath any visible reinforcing steel and to sound concrete. The reinforcing steel shall not be damaged or its bond in the surrounding concrete. The Contractor must use fifteen (15) pound hammers or other methods accepted by the Engineer.

In addition to removal of concrete to a depth of 1 inch below reinforcing steel, localized areas of removal may be required if embedded galvanic anodes are specified in the Contract, to allow a minimum of 2 inches of concrete cover over the anodes.

Any steel reinforcing scheduled to be left in place that is damaged during the concrete removal process shall be replaced in accordance with 6.02 to the satisfaction of the Engineer and at the expense of the Contractor.

Corroded, missing, or broken reinforcing steel shall be replaced in accordance with 6.02 and as shown on the plans or as directed by the Engineer.

The Contractor shall perform the work in a manner that prevents debris from entering roadway lanes or areas below the structure. All debris shall be removed from the Site and disposed of by the Contractor.

3. Surface Preparation: All newly exposed surfaces of concrete shall be sandblasted and be visibly free from oil, solvent, grease, loose particles, or any other foreign matter. Exposed reinforcing steel shall be sandblasted in accordance with SSPC-SP-6, Commercial Blast Cleaning, to remove all contaminants, rust and rust scale.

4. Installation of Embedded Galvanic Anodes: After sandblasting reinforcing steel, galvanic anodes shall be embedded where shown on the plans and in accordance with the Contract.

5. Welded Wire Fabric in Vertical and Overhead Surface Repairs: Prior to installing formwork, steel welded wire fabric meeting the requirements of M.06.01-3 shall be installed at the proper depth in those areas as shown on the plans or directed by the Engineer. The fabric shall be tied to exposed reinforcing steel or anchored to sound concrete using means approved by the Engineer.

6. Formwork: Forms and support systems shall be designed in accordance with 6.01.03-II-1. Forms shall be so designed so that access is from the top of the formwork. If access is not possible from the top of the formwork, the Contractor shall submit a method of concrete placement for review by the Engineer.

7. Concrete Placement and Curing: Bonding compounds shall not be used before or during the placement of the concrete. Exposed surfaces shall be wetted with water immediately prior to placement. There shall be no excessive water on the surface or in the formwork. Light rust on sandblasted reinforcing steel can be anticipated and is acceptable.

The temperature of the air and surface to be repaired at the time of placement and curing shall be a minimum of 45°F. Concrete shall be placed and consolidated immediately with appropriate vibratory equipment.

Forms shall be kept moist and shall be left in place for a minimum of 7 days or as shown on the plans.

8. Form Removal and Sequence of Repair: Form removal shall be in accordance with 6.01.03-II-1(m) unless otherwise noted on the plans. The Contractor shall follow the sequence of repairs shown on the plans.

9. Finishing: Immediately following curing and form stripping, the exposed faces shall be finished in accordance with Subarticle 6.01.03-II-10(c) Grout Clean-Down Finish.

10. Sounding of Completed Repairs: Cured and finished areas may be sounded by the Engineer to detect the presence of subsurface voids or delamination. Such areas shall be removed and replaced by the Contractor at its expense until an acceptable repair is in place as determined by the Engineer.

11. Sealing Concrete Surfaces: After all repairs have been accepted, penetrating sealer shall be applied in accordance with the Contract to the repaired areas as well as all contiguous areas to the repair or as directed by the Engineer.

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

1. Concrete used for new construction: The quantity of concrete used for new construction will be the actual volume in cubic yards of the specified class, with the exception of underwater concrete, completed and accepted within the neat lines as shown on the plans or as ordered by the Engineer. Parapets will be measured for payment by the number of linear feet of parapet, completed and accepted. The length of parapet will be measured along the centerline of the top of the parapet.

When concrete is placed against bedrock, a maximum of 6 additional inches beyond the neat lines can be measured for payment.

No deduction will be made for panels, form liners, reinforcing bars, structural steel shapes or for pile heads. There will be no deduction made for the volume occupied by culvert and drainage pipes, scuppers, weep holes, public utility structures or any other opening, unless the surface area of any such single opening is 9 s.f. or more.

In the case of culverts or drainage pipes, the computation of the surface area will be based on the nominal diameter of the pipe, disregarding the thickness of the shell.

Miscellaneous materials necessary for completion of the work such as felt, mortar, grout, epoxy and joint seal will not be measured for payment.

Incidental work such as forming for anchor bolts, utilities, keyways, and sampling and testing will not be measured for payment.

The work to produce and administer the Concrete Quality Control Plan (CQCP) will not be measured for payment.

2. Underwater Concrete: When underwater concrete is used, it will be measured by the volume in cubic yards within the actual horizontal limits of the cofferdam and between the elevations established by the Engineer.

3. Concrete used for Surface or Structural Repairs: The quantity of concrete used for surface repairs or structural repairs will be the actual volume completed and accepted. Welded wire fabric used in repair areas will not be measured for payment.

4. Joint Filler: This material will be measured by the area in square feet of the joint filler, of the type and thickness specified, installed and accepted.

5. Closed Cell Elastomer: This material will be measured by the volume in cubic inches of elastomer, of the thickness specified, installed and accepted.

6.01.05—Basis of Payment: Payment for this work will be made as follows:

1. Concrete: Progress payments may be allowed for completed major labor elements of work such as forming, placing and curing. Prior to placement, the Contractor shall submit a proposed schedule of values for review and approval by the Engineer.

Payment for any lot of concrete allowed to remain in place will be adjusted when the field and laboratory testing of the material is completed. The quantity of concrete in each lot for new construction will be a maximum of 75 c.y. Payment for each lot of concrete will be adjusted based on the results of the acceptance testing performed by the Engineer.

The pay factors listed in Table 6.01.05-1 apply for Standard and Modified Standard Mix classes with regard to entrained air content.

Table 6.01.05-1 Entrained Air Content Pay Factors

Specified Entrained air (%)*				Pay factor (%)
6.0 +/- 1.5%		7.5 +/- 1.5%		1.00 (100)
4.3 and 4.4	7.6 and 7.7	5.8 and 5.9	9.1 and 9.2	0.98 (98)
4.1 and 4.2	7.8 and 7.9	5.6 and 5.7	9.3 and 9.4	0.96 (96)
3.9 and 4.0	8.0 and 8.1	5.4 and 5.5	9.5 and 9.6	0.94 (94)
3.7 and 3.8	8.2 and 8.3	5.2 and 5.3	9.7 and 9.8	0.92 (92)
3.5 and 3.6	8.4 and 8.5	5.0 and 5.1	9.9 and 10.0	0.90 (90)
Concrete lots with less than 3.5% or greater than 8.5% entrained air will be rejected.		Concrete lots with less than 5.0% or greater than 10% entrained air will be rejected.		
*Air content measured at time and point of placement				

The pay factors listed in Table 6.01.05-2a apply for Standard and Modified Standard Mix classes with regard to compressive strength.

Table 6.01.05-2a Compressive Strength Pay Factors

Compressive Strength (%)	Pay factor (%)
95 or greater	1.00 (100)
90 to 94.9	0.95 (95)
85 to 89.9	0.90 (90)
*Measured at 28 days	
Concrete lots with less than 85% specified strength will be rejected.	

The pay factors listed in Table 6.01.05-2b apply for Standard and Modified Standard Mix classes with regard to surface resistivity when specified in accordance with AASHTO T 358 using 4 inch × 8-inch cylinders.

Table 6.01.05-2b Permeability Pay Factors

Surface Resistivity (kΩ-cm)*	Pay factor (%)
29 or greater	1 (100)
25 to 28.9	0.85 (85)
21 to 24.9	0.75 (75)
*Measured at 56 days	
Concrete lots with resistivity values less than 21 will be rejected.	

The payment adjustment value for entrained air, 28-day strength, and permeability if applicable, for any lot of concrete for new construction that is allowed to remain in-place is determined using the formulas listed in Table 6.01.05-3a. An Index Price of \$400.00 per c.y. will be used to calculate each adjustment, except for Parapet Concrete, for which an Index Price of \$100 per l.f. will be used. The sum of the individual adjustment values will be deducted from the cubic yard or linear foot payment for the appropriate item.

Table 6.01.05-3a Payment Adjustment Formulas for New Construction

Adj (air) = (1 - air pay factor) × Index Price × lot size (c.y. or l.f.)
Adj (strength) = (1 - strength pay factor) × Index Price × lot size (c.y. or l.f.)
Adj (permeability) = (1 - permeability pay factor) × Index Price × lot size (c.y. or l.f.)
Total Adjustment = Adj (air) + Adj (strength) + Adj (permeability)

The payment adjustment value for entrained air and 28-day strength for any lot of repair concrete that is allowed to remain in-place is determined using the formulas listed in Table 6.01.05-3b. An index price of \$200.00 per c.f. shall be used to calculate each adjustment. The total adjustment value will be the sum of each individual adjustment value and will be deducted from the cubic foot payment for the appropriate item.

Table 6.01.05-3b Payment Adjustment Formulas for Repair Concrete

Adj (air) = (1 - air pay factor) × \$200/c.f. × lot size (c.f.)
Adj (strength) = (1 - strength pay factor) × \$200/c.f. × lot size (c.f.)
Total Adj = Adj (air) + Adj (strength)

The Contractor shall request permission from the Engineer to remove and replace a lot(s) of concrete to avoid a negative payment adjustment. Any replacement material will be sampled, tested and evaluated in accordance with this specification.

No direct payment will be made for any labor, equipment or materials used during the sampling and testing of the concrete for Progression or Acceptance. The cost shall be considered as included in the general cost of the work or as stated elsewhere in the Contract. The work of transporting the concrete test specimens, after initial curing, for Acceptance testing will be performed by the Department without expense to the Contractor.

This material used for new construction will be paid for at the Contract unit price per cubic yard or linear foot less any adjustments, for the specified class, complete in place, which price shall include all materials, equipment, tools, labor and work incidental thereto, including Concrete Quality Control Plan, heating, all admixtures, joint sealer, roofing felt, and any miscellaneous materials such as metal flashing and metal used in expansion joints and bearings.

2. Underwater Concrete: When this class of concrete is used, it will be paid for at the Contract unit price per cubic yard for "Underwater Concrete," complete in place, which price shall include all materials, equipment, tools, labor and work incidental thereto.

3. Concrete Used For Structural Repairs or Surface Repairs: The material used for structural repairs or surface repairs will be paid for at the Contract unit price per cubic foot less any adjustments, complete in place, which price shall include saw cutting, removing concrete, sandblasting, cleaning, forming, placing, curing, stripping, and finishing new surfaces, and all materials, equipment, tools, labor and clean-up incidental thereto.

4. Joint Filler: Expansion joint filler will be paid for at the Contract unit price per square foot for "Joint Filler for Bridges" of the type and thickness specified, complete in place, which price shall include all materials, equipment, tools, labor and work incidental thereto.

5. Closed Cell Elastomer: Closed cell elastomer will be paid for at the Contract unit price per cubic inch for "Closed Cell Elastomer" of the thickness specified, complete in place, which price shall include all materials, equipment, tools, labor and work incidental thereto.

Embedded galvanic anodes, deformed steel bars, and penetrating sealer, will be paid for separately.

Pay Item	Pay Unit
Footing Concrete	c.y.
Footing Concrete (Mass)	c.y.
Abutment and Wall Concrete	c.y.
Abutment and Wall Concrete (Mass)	c.y.
Column and Cap Concrete	c.y.
Column and Cap Concrete (Mass)	c.y.
Bridge Deck Concrete	c.y.
Bridge Deck Concrete (SIP Forms)	c.y.
Parapet Concrete	l.f.
Bridge Sidewalk Concrete	c.y.
Approach Slab Concrete	c.y.
Barrier Wall Concrete	c.y.
Underwater Concrete	c.y.
Surface Repair Concrete	c.f.
Structural Repair Concrete	c.f.
Class PCCXXYZ Concrete	c.y.
(Thickness and Type) Joint Filler for Bridges	s.f.
(Thickness) Closed Cell Elastomer	c.i.

SECTION 6.03 – STRUCTURAL STEEL

Section 6.03 is amended as follows:

6.03.03—Construction Methods: *Revise* Subarticle 4(f) “**High Strength Bolted Connections**” as follows:

Replace the first paragraph and Table A: "Minimum Bolt Tension in kips" with the following:

" The assembly of structural connections using high-strength bolts shall be installed so as to develop the minimum required bolt tension specified in Table A. The Manufacturer’s certified test report; including the rotational capacity test results must accompany the fastener assemblies. Fastener Assemblies delivered without the certified reports will be rejected.

Table A: Minimum Bolt Tension in kips*

<u>Bolt Diameter</u> <u>(Inches)</u>	<u>ASTM F3125</u> <u>Grade A325</u>	<u>ASTM F3125</u> <u>Grade A490</u>
5/8	19	24
3/4	28	35
7/8	39	49
1	51	64
1 1/8	64	80
1 1/4	81	102
1 3/8	97	121
1 1/2	118	148

*Equal to 70% of specified minimum tensile strength of bolts (as specified in ASTM Specifications for tests of full-size F3125 Grade A 325 and F3125 Grade A 490 bolts with UNC threads, loaded in axial tension) rounded to the nearest kip.

Revise the last sentence of the sixteenth paragraph, "Rotational-Capacity Tests" as follows:

" When performed in the field, the procedure shall meet the requirements of ASTM F3125 Annex A2."

In Table C, insert the word "Grade" in the third row before every occurrence of "A325" and "A490."

SECTION 6.86 – DRAINAGE PIPES, DRAINAGE PIPE ENDS

6.86.01—Description

6.86.02—Materials

6.86.03—Construction Methods

6.86.04—Method of Measurement

6.86.05—Basis of Payment

6.86.01—Description: This work shall consist of furnishing, preparing and installing drainage pipes of the size and type specified, bedding material, joint sealant, rubber gaskets, clamps, collars, grout, grout collars, drainage trench excavation, backfilling or satisfactory disposal of all materials, the removal of which is necessary for the proper completion of the work, connecting proposed drainage systems to existing systems, plugging or abandoning existing pipes and removal of existing pipe within trench limits, as shown on the plans or as directed by the Engineer.

This Section shall also include removal of drainage pipes outside of drainage trench excavation limits, as defined in 2.86.03-1.

6.86.02—Materials: The materials for this work shall meet the following requirements: Drainage Pipe, Drainage Pipe Ends, Sealers, Gaskets and connection hardware shall meet the requirements of M.08.01.

Bedding Material shall meet the requirements of M.08.03-1.

Granular Fill, if necessary, shall meet the requirements of M.02.01.

Brick Masonry shall meet the requirements of M.11.03 and Mortar shall meet the requirements of M.11.04.

Concrete used for Concrete Pipe Connections shall be Class “F” Concrete meeting the requirements of M.03.

6.86.03—Construction Methods:

(1) **Drainage Trench Excavation:** Drainage trench excavation and backfilling shall be performed in accordance with 2.86.03 and the requirements of the plans.

Where drainage pipe is to be laid below the surface, a drainage trench shall be excavated to the required depth, the bottom of which shall be graded to the elevation of the bottom of the bedding material.

Where drainage pipe is to be laid in a fill area, the embankment shall be placed and compacted to a minimum elevation 12 inches above the top of the proposed pipe, whereupon the drainage trench excavation shall be performed and the pipe installed.

(2) **Rock in Drainage Trench Excavation:** When rock, as defined in 2.86.01-2, is encountered, work shall be performed in accordance with 2.86.03 and the requirements of the plans.

(3) **Drainage Pipe Installation:** New or re-laid drainage pipes shall be installed on 4 inches of bedding material (12 inches if over rock in ledge formation), the details as shown on the plans, or as directed by the Engineer. Prior to placement of the drainage pipe, in accordance with the plans, bedding material shall be pre-shaped to 10% of the total height of the pipe in order to keep the pipe in the center of the trench. Following placement of the

drainage pipe, bedding material backfill shall be placed in accordance with the following table:

Internal Pipe Diameter	Required Bedding Material Backfill
< 48 inches*	25% of total height of the pipe
≥ 48 inches*	12 inches above the top of the pipe
*Includes pipe arch of equivalent internal horizontal span See Standard Drawing	

The placement of the drainage pipe shall start at the downstream end and progress upstream or as shown on the plans, or as directed by the Engineer. All drainage pipes shall be carefully laid in the center of the drainage trench, true to the lines and grades given. Bell ends shall face upgrade and all joints shall be tight.

Joints in concrete pipe shall be sealed with cold-applied bituminous sealer, preformed plastic gaskets or flexible, watertight, rubber-type gaskets. Portland cement mortar shall not be used for sealing pipe joints except with permission of the Engineer.

When cold-applied bituminous sealer is used, the bell and spigot ends shall be wiped clean and dry before applying the bituminous sealer to the pipe ends. Before the drainage pipes are placed in contact with each other, the spigot or tongue end shall be completely covered with bituminous sealer; then the pipe shall be laid to line and grade so the inside surface of all abutting pipes are flush. Additional bituminous sealer shall be applied to the joint after the connection has been made to ensure a water tight connection.

Where the end of an existing drainage pipe is not compatible with the end of a proposed concrete pipe, the Contractor shall align the inner diameters of the pipes being connected, butt the pipe ends together, and construct a cast-in-place concrete pipe connection, as shown in the plans. Incompatible bell/spigot or tongue/groove ends shall be cut off as required to ensure the interior drainage pipe walls are aligned to provide a smooth transition between the pipes.

Metal pipe and pipe arches shall be carefully joined and firmly clamped together by approved connecting bands, which shall be properly bolted in place before any backfill is placed.

Newly installed drainage pipe which is not in true alignment, or which shows any settlement or distortion, shall be reinstalled in accordance with 1.05.03.

When drainage pipe outside of proposed drainage trench limits is to be removed, it shall be removed to the limits shown on the plans and all remaining pipes shall be plugged with cement masonry.

Where shown on the plans or directed by the Engineer, the Contractor shall plug abandoned existing pipes with cement masonry.

- (4) **Drainage Pipe End Installation:** Reinforced concrete drainage pipe ends shall be placed on a prepared bed of the existing ground and accurately aligned as shown on the plans. The

joints shall be sealed as specified in 6.86.03-3 and backfill shall be placed around both sides of the unit simultaneously to the elevation shown on the plans.

Metal drainage pipe ends shall be placed on a prepared bed of the existing ground and accurately aligned as shown on the plans. After the attachment of the drainage pipe end, backfill shall be placed around both sides of the unit up to the elevation shown on the plans, exercising caution to avoid displacement or deformation of the unit.

6.86.04—Method of Measurement: This work will be measured as follows:

Drainage Trench Excavation, in accordance with 2.86.04, will not be measured for payment.

Rock in Drainage Trench Excavation will be measured in accordance with 2.86.04.

Bedding Material will not be measured for payment.

New and Re-laid Pipes and Pipe Arches will be measured for payment by the actual number of linear feet of pipe or pipe arch of the various sizes and types, completed and accepted and measured in place along the invert. Coupling bands and fittings for pipes and pipe arches will not be measured for payment.

Reinforced Concrete Drainage Pipe Ends and Metal Drainage Pipe Ends will be measured for payment as separate units.

Corrugated Metal Pipe Elbows (of the Size and Type specified) will be measured for payment by the actual number of linear feet of pipe elbows completed and accepted, based on 6 linear feet per elbow, as shown on the plans. Coupling bands for elbows will not be measured for payment.

Concrete Pipe Connection will be measured for payment by the number of each concrete pipe connection constructed at locations where proposed concrete pipes tie into an existing pipe with an incompatible end, completed and accepted by the Engineer.

Removal of drainage pipe outside of drainage trench excavation limits, as defined in 2.86.03, will be measured for payment by the actual number of linear feet of drainage pipe removed.

There will be no measurement for plugging existing pipes with cement masonry.

6.86.05—Basis of Payment:

Drainage Trench Excavation for the installation of drainage pipes will not be paid separately but shall be included in the Contract unit price for the respective drainage pipe or pipe end item(s), in accordance with the provisions of 2.86.05.

Rock in Drainage Trench Excavation will be paid for in accordance with the provisions of 2.86.05.

Bedding Material necessary for the installation of drainage items described herein will be included in the Contract unit price for the respective drainage pipe or pipe end item(s). Bedding material required to fill voids when rock in drainage trench is encountered will not be measured for payment but shall be included in the Contract unit price for "Rock in Drainage Trench Excavation," in accordance with 2.86.05.

New Pipes and Pipe Arches will be paid for at the Contract unit price per linear foot for "(Size and Type) Pipe (Thickness) – 0' to 10' Deep," "(Size and Type) Pipe (Thickness) – 0' to 20' Deep," "(Size) Pipe Arch (Thickness) – 0' to 10' Deep" or "(Size) Pipe Arch (Thickness) – 0' to 20' Deep" complete in place, including materials, drainage trench excavation, bedding material, equipment, tools, and labor incidental thereto.

Relaid Pipes and Pipe Arches will be paid for at the Contract unit price per linear foot for "Relaid Pipe (Size and Type) – 0' to 10' Deep," "Re-laid Pipe (Size and Type) – 0' to 20' Deep,"

"Relaid Pipe Arch (Size and Type) – 0' to 10' Deep," or "Relaid Pipe Arch (Size and Type) – 0' to 20' Deep," complete in place, including all materials, drainage trench excavation, bedding material, equipment, tools, and labor incidental thereto.

Reinforced Concrete Drainage Pipe Ends and Metal Drainage Pipe Ends will be paid for at the Contract unit price for each drainage pipe end of the Size and Type specified, complete in place, including all excavation, materials, attachment systems, equipment, tools and labor incidental thereto.

Corrugated Metal Pipe Elbows will be paid for at the Contract unit price per linear foot for "(Size and Type) Corrugated Metal Pipe Elbow" including all materials, drainage trench excavation, bedding material, equipment, tools, and labor incidental thereto.

Concrete Pipe Connection will be paid for at the Contract unit price each for "Concrete Pipe Connection" complete in place, including all materials, equipment, tools and labor incidental thereto.

Removal of drainage pipes of all types and sizes, outside of drainage trench excavation limits, as defined in 2.86.03-1, will be paid for at the Contract unit price per linear foot for "Remove Existing Pipe – 0' to 10' Deep," or "Remove Existing Pipe – 0' to 20' Deep," which price shall include excavation, temporary trench protection, backfill, and all equipment, tools and labor incidental thereto.

There will be no direct payment for the plugging of existing drainage pipes, but the cost thereof shall be included in the respective drainage Contract item(s).

Pay Item	Pay Unit
(Size and Type) Pipe (Thickness) – 0' to 10' Deep	l.f.
(Size and Type) Pipe (Thickness) – 0' to 20' Deep	l.f.
(Size and Type) Pipe Arch (Thickness) – 0' to 10' Deep	l.f.
(Size and Type) Pipe Arch (Thickness) – 0' to 20' Deep	l.f.
Relaid (Size and Type) Pipe– 0' to 10' Deep	l.f.
Relaid (Size and Type) Pipe– 0' to 20' Deep	l.f.
(Size and Type) Relaid Pipe Arch – 0' to 10' Deep	l.f.
(Size and Type) Relaid Pipe Arch – 0' to 20' Deep	l.f.
(Size) Reinforced Concrete Drainage Pipe End	ea.
(Size) Metal Drainage Pipe End	ea.
(Size and Type) Corrugated Metal Pipe Elbow	l.f.
Concrete Pipe Connection	ea.
Remove Existing Pipe – 0' to 10' Deep	l.f.
Remove Existing Pipe – 0' to 20' Deep	l.f.

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

Article 10.00.03 – Plans:

In the first paragraph, replace the 2nd, 3rd, and 4th sentences with the following:

The Contractor shall digitally mark, in red, any changes on the plan(s) using a pdf program.

The Contractor shall submit the digital pdf file(s) to the Engineer and to DOT.TrafficElectrical@ct.gov, for Traffic Signals, prior to requesting the Functional Inspection.

Also prior to requesting the Functional Inspection, the Contractor shall deliver to the Engineer the following:

In the first paragraph, last sentence, in item no. 1, replace “Four (4)” with “Digital PDF Files and Five (5)” [paper prints of schematics and wiring diagrams...].

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

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

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

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

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

SECTION 12.00 – GENERAL CLAUSES FOR HIGHWAY SIGNING

Description:

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

12.00.07 – Global Positioning System (GPS) coordinates for signs:

The Contractor shall obtain and provide to the Engineer sign installation data, including Global Positioning System (GPS) latitude and longitude coordinates, for all new permanent State owned and maintained signs (temporary and construction signs are not to be included) installed in the project. The Engineer shall forward the sign data to the Division of Traffic Engineering for upload into the Highway Sign Inventory and Maintenance Management Program (SIMS). Sign data submissions or questions relating to SIMS or GPS shall be sent to DOT-SignInventory@ct.gov.

The horizontal datum is to be set to the State Plane Coordinate System, North American Datum of 1983 (NAD83) in feet. The minimum tolerance must be within 10 feet. The format of the GPS information shall be provided in a Microsoft Office compatible spreadsheet (Excel) file with data for each sign. The record for each sign installed is to be compatible with the anticipated CTDOT Sign Inventory and Management System (CTSIMS). The following format shall be used. However, the data fields noted by “#” are not required for the project submission. These entries will be completed as part of the Traffic Engineering CTSIMS data upload.

The cost of this work shall be included in the cost of the respective sign face – sheet aluminum and sign face – extruded aluminum items. The receipt of this electronic database must be received and accepted by the Engineer prior to final payment for items involving permanent highway signing. The electronic database information shall detail information regarding the sign actually installed by the project.

<u>Field Number</u>	<u>Type</u>	<u>size</u>	<u>Description</u>
1	text	20	Record Number (starting at 1...)
2	text	20	Sign Catalog Number
# 3	text	10	Size Height
# 4	text	10	Size Width
5	text	25	Legend
# 6	text	10	Background Color
# 7	text	10	Copy Color
8	Link	25	Material (see acceptable categories)
9	text	30	Comments if any
# 10	text	20	MUTCD Type
11	text	15	Town
12	text	5	Route
13	text	5	Route direction

GENERAL

#	14	text	10	Highway Log Mileage
	15	text	15	Latitude
	16	text	15	Longitude
	17	text	25	Mounting Type
	18	text	25	Reflective Sheeting Type
	19	date	25	Date Installed
	20	text	10	Number of Posts
	21	text	255	Sheeting Manufacturer name and address
	22	text	15	State Project Number (or)
	23	text	15	Encroachment Permit number.
	24	Graphic	*	Sign Picture Graphic.

* Graphics provided shall be representative of the sign supplied and be in color. Graphic formats shall be either JPG or TIFF and provided with a recommended pixel density of 800 x 600. The graphic shall be inserted in the supplied media in field 24 for each sign.

SECTION 18.03 – IMPACT ATTENUATION SYSTEM, TEMPORARY
IMPACT ATTENUATION SYSTEM

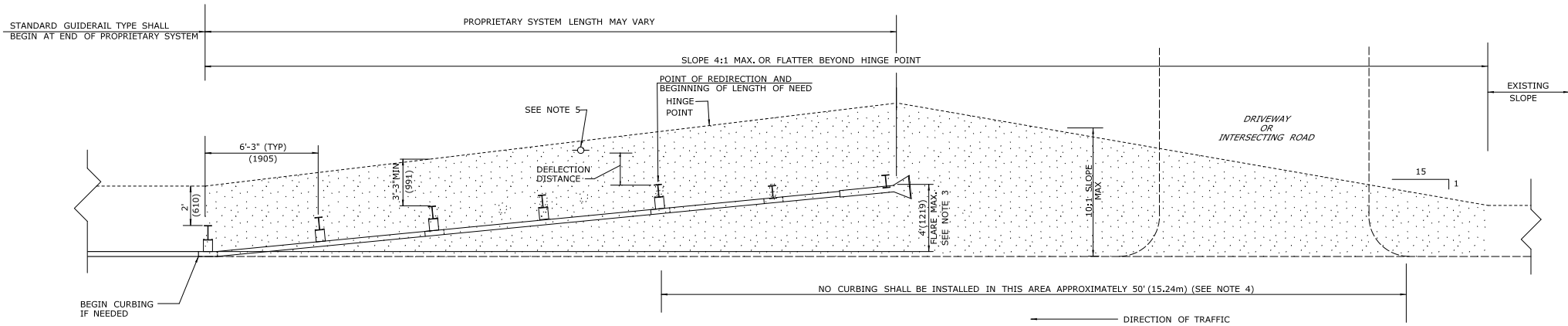
Article 18.03.03 – Construction Methods:

Add the following:

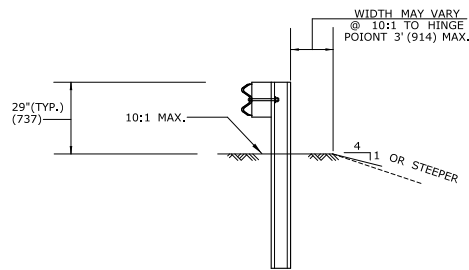
“The impact attenuation system shall be constructed in accordance with the attached drawings and based on the system type being installed.”

GENERAL NOTES:

1. THIS GRADING PLAN APPLIES TO THE LATEST VERSION OF DEPARTMENT APPROVED PROPRIETARY IMPACT ATTENUATION SYSTEM FLARED TYPES CHOSEN FROM THE DEPARTMENT'S QUALIFIED PRODUCTS LIST.
2. A MINIMUM AREA OF 75' (22.9m) LONG BY THE DESIGNATED CLEAR ZONE WIDTH IMMEDIATELY BEHIND AND BEYOND THE TERMINAL SHOULD BE FREE OF FIXED OBJECTS.
3. SEE CONSTRUCTION PLANS FOR APPROPRIATE OFFSET FOR NOSE OF SYSTEM. THE FLARE IS BASED ON THE OFFSET DESIGNATED ON THE PLANS.
4. WHEN A DRIVEWAY OR INTERSECTING ROAD IS WITHIN 5' OF THE SYSTEM, AND CURB EXISTS REMOVE CURBING UP TO POST 3. REDIRECTION BEGINS AT POST 3.
5. IF A UTILITY POLE OR FIXED OBJECT EXISTS NEAR END OF SYSTEM, THE SYSTEM SHALL BE INSTALLED SUCH THAT THE POINT OF REDIRECTION OCCURS PRIOR TO UTILITY POLE OR OBJECT. IN ADDITION, THE DEFLECTION DISTANCE NOTED IS 4'-3" FOR STANDARD W-BEAM STRONG POST GUIDERAIL INSTALLED @ A 6'-3" POST SPACING AND SHALL BE MAINTAINED. A CLEAR RUN-OUT LENGTH BEHIND THE SYSTEM FREE OF FIXED OBJECTS IS ESSENTIAL TO PROPER FUNCTIONING OF A PROPRIETARY GATING IMPACT ATTENUATION SYSTEM AND SHOULD BE STRIVED FOR.



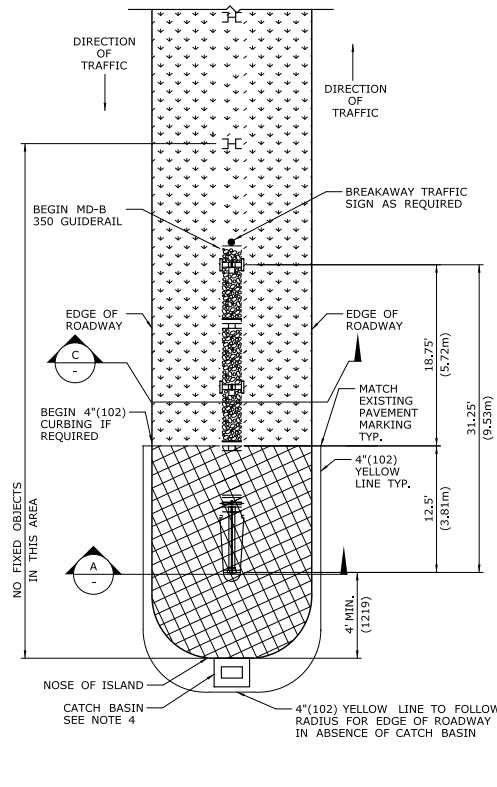
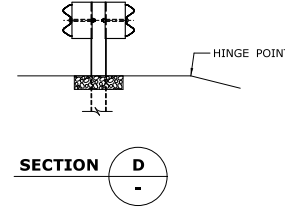
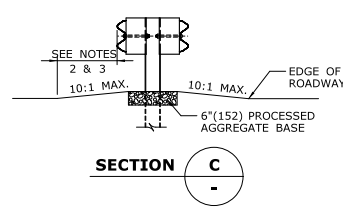
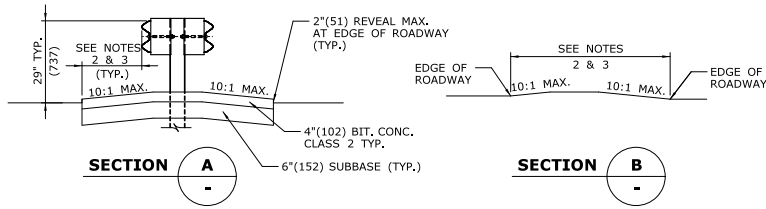
**PLAN VIEW
FLARE**



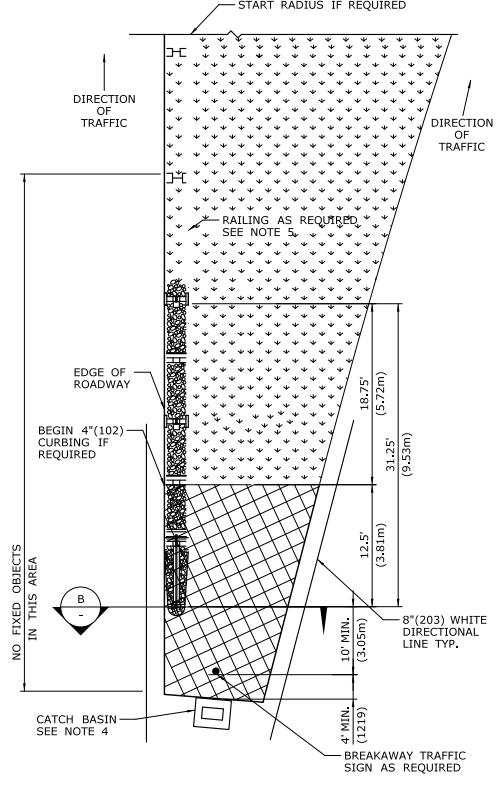
TYPICAL SECTION

GENERAL NOTES:

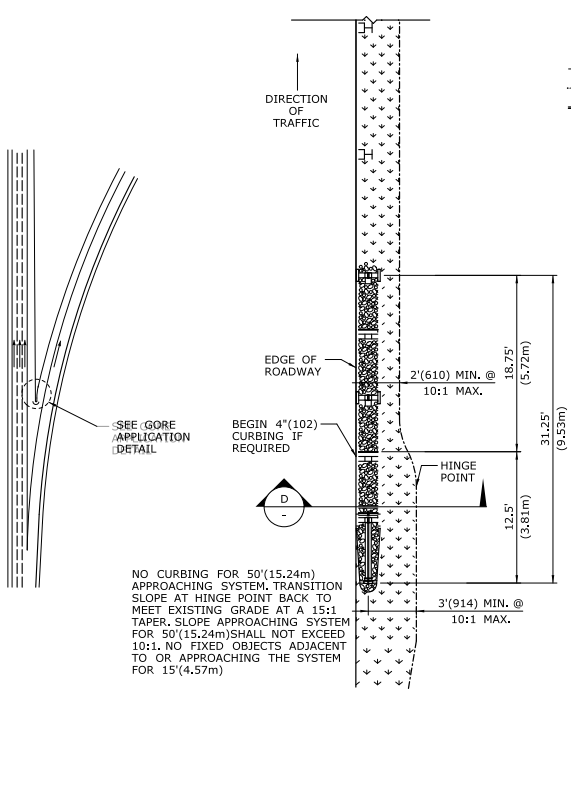
1. THIS GRADING PLAN APPLIES TO THE LATEST VERSION OF DEPARTMENT APPROVED PROPRIETARY IMPACT ATTENUATION SYSTEM MEDIAN/GORE TYPES CHOSEN FROM THE DEPARTMENT'S QUALIFIED PRODUCTS LIST.
2. WHEN THE DISTANCE FROM THE EDGE OF ROADWAY IS BETWEEN 0 AND 11.5'(3.51m) ON ONE OR BOTH SIDES OF THE SYSTEM, THE SLOPE SHALL NOT BE GREATER THAN 10:1 FOR THE ENTIRE LENGTH INCLUDING GORE OR NOSE OF ISLAND IN THE FRONT OF THE SYSTEM. IF THE SYSTEM IS A BRAKE MASTER, THE DISTANCE FROM THE EDGE OF TRAVEL WAY TO THE CENTER LINE OF THE SYSTEM ON BOTH SIDES MUST BE A MINIMUM OF 10'(3.05m).
3. WHEN THE DISTANCE FROM THE EDGE OF THE ROADWAY IS GREATER THAN 11.5'(3.51m) ON ONE OR BOTH SIDES OF THE SYSTEM, THE SLOPE SHALL NOT BE GREATER THAN 6:1 FOR THE ENTIRE LENGTH.
4. CATCH BASIN AT THIS LOCATION IF NEEDED, MUST HAVE A TYPE "C-L" TOP.
5. RAIL ON LEFT SIDE OF RAMP MAY NOT ALWAYS BE REQUIRED. IF NEEDED ON THE RAMP, IT SHOULD BE A 50'(15.24m) RADIUS OR GREATER.
6. WORK WILL BE MEASURED AND PAID FOR AT CONTRACT UNIT PRICES FOR THE VARIOUS ITEMS INVOLVED.
7. DELINEATE THE NOSE OF THE TERMINAL WITH A TYPE III RETROREFLECTIVE SHEETING IN CONFORMANCE WITH SECTION M18.09 OR AS PROVIDED BY THE MANUFACTURER.



MEDIAN ISLAND APPLICATION



GORE APPLICATION



SHOULDER APPLICATION

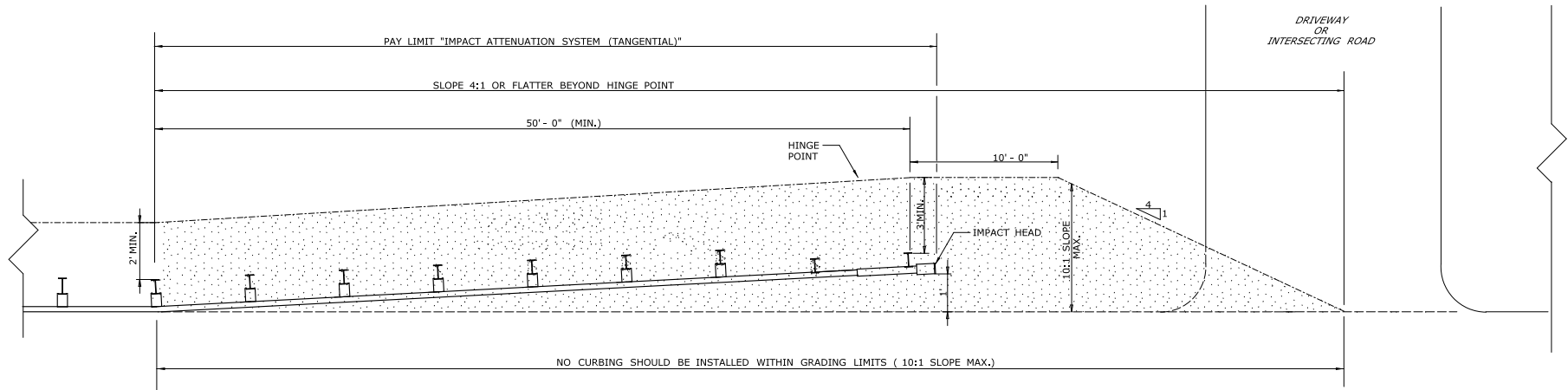
LEGEND

	NO CURBING
	2"(51) REVEAL MAX.
	4"(102) CURBING MAX.
	TURF ESTABLISHMENT
	PROCESSED AGGREGATE WELL COMPACTED
	PAVEMENT

GRADING PLAN FOR IMPACT ATTENUATION SYSTEM (MEDIAN/GORE)

GENERAL NOTE:

1. SEE TR-1205-01 FOR ATTENUATOR REFLECTOR SIGN #50-5032 TO BE INSTALLED ON THE NOSE OF THE IMPACT HEAD, THE HEIGHT AND WIDTH OF THE SHEET VARIES DEPENDING ON THE SIZE OF THE NOSE OF THE IMPACT HEAD. REFLECTOR SIGN SHALL COVER THE ENTIRE SURFACE AREA OF THE IMPACT HEAD.



Plan

IMPACT ATTENUATION SYSTEM (TANGENTIAL)

SECTION M.03 – PORTLAND CEMENT CONCRETE

Replace Section M.03 in its entirety with the following:

M.03.01—Component Materials

M.03.02—Mix Design Requirements

M.03.03—Producer Equipment and Production Requirements

M.03.04—Curing Materials

M.03.05—Non Shrink, Non Staining Grout

M.03.06—Expansive Cement for Anchoring

M.03.07—Chemical Anchors

M.03.08—Joint Materials

M.03.09—Protective Compound/Sealers

M.03.10—Formwork

M.03.01—Component Materials

1. Coarse Aggregate: Coarse aggregate shall meet the requirements of M.01.

2. Fine Aggregate: Fine aggregate shall meet the requirements of M.01.

3. Cement:

(a) Portland: Types I, II, and III Portland cement shall meet the requirements of AASHTO M 85. Type I and Type III Portland cement shall be used only when required or expressly permitted by the Project specification or the Engineer. The use of Type I or III will require that these mixtures be submitted as Non-standard Mix Designs. All cement shall be provided by a mill participating in the Departments' Cement Certification program. The requirements of the Certification Program are detailed in the Departments' Quality Assurance Program for Materials.

(b) Pre-Blended Cements: Binary or Ternary cements consisting of Portland Cement and supplemental cementitious materials may be used provided that all the requirements of M.03.01- 3(a) and -3(c) are met.

(c) Replacement Materials: Unless already approved as a Standard Mix Design, any Contractor proposed Mix Designs with partial replacement of Portland Cement (PC) with fly ash or ground granulated blast furnace slag (GGBFS), shall be submitted in writing to the Engineer for approval prior to the start of work, on a project-by-project basis. The type of material, source, and the percentage of the PC replaced shall be clearly indicated. Upon request, a Certified Test Report for the cement replacement material shall be provided to the Engineer for use during the Mix Design review.

1. Fly Ash: Fly ash to be used as a partial replacement for Portland cement shall meet the requirements of AASHTO M 295, either Class C or Class F, including the uniformity requirements of Table 2A. Loss on Ignition for either class of fly ash shall not exceed 4.0%. Fly ash may be used to replace up to a maximum of 20% of the required Portland cement for mixes without permeability requirements. For mixes with permeability requirements, the maximum of 20% may be exceeded. The fly ash shall be substituted on a weight basis, with a minimum of 1 lb. of fly ash for 1 lb. of Portland cement. Different classes of fly ash or the same class from different sources shall not be permitted on any single project without the written approval of the Engineer.

2. Ground Granulated Blast Furnace Slag (GGBFS): GGBFS used as a partial replacement for Portland cement shall meet the requirements of AASHTO M 302/ASTM C989, Grade 100 or 120. As determined by the Engineer, GGBFS may be used to replace a maximum of 30% of the required Portland cement for mixes without permeability requirements. For mixes with permeability requirements, the maximum of 30% may be exceeded. The Engineer may restrict or prohibit the use of GGBFS if ambient temperatures anticipated during the placement and initial curing of the concrete are low. The GGBFS shall be substituted on a weight basis, with a minimum of 1 lb. of slag for 1 lb. of Portland cement. Different sources of GGBFS shall not be permitted on any single project without the written approval of the Engineer.

4. Water: All water used in the mixing of concrete shall be odorless and clear in appearance. Surface water may be used if not taken from shallow or muddy sources; classified as Class C or Class D on the Department of Energy and Environmental Protection (DEEP) Water Quality Classification mapping; and accommodations have been made to prevent contaminants from entering the supply to the satisfaction of the Engineer. The Engineer may request that water from any surface or ground source be tested in accordance with AASHTO T26 and AASHTO D512 if the appearance or scent of the water is suspect. To be acceptable, the pH of the water must not be less than 6.0 or greater than 8.0 and Chloride Ion Concentration of the water must not exceed 250ppm. Potable water taken directly from a municipal or regional water supply may be used for mixing concrete without testing. Heating or cooling of water may be required to meet mix temperature requirements at time of placement.

5. Admixtures: All admixtures shall perform their function without injurious effects upon the concrete. If requested by the TDC, the Contractor shall present a certified statement from a recognized laboratory attesting to this requirement. A "recognized" laboratory is any cement and concrete laboratory approved and inspected regularly by the Cement and Concrete Reference Laboratory (CCRL). The statement shall contain results of compression tests of cylinder specimens made with concrete utilizing the admixture(s) in proportions equal to those proposed by the Contractor. The results of at least 5 standard 6 inch x 12 inch cylinders of each mix design shall be listed with the results of at least 5 like-sized cylinders not utilizing the admixture(s). Specimens must be made and cured in the laboratory in accordance with AASHTO T 126 and will be tested in accordance with AASHTO T 22.

- (a) **Air-Entraining Admixtures:** In the event that air entrained concrete is required, an admixture meeting the requirements of AASHTO M 154 may be used. Tests for 7 and 28-day compressive and flexural strengths and resistance to freezing and thawing are required whereas tests for bleeding, bond strength and volume change will not be required.
- (b) **Other Chemical Admixtures:** In the event that concrete properties are specified that require the use of additional admixtures, or the Contractor proposes the use of additional admixtures to facilitate placement, the admixtures shall meet the requirements of AASHTO M194M/M, including the 1 year performance data.

M.03.02—Mix Design Requirements

1. Standard ConnDOT Mix Designs: Standard Mix Designs shall be designed in accordance with applicable sections of ACI 211 and ACI 318. The mixtures shall consist of Portland cement, fine aggregate, coarse aggregate, admixtures, and water proportioned in accordance with Table M.03.02-1. The mixtures shall also be designed to obtain the plastic properties of Portland cement concrete as specified in Table 6.01.03-2.

Table M.03.02-1 Standard Portland Cement Concrete Mixes

Class ¹	Max. Water/Cement ² ratio	Min. Cement ² Content - lb./c.y.	Air Content %	Electrical Resistivity (Permeability)
				kΩ-cm AASHTO T 358
PCC0223Z	0.69	455	6 +/- 1.5	NA
PCC0334Z	0.48	615		NA
PCC0336Z	0.50	564		NA
PCC0354Z	0.49	615		NA
PCC0446Z	0.44	658		NA
PCC04462	0.42			29 minimum
PCC0556Z	0.40			NA
PCC05562	0.40			29 minimum
PCCXXX81 ³	0.46		7.5 +/- 1.5	15 maximum
PCCXXX82	0.40			29 minimum

¹ PCCXYZ where:

PCC = Portland Cement Concrete

XXX = 28-day minimum compressive strength (psi/100)

Y = Nominal Maximum Aggregate Size (U.S. Sieve No. Designation)

Z = Exposure Factor (See Table M.03.02-1a)

² Portland Cement may be partially replaced within a Standard Mix Design by other approved cementitious material meeting the requirements of M.03.01-3(c) if permitted by the Engineer.

³ When this class is paid for in a surface or structural repair concrete item, the plastic properties necessary for confined placement to ensure appropriate workability for consolidation within the forms shall be noted on the delivery ticket by the concrete supplier.

Table M.03.02-1a Exposure Factor per Application

Exposure		Application
0	Benign	Elements not exposed to weather (buried, enclosed)
1	Moderate	Elements not in contact with salt water or deicing chemicals
2	Severe	Elements in contact with salt water, deicing chemicals, flowing/standing water

Mix designs shall indicate the dosage of admixtures anticipated to provide plastic properties required in the Project specification. Plastic properties of standard mix classes of concrete in the plastic state are listed in Table 6.01.03-2.

Standard Mix Designs are required to be designed and submitted by the concrete producers, and are approved by the Department on a standing basis. Submittal or re-approval of these Standard Mix Designs on an annual basis is not required. Previously approved producer-designed Standard Mixes that have a record of satisfactory performance may be utilized on Department projects unless there is a change in the gravimetric properties or the sources of any materials. Revisions to the Standard Mix Designs, which include changes in component sources, can be submitted at any time to the TDC, but must be approved prior to use on Department projects.

2. Non-Standard CTDOT Mix Designs: Any proposed Mix Designs that do not comply with Table M.03.02-1 are required to be submitted 15 days prior to use on a project-by-project basis and be approved by the TDC prior to use. The use of an approved admixture with an otherwise approved Standard Mix Design is not considered non-standard.

All Non-standard Mix Designs used for load-bearing structures shall contain a minimum of 658 lb./c.y. of cementitious materials.

Concrete used in applications such as flowable fill or controlled low-strength material may be designed with less than 658 lb./c.y. of cementitious materials.

M.03.03—Producer Equipment and Production Requirements

1. General Requirements: The source of the concrete must be approved by the Engineer prior to use on Department projects. Specifically the location and capacity of the central mix or dry batch plant, and complement of truck mixers/haulers, shall be adequate for continuous placement of concrete on a typical Department project. Approval may be revoked at any time in accordance with 1.06.01.

- (a) **Inspection:** The production facility supplying hydraulic cement concrete shall have a current Certification of Ready Mixed Concrete Production Facilities from the National Ready Mixed Concrete Association (NRMCA), or equivalent certification approved by the Engineer.
- (b) In addition to the requirements of approved third party certification, the facility shall produce batch tickets that meet the requirements of 6.01.03-3(a).
- (c) **Quality Control:** The Contractor is responsible for all aspects of Quality Control (QC). As determined by the Engineer, should material delivered to a project not meet specification, the Contractor may be required to submit to the Engineer a corrective procedure for approval within 3 calendar days. The procedure shall address any minor adjustments or corrections made to the equipment or procedures at the facility.
- (d) **Suspension:** As determined by the Engineer, repeated or frequent delivery of deficient material to a Department project may be grounds for suspension of that source of material. A detailed QC plan that describes all QC policies and procedures for that facility may be

required to formally address quality issues. This plan must be approved by the Engineer and fully implemented, prior to reinstatement of that facility.

2. Hand Mixed Concrete: Hand mixing shall be permitted only with the permission of the Engineer. Hand mixed batches shall not exceed 1/2 c.y. in volume. Hand mixing will not be permitted for concrete to be placed under water.

M.03.04—Curing Materials

1. Water: Any water source deemed acceptable by the Engineer for mixing concrete may be used to provide water for curing purposes. Surface water may be used if classified as Class C or Class D on the Department of Energy and Environmental Protection (DEEP) Water Quality Classification mapping and accommodations have been made to prevent contaminants from entering the supply to the satisfaction of the Engineer. In general, water shall not be taken from shallow or muddy sources. In cases where sources of supply are relatively shallow, the intake pipe shall be enclosed to exclude silt, mud, grass, etc.; and the water in the enclosure shall be maintained at a depth of not less than 2 feet under the intake pipe.

2. Mats: Mats for curing concrete shall be capable of maintaining moisture uniformly on the surface of the concrete. The mats shall not contain any materials such as dyes, sugar, etc., that may be injurious to the concrete.

The length or width of the mats shall be sufficient to cover all concrete surfaces being cured. Should more than one mat be required, sufficient overlap shall be provided by the Contractor as determined by the Engineer.

3. Liquid Membrane-Forming Compound: Liquid membrane-forming compound shall meet the requirements of AASHTO M 148 Type 2, Class B, or shall be a water-soluble linseed oil-based compound meeting the requirements of AASHTO M 148, Type 2.

4. White Polyethylene Sheeting (Film): White polyethylene sheeting (film) shall meet the requirements of AASHTO M 171.

M.03.05—Non Shrink, Non Staining Grout

1. Bagged (pre-mixed): Bagged (pre-mixed) formulations of non-shrink grout shall meet the requirements of ASTM C1107. The grout shall be mixed with potable water for use. The grout shall be mixed to a flowable consistency as determined by ASTM C230. All bagged material 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.

2. Bulk: The Contractor may formulate and design a grout mix for use on the Project in lieu of using a pre-bagged product. The Contractor shall obtain prior written approval of the Engineer for any such proposed Mix Design. Any such Mix Design shall include the proportions of hydraulic cement, potable water, fine aggregates, expansive agent, and any other necessary additive or admixture. This material shall meet all of the same chemical and physical requirements as shall the pre-bagged grout, in accordance with ASTM C1107.

M.03.06—Expansive Cement for Anchoring

The premixed anchoring cement shall be non-metallic, concrete gray in color and prepackaged. The mix shall consist of hydraulic cement, fine aggregate, expansive admixtures and water meeting the following requirements:

1. The anchoring cement shall have a minimum 24 hour compressive strength of 2,600 psi when tested in accordance with ASTM C109.

2. The water content of the anchoring cement shall be as recommended by the manufacturer. Water shall meet the requirements of M.03.01-4.

The Contractor shall provide a Certified Test Report and Materials Certificate for the premixed anchoring cement in accordance with 1.06.07. The Contractor shall also provide, when requested by the Engineer, samples of the premixed anchoring cement for testing and approval.

M.03.07—Chemical Anchors

Chemical anchor material must be listed on the Departments' Qualified Products List and approved by the Engineer for the specified use.

The chemical anchor material shall be epoxy or polyester polymer resin. It shall not contain any metals or other products that promote corrosion of steel. The Contractor shall supply the Engineer with a Certified Test Report and Materials Certificate for the chemical anchor material in accordance with 1.06.07. When requested by the Engineer, the Contractor shall also provide samples of the chemical anchor material.

M.03.08—Joint Materials

1. Transverse Joints for Concrete Pavement: Transverse joints shall consist of corrosion resistant load transfer devices, poured joint seal and in addition, in the case of expansion joints, expansion joint filler all meeting the following requirements:

- (a) The corrosion resistant load transfer device shall be coated steel or sleeved steel or be made of corrosion resistant material. The dimensions of any devices used shall be as shown on the plans, exclusive of any coating or sleeving. Core material of coated or sleeved metallic devices shall be steel meeting the requirements of AASHTO M 255M/M 255 Grade 520, or steel having equal or better properties and approved by the Engineer. Nonmetallic devices shall meet the various strength requirements applicable to metallic devices as well as all other requirements stated herein.
- (b) All coated load transfer devices shall meet the requirements of AASHTO M 254. Uncoated or sleeved load transfer devices shall meet the applicable physical requirements of AASHTO M 254. The use of field applied bond breakers will not be permitted.
- (c) The basis of acceptance for corrosion resistant load transfer devices shall be the submission by the Contractor of a minimum of 2 samples accompanied by Certified Test Reports meeting the requirements of 1.06.07 demonstrating that the load transfer device meets the requirements of AASHTO M 254 for the type of device supplied. The Engineer reserves the right to reject any load transfer device deemed unsatisfactory for use.

2. Joint Filler for Concrete Curbing: Expansion joint filler shall be either preformed expansion joint filler or wood joint filler as indicated on the plans and shall meet the following requirements:

- (a) Preformed expansion joint filler shall be the bituminous cellular type and shall meet the requirements of AASHTO M 213.
- (b) Boards for wood joint filler shall have 2 planed sides and shall be redwood, cypress or white pine. Redwood and cypress boards shall be of sound heartwood. White pine boards shall be of sound sapwood. Occasional small, sound knots and medium surface checks will be permitted provided the board is free of any defects that will impair its usefulness for the purpose intended. The joint filler may be composed of more than one length of board in the length of the joint, but no board of a length less than 6 feet shall be used; and the

separate boards shall be held securely to form a straight joint. Boards composed of pieces that are jointed and glued shall be considered as one board.

- (c) Dimensions shall be as specified or shown on the plans; and tolerances of plus 1/16 inch thickness, plus 1/8 inch depth and plus 1/4 inch length will be permitted.
- (d) All wood joint filler boards shall be given a preservative treatment by brushing with creosote oil meeting the requirements of AASHTO M 133. After treatment, the boards shall be stacked in piles, each layer separated from the next by spacers at least 1/4 inch thick; and the boards shall not be used until 24 hours after treatment. Prior to concreting, all exposed surfaces of the wood filler shall be given a light brush coating of form oil.
- (e) Testing of board expansion joint filler shall be in accordance with pertinent sections of AASHTO T 42.

3. Longitudinal Joint Devices: The metal used in the fabrication of longitudinal joint devices shall meet ASTM requirements for each type of metal used. The dimensions shall be as shown on the plans.

4. Expansion Joint Fillers for Bridges and Bridge Bearings:

- (a) Preformed expansion joint filler for bridges shall meet the requirements of AASHTO M 153, Type I or Type II.
- (b) Pre-molded expansion joint filler for bridge bearings shall meet the requirements of AASHTO M 33.

5. Joint Sealants:

(a) **Joint Sealer for Pavement:** The joint sealer for pavement shall be a rubber compound of the hot-poured type and shall meet the requirements of AASHTO M 324 Type II unless otherwise noted on the plans or in the special provisions.

(b) **Joint Sealer for Structures:** Structure joint sealers shall be one of the following type sealants:

1. Where "Joint Seal" is specified on the plans, it shall meet the requirements of the Federal Specifications SS-S-200-E (Self-leveling type), TT-S-0227E (COM-NBS) Type II-Class A (Non-sag type), or 1 component polyurethane-base elastomeric sealants conforming to FS TT-S-00230C Type II-Class A or an approved equal.

A Certified Test Report will be required in accordance with 1.06.07, certifying that the sealant meets the requirements set forth in the Federal Specification. Should the consignee noted on a Certified Test Report be other than the Prime Contractor, a Materials Certificate shall be required to identify the shipment.

2. Where "Silicone Joint Sealant" is specified on the plans, it shall be one of the following or an approved equal:
 - i. Sealant, manufactured by the Dow Corning Corporation, Midland, Michigan 48686-0994
 - ii. Dow Corning 888 Silicone Joint Sealant or
 - iii. Dow Corning 888-SL Self-Leveling Silicone Joint 48686-0994

6. Closed Cell Elastomer: The closed cell elastomer shall meet the requirements of ASTM D1056, Grade RE-41 B2. The elastomer shall have a pressure-sensitive adhesive backing on one side.

The Contractor shall deliver the closed cell elastomer to the job site a minimum of 30 days prior to installation. Prior to the delivery of the closed cell elastomer, the Contractor shall notify the Engineer of the date of shipment and the expected date of delivery. Upon delivery of the closed cell elastomer to the job site, the Contractor shall immediately notify the Engineer.

Each separate length, roll or container shall be clearly tagged or marked with the manufacturer's name, trademark and lot number. A lot is defined as that amount of closed cell elastomer manufactured at 1 time from 1 batch of elastomer. A batch is defined as that amount of elastomer prepared and compounded at 1 time. The Contractor shall furnish a Certified Test Report in accordance with 1.06.07, confirming that the closed cell elastomer meets the requirements set forth in these specifications. Should the co-signee noted on a Certified Test Report be other than the Prime Contractor, a Materials Certificate shall be required to identify shipment.

The Contractor shall furnish a 1 foot length of closed cell elastomer in each lot for purposes of inspection and testing by the Engineer. The Engineer will cut a 1 foot sample from each lot and inspect the sample for conformance to size, and perform physical tests on the sample as deemed necessary.

The Engineer shall reject any lot or portion of a lot that does not meet the requirements stated herein. A rejected lot or portion of a lot may be resubmitted provided the Contractor has removed or corrected, in a manner acceptable to the Engineer, all non-conforming material.

M.03.09—Protective Compound/Sealers

The brand and type of material must be listed on the Department's Qualified Products List and approved by the Engineer for the specified use.

M.03.10—Formwork

1. Stay-in-place Forms: Material for stay-in-place metal forms shall be made of zinc-coated (galvanized) steel sheet meeting ASTM Specification A653 (Structural Steel (SS) Grade 33 through 80). The minimum thickness shall be 20 gauge. Coating weight shall meet the requirements of ASTM A924, Class G235, and shall otherwise meet all requirements relevant to steel stay-in-place metal forms and the placing of concrete as specified herein and as noted in the Contract.

Form supports shall either be fabricated and meet the same material requirements as the forms, or be fabricated from structural steel meeting the requirements of ASTM A36 and shall be hot-dip galvanized in accordance with ASTM A123.

Lightweight filler material for forms shall be as recommended by the form manufacturer.

2. Temporary Forms and Falsework: Forms and Falsework shall be of wood, steel or other material approved by the Engineer. This approval does not relieve the Contractor from employing adequately sized materials of sufficient rigidity to prevent objectionable distortion of the formed concrete surfaces caused by pressure of the plastic concrete and other loads incidental to the construction operations.

SECTION M.04 – BITUMINOUS CONCRETE MATERIALS

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, Plant, and laboratory used to produce and test bituminous concrete must be qualified on an annual basis by the Engineer. AASHTO or ASTM Standards noted with an (M) have been modified and are detailed in Table M.04.03-5.

Aggregates from multiple sources of supply must not be blended or stored in the same stockpile.

1. Coarse Aggregate: All coarse aggregate shall meet the requirements listed in M.01.

2. Fine Aggregate: All fine aggregate shall meet the requirements listed in M.01.

3. Mineral Filler: Mineral filler shall conform to the requirements of AASHTO M 17.

4. Performance Graded (PG) Asphalt Binder:

(a) General:

- i. PG asphalt binder shall be uniformly mixed and blended and be free of contaminants such as fuel oils and other solvents. Binder shall be properly heated and stored to prevent damage or separation.
- ii. The binder shall meet the requirements of AASHTO M 332 and shall be graded or verified in accordance with AASHTO R 29. 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. 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 is accompanied by a statement certifying that the transport vehicle was inspected before loading was found acceptable for the material shipped and that the binder is free of contamination from any residual material, along with 2 copies of the bill of lading.
- iv. The blending or combining of PG binders in 1 storage tank at the Plant from different suppliers, grades, or additive percentages is prohibited.

(b) 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) may supply PG binders to Department projects.

(c) Standard Performance Grade (PG) Binder:

- i. Standard PG binder shall be defined as “Neat.” Neat PG binders shall be free from modification with: fillers, extenders, reinforcing agents, adhesion promoters,

thermoplastic polymers, acid modification and other additives such as re-refined motor oil, and shall indicate such information on each bill of lading and Certified Test Report.

ii. The standard asphalt binder shall be PG 64S-22.

(d) Modified Performance Grade (PG) Binder: The modified asphalt binder shall be Performance Grade PG 64E-22 asphalt modified solely 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 332 (including Appendix X1) and AASHTO R 29.

(e) Warm Mix Additive or Technology:

- i. The warm mix additive or technology must be listed on the North East Asphalt User Producer Group (NEAUPG) Qualified Warm Mix Asphalt (WMA) Technologies List at the time of bid, which may be accessed online at <http://www.neaupg.uconn.edu>.
- 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 332 and shall be graded or verified in accordance with AASHTO R 29 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.

5. Emulsified Asphalts:

(a) General:

- i. The emulsified asphalt shall meet the requirements of AASHTO M 140(M) or AASHTO M 208 as applicable.
- ii. The emulsified asphalts shall be free of contaminants such as fuel oils and other solvents.
- iii. The blending at mixing Plants of emulsified asphalts from different suppliers is prohibited.

(b) Basis of Approval:

- i. The request for approval of the source of supply shall list the location where the material is manufactured, the handling and storage methods, and certifications in accordance with AASHTO R 77. Only suppliers that have an approved "Quality Control Plan for Emulsified Asphalt" formatted in accordance with AASHTO R 77 and that submit monthly split samples per grade to the Engineer may supply emulsified asphalt to Department projects.
- ii. Each shipment of emulsified asphalt delivered to the Project site shall be accompanied with the corresponding Certified Test Report listing Saybolt viscosity, residue by evaporation, penetration of residue, and weight per gallon at 77°F and Material Certificate.
- iii. Anionic emulsified asphalts shall meet the requirements of AASHTO M-140. Materials

used for tack coat shall not be diluted and meet grade RS-1 or RS-1h. When ambient temperatures are 80°F and rising, grade SS-1 or SS-1h may be substituted if permitted by the Engineer.

- iv. Cationic emulsified asphalt shall meet the requirements of AASHTO M-208. 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 permitted by the Engineer.

6. Reclaimed Asphalt Pavement (RAP):

(a) General: RAP is a material obtained from the cold milling or removal and processing of bituminous concrete pavement. RAP material shall be crushed to 100% passing the 1/2 inch sieve and free from contaminants such as joint compound, wood, plastic, and metals.

(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 request approval from the Engineer at least 30 calendar days prior to the start of the paving operation. The request shall include a Material Certificate and applicable test results stating that the RAP consists of aggregates that meet the specification requirements of M.04.01-1 through M.04.01-3 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-lb. sample of the RAP to be incorporated into the recycled mixture.
 - 2. A 25-lb. sample of the extracted aggregate from the RAP.

7. 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 conforms to the following gradation:

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

The Contractor shall submit a Material Certificate to the Engineer stating that the CRCG complies with all the applicable requirements in this Section.

8. Joint Seal Material: Joint seal material must meet the requirements of ASTM D6690 - Type 2. The Contractor shall submit a Material Certificate in accordance with 1.06.07 certifying that the joint seal material meets the requirements of this Section.

9. Recycled Asphalt Shingles (RAS): RAS shall consist of processed asphalt roofing shingles from post-consumer asphalt shingles or from manufactured shingle waste. The RAS material under consideration for use in bituminous concrete mixtures must be certified as being asbestos-free and shall be entirely free of whole, intact nails. The RAS material shall meet the requirements of AASHTO MP 23.

The Producer shall test the RAS material to determine the asphalt content and the gradation of the RAS material. The Producer shall take necessary action to prevent contamination of RAS stockpiles.

The Contractor shall submit a Material Certificate to the Engineer stating that the RAS complies with all the applicable requirements in this Section.

10. Plant Requirements:

(a) General: The Plant producing bituminous concrete shall comply with AASHTO M 156.

(b) Storage Silos: The Contractor may use silos for short-term storage with the approval of the Engineer. A storage silo must have heated cones and an unheated silo cylinder if it does not contain a separate internal heating system. When multiple silos are filled, the Contractor shall discharge 1 silo at a time. Simultaneous discharge of multiple silos for the same Project is not permitted.

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

*Not to exceed HMA limits

(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 Plant ticket, as specified herein.

If recycled materials are used, the Plant tickets shall include their dry weight, percentage, and daily moisture content.

If a WMA Technology is added at the Plant, the Plant tickets shall include the actual dosage rate.

For drum Plants, the Plant ticket shall be produced at 5 minute intervals and maintained by the vendor for a period of 3 years after the completion of the Project.

For batch Plants, the Plant ticket shall be produced for each bath and maintained by the vendor for a period of 3 years after the completion of the Project. In addition, an asterisk (*)

shall be automatically printed next to any individual batch weight(s) exceeding the following tolerances:

Each Aggregate Component	±1.5% of individual or cumulative target weight for each bin
Mineral Filler	±0.5% of the total batch
Bituminous Material	±0.1% of the total batch
Zero Return (Aggregate)	±0.5% of the total batch
Zero Return (Bituminous Material)	±0.1% of the total batch

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.

The scales shall not be 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.

(d) Aggregates: Aggregate stockpiles shall be managed to prevent segregation and cross contamination. For drum Plants only, the percent moisture content, at a minimum prior to production and half way through production, shall be determined.

(e) Mixture: The dry and wet mix times shall be sufficient to provide a uniform mixture and a minimum particle coating of 95% as determined by AASTO T 195(M).

Bituminous concrete mixtures shall contain no more than 0.5% moisture when tested in accordance with AASHTO T 329.

(f) RAP: RAP moisture content shall be determined a minimum of twice daily (prior to production and halfway through production).

(g) Asphalt Binder: A binder log shall be submitted to the Department's Central Lab on a monthly basis.

(h) Warm mix additive: For mechanically foamed WMA, the water injection rate shall be monitored during production and not exceed 2.0% by total weight of binder. For additive added at the Plant, the dosage rate shall be monitored during production.

(i) Testing Laboratory: The Contractor shall maintain a laboratory to test bituminous concrete mixtures during production. The laboratory shall have a minimum of 300 s.f., have a potable water source and drainage in accordance with the CT Department of Public Health Drinking Water Division, and 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 and a functioning web browser with unrestricted access to <https://ctmail.ct.gov>. This equipment shall be maintained in working order at all times and be made available for use by the Engineer.

The laboratory shall be equipped with a 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. Sufficient light and ventilation must be provided. During summer months

adequate cooling or ventilation must be provided so the indoor air temperature shall not exceed the ambient outdoor temperature.

The laboratory testing apparatus, supplies, and safety equipment shall be capable of performing all the applicable tests in their entirety that are referenced in AASHTO R 35 and AASHTO M 323. 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, and 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 laboratory. The Contractor shall take immediate action to replace, repair, 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. Curb Mix:

(a) Requirements: The Contractor shall use bituminous concrete that meets the requirements of Table M.04.02-1. RAP may be used in 5% increments by weight up to 30%.

(b) Basis of Approval: Annually, an approved JMF based on a mix design for curb mix must be on file with the Engineer prior to use.

The Contractor shall test the 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. 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.

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.

Any change in component source of supply or consensus properties must be approved by the Engineer. A revised JMF shall be submitted prior to use.

**TABLE M.04.02-1:
Control Points for Curb Mix Mixtures**

Mix	Curb Mix	Production Tolerances from JMF Target
Grade of PG Binder content %	PG 64S-22 6.5 - 9.0	0.4
Sieve Size		
No. 200	3.0 - 8.0 (b)	2.0
No. 50	10 - 30	4
No. 30	20 - 40	5
No. 8	40 - 70	6
No. 4	65 - 87	7
1/4 inch		
3/8 inch	95 - 100	8
1/2 inch	100	8
3/4 inch		8
1 inch		
2 inch		
Additionally, the fraction of material retained between any 2 consecutive sieves shall not be less than 4%.		
Mixture Temperature		
Binder	325°F maximum	
Aggregate	280-350°F	
Mixtures	265-325°F	
Mixture Properties		
Air Voids (VA) %	0 – 4.0 (a)	
Notes: (a) Compaction Parameter 50 gyrations (N _{des}) (b) The percent passing the No. 200 sieve shall not exceed the percentage of bituminous asphalt binder.		

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

(a) **Requirements:** All designated mixes shall be designed using the Superpave mix design method in accordance with AASHTO R 35. A JMF based on the mix design shall meet the requirements of Tables M.04.02-2 to M.04.02-5. Each JMF and component samples must be submitted no less than 7 days prior to production and must be approved by the Engineer prior to use. All JMFs expire at the end of the calendar year.

All aggregate component consensus properties and tensile strength ratio (TSR) specimens shall be tested at an AASHTO Materials Reference Laboratory (AMRL) by NETTCP Certified Technicians.

All bituminous concrete mixes shall be tested for stripping susceptibility by performing the TSR test procedure in accordance with AASHTO T 283(M) at a minimum every 36 months. The compacted specimens may be fabricated at the Plant and then tested at an AMRL accredited facility. A minimum of 45000 grams of laboratory or plant blended mixture and the

corresponding complete Form MAT-412s shall be submitted to the Division of Material Testing (DMT) for design TSR testing verification. The mixture submitted shall be representative of the corresponding mix design as determined by the Engineer.

- i. Superpave Mixtures with RAP: RAP may be used 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. The JMF shall be accompanied by a blending chart and supporting test results in accordance with AASHTO M 323 Appendix X1, or by testing that shows the combined binder (recovered binder from the RAP, virgin binder at the mix design proportions, warm mix asphalt additive and any other modifier if used) meets the requirements of the specified binder grade.
 - Two (2) representative samples of RAP shall be obtained. Each sample shall be split, and 1 split sample shall be tested for binder content in accordance with AASHTO T 164 and the other in accordance with AASHTO T 308.
 - RAP material shall not be used with any other recycling option.
- ii. Superpave Mixtures with RAS: RAS may be used solely in HMA S1 mixtures with the following conditions:
 - RAS amounts up to 3% may be used.
 - RAS total binder replacement up to 15% may be used with no binder grade modification.
 - RAS total binder replacement 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. The JMF shall be accompanied by a blending chart and supporting test results in accordance with AASHTO M 323 Appendix X1, or by testing that shows the combined binder (recovered binder from the RAP, virgin binder at the mix design proportions, warm mix asphalt additive and any other modifier if used) meets the requirements of the specified binder grade.
 - Superpave Mixtures with RAS shall meet AASHTO PP 78 design considerations.
- iii. Superpave Mixtures with CRCG: CRCG may be used solely in HMA S1 mixtures. One percent (1%) of 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.
- (b) Basis of Approval: The following information must be included in the JMF submittal:
 - i. Gradation, consensus properties and specific gravities of the aggregate, RAP or RAS.
 - ii. Average asphalt content of the RAP or RAS by AASHTO T 164.
 - iii. Source of RAP or RAS and percentage to be used.
 - iv. Warm mix Technology, manufacturer's recommended additive rate and tolerances, and manufacturer recommended mixing and compaction temperatures.
 - v. TSR test report and anti-strip manufacturer and recommended dosage rate if applicable.
 - vi. Mixing and compaction temperature ranges for the mix with and without the warm-mix technology incorporated.
 - vii. JMF ignition oven correction factor by AASHTO T 308.

With each JMF submittal, the following samples shall be submitted to the Division of Materials Testing:

- 4 - one (1) quart cans of PG binder, with corresponding Safety Data Sheet (SDS)
- 1 - 50 lbs. bag of RAP
- 2 - 50 lbs. bags of Plant-blended virgin aggregate

A JMF may not be approved if any of the properties of the aggregate components or mix do not meet the verification tolerances as described in the Department's current QA Program for Materials, Acceptance and Assurance Testing Policies and Procedures.

Any material based on a JMF, once approved, shall only be acceptable for use when it is produced by the designated Plant, it utilizes the same components, and the production of material continues to meet all criteria as specified in Tables M.04.02-2, M.04.02-3 and M.04.02-4. A new JMF must be submitted to the Engineer for approval whenever a new component source is proposed.

Only 1 mix with 1 JMF will be approved for production at a time. Switching between approved JMF mixes with different component percentages or sources of supply is prohibited.

TABLE M.04.02-2: Superpave Master Range for Bituminous Concrete Mixture Design Criteria

Sieve	S0.25		S0.375		S0.5		S1	
	Control Points		Control Points		Control Points		Control Points	
inches	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	-	-
No. 4	72	90	-	72	-	-	-	-
No. 8	32	67	32	67	28	58	19	45
No. 16	-	-	-	-	-	-	-	-
No. 30	-	-	-	-	-	-	-	-
No. 50	-	-	-	-	-	-	-	-
No. 100	-	-	-	-	-	-	-	-
No. 200	2.0	10.0	2.0	10.0	2.0	10.0	1.0	7.0
VMA (%)	16.5 ± 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 / effective binder	0.6 - 1.2		0.6 - 1.2		0.6 - 1.2		0.6 - 1.2	
TSR	≥ 80%		≥ 80%		≥ 80%		≥ 80%	
T-283 Stripping	Minimal as determined by the Engineer							

(c) Mix Status: Each facility will have each type of bituminous concrete mixture rated based on the results of the previous year of production. Mix status will be provided to each bituminous concrete Producer 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.04.03-4 and are calculated as follows:

Criteria A: Percentage of acceptance test results with compliant air voids.

Criteria B: The average of the percentage of acceptance results with compliant VMA and the percentage of acceptance results with compliant air voids.

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

Mix status is defined as:

“A” – Approved: Assigned to each mixture type from a production facility with a current rating of 70% or greater, or to each mixture type completing a successful PPT.

“PPT” – Pre-Production Trial: Temporarily assigned to each mixture type from a production facility when:

1. there are no compliant acceptance production test results submitted to the Department from the previous year;
2. there is a source change in one or more aggregate components;
3. there is a component percentage change of more than 5% by weight;
4. there is a change in RAP percentage;
5. the mixture has a rating of less than 70% from the previous season;
6. it is a new JMF not previously submitted; or
7. the average of 10 consecutive acceptance results for VFA, Density to N_{ini} or dust to effective binder ratio does not meet the criteria in tables M.04.02-2 and M.04.02-4.

Bituminous concrete mixtures rated with a “PPT” status cannot be used on Department projects. Testing shall be performed by the Producer with NETTCP certified personnel on material under this status. Test results must confirm that specification requirements in Tables M.04.02-2 through M.04.02-4 are met and the binder content (Pb) meets the requirements in Table M.04.03-2 before material can be used. One of the following methods must be used to verify the test results:

Option A: Schedule a day when a Department Inspector can be at the facility to witness testing

Option B: When the Contractor or their representative performs testing 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, and 5,000 grams of cooled loose bituminous concrete for verification testing and approval

Option C: When the Contractor or their representative performs testing without being witnessed by a Department Inspector, the Engineer may verify the mix in the Contractor’s laboratory

Witnessing or verifying by the Department of compliant test results will change the mix’s status to “A”

The differences between the Department’s test results and the Contractor’s must be within the “C” tolerances included in the [Department’s QA Program for Materials, Acceptance and Assurance Testing Policies and Procedures](#) in order to be verified.

“U” – Not Approved: Status assigned to a type of mixture that does not have an approved JMF. Bituminous concrete mixtures with a “U” status cannot be used on Department projects.

**TABLE M.04.02-3:
Superpave Consensus Properties Requirements for Combined Aggregate**

Traffic Level	Design ESALs (80kN) Millions	Coarse Aggregate Angularity ⁽¹⁾	Fine Aggregate Angularity AASHTO T 304, Method A Minimum %	Flat and Elongated Particles ⁽²⁾ ASTM D4791, Maximum %	Sand Equivalent AASHTO T 176, Minimum %
		ASTM D5821, Minimum %			
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

Notes:
⁽¹⁾ 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.
⁽²⁾ Criteria presented as maximum Percent by mass of flat and elongated particles of materials retained on the No. 4 sieve, determined at 5:1 ratio.

TABLE M.04.02-4: Superpave Traffic Levels and Design Volumetric Properties

Traffic Level	Design ESALs (million)	Number of Gyration by Superpave Gyratory Compactor			Percent Density of Gmm from HMA/WMA Specimen			Voids Filled with Asphalt (VFA) Based on Nominal Mix Size - Inch			
		N _{ini}	N _{des}	N _{max}	N _{ini}	N _{des}	N _{max}	0.25	0.375	0.5	1
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	7	75	115	≤90.0	96.0	≤98.0	65-77	65-76	65-75	65-75

**TABLE M.04.02-5:
Superpave Minimum Binder Content by Mix Type and Level**

Mix Type	Level	Binder Content Minimum
S0.25	1	5.80
S0.25	2	5.70
S0.25	3	5.70
S0.375	1	5.70
S0.375	2	5.60
S0.375	3	5.60
S0.5	1	5.10
S0.5	2	5.00
S0.5	3	5.00
S1	1	4.60
S1	2	4.50
S1	3	4.50

M.04.03—Production Requirements:

1. Standard Quality Control Plan (QCP) for Production: The QCP for production 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. As a minimum, the following quality characteristics shall be included in the control charts:

- percent passing No. 4 sieve
- percent passing No. 200 sieve
- binder content
- air voids
- Gmm
- Gse
- VMA

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 the first day of each month.

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.

The Contractor shall submit complete production testing records to the Engineer within 24 hours in a manner acceptable to the Engineer.

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 and 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 Requirements:

(a) General:

For those mixes with a total estimated project tonnage over 500 tons, a NETTCP HMA Paving Inspector certified Contractor representative shall obtain a field sample of the material placed at the project site in accordance with AASHTO T 168 using the procedure indicated in Section 5.2.3 or an alternate procedure approved by the Engineer. Sampling from the truck at the Plant in accordance with AASHTO T 168 using the procedure indicated in Section 5.2.2 will be allowed for those mixes with a total estimated project tonnage equal to or less than 500 tons. Regardless of sampling location, the sample shall be quartered by the Contractor in accordance with AASHTO R 47 and placed in an approved container. The container shall be sealed with a security tape provided by the Department and labelled to include the project number, date of paving, mix type, lot and subplot numbers and daily tonnage. The minimum weight of each quartered sample shall be 14000 grams. The Contractor shall transport one of the containers to the Department's Central Laboratory in Rocky Hill, retain one of the sealed containers for potential use in dispute resolution and test the remaining samples for acceptance in accordance with past practice.

The Contractor shall submit all acceptance test 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 and may be disposed of with the approval of the Engineer. All quality control specimens shall be clearly labeled and separated from the acceptance specimens.

Contractor personnel performing QC and acceptance testing must be present at the facility prior to, during, and until completion of 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 policies and procedures 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.

Verification and dispute resolution testing will be performed by the Engineer in accordance with the Department's QA Program for Materials.

Should the Department be unable to validate the Contractor's acceptance test result(s) for a lot of material, the Engineer will use results from verification testing and re-calculate the pay adjustment for that lot. The Contractor may request to initiate the dispute resolution process in writing within 24 hours of receiving the adjustment and must include supporting documentation or test results to justify the request.

(b) Curb Mix Acceptance Sampling and Testing Procedures: Curb Mixes shall be tested by the Contractor at a frequency of 1 test per every 250 tons of cumulative production, regardless of the day of production.

When these mix designs are specified, the following acceptance procedures and AASHTO test methods shall be used:

TABLE M.04.03-1: Curb Mix Acceptance Test Procedures

Protocol	Reference	Description
1	AASHTO T 30(M)	Mechanical Analysis of Extracted Aggregate
2	AASHTO T 168	Sampling of Bituminous Concrete
3	AASHTO T 308	Binder Content by Ignition Oven Method (adjusted for aggregate correction factor)
4	AASHTO T 209(M)⁽²⁾	Theoretical Maximum Specific Gravity and Density of Bituminous Paving Mixtures
5	AASHTO T 312⁽²⁾	⁽¹⁾ Superpave Gyrotory Molds Compacted to N _{des}
6	AASHTO T 329	Moisture Content of Hot-Mix Asphalt (HMA) by Oven Method

Notes: ⁽¹⁾ One (1) set equals 2 each of 6-inch molds. Molds to be compacted to 50 gyrations.
⁽²⁾ Once per year or when requested by the Engineer.

- i. Determination of Off-Test Status:
 1. Curb Mix is considered “off test” 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 mixture. If the mix is “off test,” the Contractor must take immediate actions to correct the deficiency and a new acceptance sample shall be tested on the same day or the following day of production.
 2. When multiple silos are located at 1 site, mixture supplied to 1 project is considered as coming from 1 source for the purpose of applying the “off test” status.
 3. The Engineer may cease supply from the Plant when test results from 3 consecutive samples are not within the JMF tolerances or the test results from 2 consecutive samples not within the control points indicated in Table M.04.02-1 regardless of production date.
 - ii. JMF Revisions
 1. If a test indicates that the bitumen content or gradation are outside the tolerances, the Contractor may make a single JMF revision as allowed by the Engineer prior to any additional testing. Consecutive test results outside the requirements of Table M.04.02-1 JMF tolerances may result in rejection of the mixture.
 2. 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.
- (c) Superpave Mix Acceptance:
- i. Sampling and Testing Procedures

Production Lot: The lot will be defined as one of the following types:

 - Non-PWL Production Lot for total estimated Project quantities per mixture less than 3500 tons: All mixture placed during a single continuous paving operation.
 - PWL Production Lot for total estimated Project quantities per mixture of 3500 tons or more: Each 3500 tons of mixture produced within 30 calendar days.

Production Sub Lot:

 - For Non-PWL: As defined in Table M.04.03-2
 - For PWL: 500 tons (The last sub lot may be less than 500 tons.)

Partial Production Lots (For PWL only): A Lot with less than 3500 tons due to:

- completion of the course;
- a Job Mix Formula revision due to changes in:
 - o cold feed percentages over 5%,
 - o target combined gradation over 5%,
 - o target binder over 0.15%,
 - o any component specific gravity; or
- a lot spanning 30 calendar days.

The acceptance sample(s) location(s) shall be selected using stratified - random sampling in accordance with ASTM D3665 based on:

- the total daily estimated tons of production for non-PWL lots, or
- the total size for PWL lots.

One (1) acceptance sample shall be obtained and tested per sub lot with quantities over 125 tons. The Engineer may direct that additional acceptance samples be obtained. For non-PWL lots, one (1) acceptance test shall always be performed in the last sub lot based on actual tons of material produced.

For non-PWL lots, quantities of the same mixture per Plant may be combined daily for multiple State projects to determine the number of sub lots.

The payment adjustment will be calculated as described in 4.06.

**TABLE M.04.03-2:
Superpave Acceptance Testing Frequency per Type/Level/Plant for Non-PWL Lots**

Daily Quantity Produced in Tons (Lot)	Number of Sub Lots/Tests
0 to 125	0, Unless requested by the Engineer
126 to 500	1
501 to 1,000	2
1,001 to 1,500	3
1,500 or greater	1 per 500 tons or portions thereof

The following test procedures shall be used for acceptance:

TABLE M.04.03-3: Superpave Acceptance Testing Procedures

Protocol	Procedure	Description
1	AASHTO T 168	Sampling of bituminous concrete
2	AASHTO R 47	Reducing samples to testing size
3	AASHTO T 308	Binder content by ignition oven method (adjusted for aggregate correction factor)
4	AASHTO T 30(M)	Gradation of extracted aggregate for bituminous concrete mixture
5	AASHTO T 312	⁽¹⁾ Superpave gyratory molds compacted to N_{des}
6	AASHTO T 166	⁽²⁾ Bulk specific gravity of bituminous concrete
7	AASHTO R 35	⁽²⁾ Air voids, VMA
8	AASHTO T 209(M)	Maximum specific gravity of bituminous concrete (average of 2 tests)
9	AASHTO T 329	Moisture content of bituminous concrete

Notes: ⁽¹⁾ One (1) set equals 2 each of 6-inch molds. Molds to be compacted to N_{max} for PPTs and to N_{des} for production testing. The first sub lot of the year shall be compacted to N_{max} .

⁽²⁾ Average value of 1 set of 6-inch molds.

If the average ignition oven corrected binder content differs by 0.3% or more from the average of the Plant ticket binder content in 5 consecutive tests regardless of the production date (moving average), the Contractor shall immediately investigate, determine an assignable cause, and correct the issue. When 2 consecutive moving average differences are 0.3% or more and no assignable cause has been established, the Engineer may require a new ignition oven aggregate correction factor to be performed or to adjust the current factor by the average of the differences between the corrected binder content and production Plant ticket for the last 5 acceptance results.

The Contractor shall perform TSR testing within 30 days after the start of production for all design levels of HMA- and PMA- S0.5 Plant-produced mixtures, in accordance with AASHTO T 283(M). The TSR test shall be performed at an AMRL certified laboratory by NETTCP certified technicians. The compacted specimens may be fabricated at the Plant and then tested at an AMRL accredited facility. A minimum of 45000 grams of plant blended mixture and the corresponding complete Form MAT-412s shall be submitted to the DMT for production TSR testing verification. The mixture submitted shall be representative of the corresponding mix design as determined by the Engineer. Additionally, the TSR test report and tested specimens shall be submitted to the Engineer for review. 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, technical datasheet and SDS for the anti-strip additive (if applicable) to the Engineer.

i. Determination of Off-Test Status:

1. Superpave mixes shall be considered "*off test*" when any control point sieve, binder content, VA, VMA, and Gmm value is outside of the limits specified in Table M.04.03-4 or the target binder content at the Plant is below the minimum binder

content stated in Table M.04.02-5. Note that further testing of samples or portions of samples not initially tested for this purpose cannot be used to change the status.

2. Any time the bituminous concrete mixture is considered off-test:
 - A. The Contractor shall notify the Engineer when the Plant is “*off test*” for any mix design that is delivered to the Project in any production day. When multiple silos are located at 1 site, mixture supplied to 1 project is considered as coming from 1 source for the purpose of applying the “*off test*” determination.
 - B. 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 with 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.

ii. Cessation of Supply for Superpave Mixtures in Non-PWL Lots:

A mixture **shall not be used** on Department projects when it is “off test” for:

1. four (4) consecutive tests in any combination of VA, VMA or Gmm, regardless of date of production, or
2. two (2) consecutive tests in the control point sieves in 1 production shift.

As a result of cessation of supply, the mix status will be changed to PPT

iii. JMF revisions:

JMF revisions are only permitted prior to or after a production shift. A JMF revision is effective from the time it was submitted and is not retroactive to the previous test(s).

JMF revisions shall be justified by a documented trend of test results.

Revisions to aggregate or RAP specific gravities are only permitted when testing is performed at an AMRL certified laboratory by NETTCP certified technicians.

A JMF revision is required when the Plant target RAP or bin percentage deviates by more than 5% or the Plant target binder content deviates by more than 0.15% from the active JMF.

TABLE M.04.03-4: Superpave Mixture Production Requirements

	S0.25		S0.375		S0.5		S1		Tolerances
Sieve	Control Points		Control Points		Control Points		Control Points		From JMF Targets ⁽²⁾
inches	Min (%)	Max (%)	Min (%)	Max (%)	Min (%)	Max (%)	Min (%)	Max (%)	+/- Tolerance
1.5	-	-	-	-	-	-	100	-	
1.0	-	-	-	-	-	-	90	100	
3/4	-	-	-	-	100	-	-	90	
1/2	100	-	100	-	90	100	-	-	
3/8	97	100	90	100	-	90	-	-	
No. 4	72	90	-	72	-	-	-	-	
No. 8	32	67	32	67	28	58	19	45	
No. 16	-	-	-	-	-	-	-	-	
No. 200	2.0	10.0	2.0	10.0	2.0	10.0	1.0	7.0	
Pb	JMF value		JMF value		JMF value		JMF value		0.3 ⁽³⁾
VMA (%)	16.5		16.0		15.0		13.0		1.0 ⁽⁴⁾
VA (%)	4.0		4.0		4.0		4.0		1.0 ⁽⁵⁾
Gmm	JMF value		JMF value		JMF value		JMF value		0.030
Mix Temp. – HMA ⁽⁶⁾	265-325°F ⁽¹⁾		265-325°F ⁽¹⁾		265-325°F ⁽¹⁾		265-325°F ⁽¹⁾		
Mix Temp. – PMA ⁽⁶⁾	285-335°F ⁽¹⁾		285-335°F ⁽¹⁾		285-335°F ⁽¹⁾		285-335°F ⁽¹⁾		
Prod. TSR	N/A		N/A		≥80%		N/A		
T-283 Stripping	N/A		N/A		Minimal TBD by the Engineer		N/A		

Notes: ⁽¹⁾ 300°F minimum after October 15.

⁽²⁾ JMF tolerances shall be defined as the limits for production compliance.

⁽³⁾ 0.4 for PWL lots

⁽⁴⁾ 1.3 for all PWL lots except S/P 0.25 mixes. 1.1 for S/P 0.25 Non-PWL lots. 1.4 for S/P 0.25 PWL lots

⁽⁵⁾ 1.2 for PWL lots

⁽⁶⁾ Also applies to placement

**Table M.04.03-5:
Modifications to Standard AASHTO and ASTM Test Specifications and Procedures**

AASHTO Standard Method of Test	
Reference	Modification
T 30	Section 7.2 through 7.4 Samples are not routinely washed for production testing
T 209	Section 7.2 The average of 2 bowls is used proportionally in order to satisfy minimum mass requirements. 8.3 Omit Pycnometer method.
T 283	When foaming technology is used, the material used for the fabrication of the specimens shall be cooled to room temperature, and then reheated to the manufacturer's recommended compaction temperature prior to fabrication of the specimens.
AASHTO Standard Recommended Practices	
Reference	Modification
R 26	<p>All laboratory technician(s) responsible for testing PG binders shall be certified or Interim Qualified by NETTCP as a PG Asphalt Binder Lab Technician.</p> <p>All laboratories testing binders for the Department are required to be accredited by the AMRL.</p> <p>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.</p> <p>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 or limitations required.</p> <p>All AASHTO M 320 references shall be replaced with AASHTO M 332.</p> <p>Once a month, 1 split sample and test results for each asphalt binder grade and each lot shall be submitted by the PG binder supplier to the Department's Central Lab. Material remaining in a certified lot shall be re-certified no later than 30 days after initial certification. Each April and September, the PG binder supplier shall submit test results for 2 BBR tests at 2 different temperatures in accordance with AASHTO R 29.</p>

SECTION M.06 – METALS

Section M.06 *is amended as follows:*

M.06.01—Reinforcing Steel:

Delete the entire last paragraph in Subarticle 1 "Bar Reinforcement" that reads: "Prior to the incorporation... ..and type of bar reinforcement."

M.06.02—Structural Steel:

Revise Subarticle 2 "Anchor Bolts" as follows:

"(a) Anchor bolt assemblies shall meet the requirements of ASTM F1554, and the grade shall be as specified on the plans. All components of the bolt assembly shall be galvanized in accordance with ASTM F2329."

Replace Subarticle 3 "High Strength Bolts" with the following:

" **3. High-Strength Bolts:** High-strength bolts, including suitable nuts and hardened washers, shall meet the following requirements:

- (a) High-strength bolts shall meet the requirements of ASTM F3125 Grade A325 or ASTM F3125 Grade A490 as shown on the plans. High-strength bolts used with coated steel shall be mechanically galvanized, unless otherwise specified. High-strength bolts used with uncoated weathering grades of steel shall be Type 3.

Nuts for ASTM F3125 Grade A325 bolts shall meet the requirements of ASTM A563, Grades DH, DH3, C, C3 and D. Where galvanized high-strength bolts are used, the nuts shall be galvanized, heat-treated Grade DH. Where Type 3 high-strength bolts are used, the nuts shall be Grade C3 or DH3.

Nuts for ASTM F3125 Grade A490 bolts shall meet the requirements of ASTM A563, Grade DH. Where Type 3 high-strength bolts are used, the nuts shall be Grade DH3.

All galvanized nuts shall be lubricated with a lubricant containing a visible dye of any color that contrasts with the color of the galvanizing. Black bolts must be oily to the touch when delivered and installed.

Circular flat and square or rectangular beveled, hardened steel washers shall meet the requirements of ASTM F436. Unless otherwise specified, galvanized washers shall be furnished when galvanized high-strength bolts are specified, and washers with atmospheric corrosion resistance and weathering characteristics shall be furnished when Type 3 high-strength bolts are specified.

Compressible-washer-type direct tension indicator washers, used in conjunction with

high-strength bolts, shall meet the requirements of ASTM F959. Where galvanized high-strength bolts are used, the washers shall be galvanized in accordance with ASTM B695, Class 55. Where Type 3 high-strength bolts are used, the washers shall be galvanized in accordance with ASTM B695, Class 55 and coated with epoxy.

- (b) Identifying Marks:** ASTM F3125 Grade A325 for bolts and the specifications referenced therein for nuts require that bolts and nuts manufactured to the specification be identified by specific markings on the top of the bolt head and on one face of the nut.

Markings may be raised or depressed at the manufacturer's option and shall be visible after coating if coating is required. Head markings must identify the grade by the symbol "A325," the manufacturer and the type, if Type 3. Nut markings must identify the grade, the manufacturer and if Type 3, the type. Markings on direct tension indicators must identify the manufacturer and Type "A325." Other washer markings must identify the manufacturer and if Type 3, the type.

ASTM F3125 Grade A490 for bolts and the specifications referenced therein for nuts require that bolts and nuts manufactured to the specifications be identified by specific markings on the top of the bolt head and on one face of the nut. Markings may be raised or depressed at the manufacturer's option and shall be visible after coating if coating is required. Head markings must identify the grade by the symbol "A490," the manufacturer and the type, if Type 3. Nut markings must identify the grade, the manufacturer and if Type 3, the type. Markings on direct tension indicators must identify the manufacturer and Type "A490." Other washer markings must identify the manufacturer and if Type 3, the type.

ASTM F3125 Grade A325 and ASTM F3125 Grade A490 bolt lengths up to 4 times the diameter which are fully threaded but which are not required to be fully threaded by the relevant ASME standard shall be marked with a "T" immediately after the grade designation, for example "A325T." Bolts with any other non-standard dimensions, including thread length, shall be marked with an "S" immediately after the grade designation, for example "A325S." All other markings, if used, such as a private label distributor's mark shall also be separate and distinct.

- (c) Dimensions:** Bolt and nut dimensions shall meet the requirements for Heavy Hexagon Structural Bolts and for Heavy Semi-Finished Hexagon Nuts given in ASME Standard B18.2.6.
- (d) Galvanized Bolts:** Galvanized bolts shall meet the requirements of ASTM F3125 Grade A325, Type 1. The bolts shall be hot-dip galvanized in accordance with ASTM F2329, to a thickness of 50 μm or mechanically galvanized in accordance with ASTM B695, Class 55. Bolts, nuts, and washers of any assembly shall be galvanized by the same process. The nuts shall be overtapped to the minimum amount required for the fastener assembly, and shall be lubricated with a lubricant containing a visible dye so a visual check can be made for the lubricant at the time of field installation. Galvanized bolts shall be tension

tested after galvanizing. ASTM F3125 Grade A490 bolts shall be uncoated or shall be coated in accordance with either ASTM F1136 Grade 3 or ASTM F2833 Grade 1.

- (e) **Test Requirements:** The maximum hardness of ASTM F3125 Grade A325 bolts shall be 34 HRC. The maximum hardness of ASTM F3125 Grade A490 bolts shall be 38 HRC.

Plain, ungalvanized nuts shall have a minimum hardness of 89 HRB.

Proof load tests, in accordance with the requirements of ASTM F606 Method 1, shall be required for the bolts. Wedge tests of full-size bolts are required in accordance with Section 10.1 of ASTM F3125. Galvanized bolts shall be wedge tested after galvanizing.

Proof load tests of ASTM A563 are required for nuts. Proof load tests for nuts used with galvanized bolts shall be performed after galvanizing, overtapping and lubricating.

Rotational-capacity tests are required and shall be performed on all plain or galvanized (after galvanizing) bolt, nut and washer assemblies by the manufacturer or distributor prior to shipping and by the Contractor at the Site.

The thickness of galvanizing on bolts, nuts and washers shall be measured. On bolts, it shall be measured on the wrench flats or on top of the bolt head, and on nuts it shall be measured on the wrench flats.

- (f) **Certified Test Reports and Materials Certificates:** The Contractor shall submit notarized copies of Certified Test Reports and Materials Certificates in accordance with Article 1.06.07 for fastener assemblies. In addition the Certified Test Reports and Materials Certificates shall include the following:

1. Mill test reports shall indicate the place where the material was melted and manufactured.
2. Test reports for proof load tests, wedge tests, and rotational-capacity tests shall indicate where the tests were performed, date of tests, location of where the components were manufactured and lot numbers.
3. The test report for galvanized components shall indicate the thickness of the galvanizing.

- (g) **Material Samples:** Prior to incorporation into the work, the Contractor shall submit samples of the bolt assemblies to the Engineer for testing in accordance with the latest edition of the "[Materials Testing Manual](#) (Chapter 8, Minimum Schedule for Acceptance Testing)." Samples shall be submitted for each diameter, length, material designation, grade, coating and manufacturer of bolt assembly."

M.06.03—Galvanizing:

Replace the entire subarticle with the following:

"M.06.03—Galvanizing: Unless otherwise specified on the plans or in the special provisions, the zinc coating on all iron and steel materials, other than wire, shall meet the requirements of ASTM A123, A153 or F2329, whichever shall apply. When mechanical galvanizing is used it shall meet the requirements of ASTM B695 Class 55."

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).

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

The completed form must be submitted to the Office of Contract Compliance for approval. The form is due on the 15th 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 **10** percent (%) 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.
- Packagers, 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 #000099A – REMOVE OBSTRUCTION LIGHT

Description:

Under this item the Contractor shall remove a complete aviation obstruction lighting system consisting of aviation obstruction lights, brackets, surface conduit and junction boxes, mountings, and cables, where shown on the plans or as directed by the Engineer. The removed aviation obstruction lighting equipment shall remain the property of the Contractor.

Construction Methods:

The Contractor shall remove a complete aviation obstruction lighting system consisting of aviation obstruction lights, brackets, surface conduit and junction boxes, mountings, and cables, where, shown on the plans or as directed by the Engineer.

The removed aviation obstruction lighting equipment shall remain the property of the Contractor.

The limits of surface conduit and junction box removal shall be from the aviation light down to just below the bridge sidewalk level. All conduit and junction boxes associated with this system located below the bridge sidewalk and extending to the lighting control cabinet shall be removed under Item No. 1008901A – Remove Conduit.

The removal of the existing aviation obstruction lighting equipment shall be coordinated with the installation of the new aviation obstruction lighting equipment (paid for under separate bid items) so that proper nighttime aviation obstruction lighting of the bridge is maintained at all times. The removal of aviation obstruction lights shall be carried out on a “one for one” basis during daylight hours with the new aviation obstruction light installed and powered immediately upon the removal of the existing light.

The removal of an existing aviation obstruction light shall be postponed if the light is found to be operating during daylight hours due to the presence of fog. Nighttime aviation obstruction lighting of the bridge shall be maintained throughout all stages of construction.

Removed materials shall be properly disposed of by the Contractor.

Method of Measurement:

This work will be measured for payment as an each item for the removal of the complete existing aviation light system as described.

Basis of Payment:

This work will be paid for at the contract unit price each for "Remove Obstruction Light", which price shall include the removal of aviation obstruction lights, brackets, mounting hardware,

surface conduit, junction boxes, cables, disconnection, disposal, hauling, and all work, labor and materials incidental thereto.

Pay Item

Pay Unit

Remove Obstruction Light

ea.

ITEM #0020903A – LEAD COMPLIANCE FOR MISCELLANEOUS EXTERIOR TASKS

Description:

Work under this item shall include the special handling measures and work practices required for miscellaneous exterior tasks that impact materials containing or covered by lead paint. Lead paint includes paint found to contain **any** detectable amount of lead by Atomic Absorption Spectrophotometry (AAS) or X-Ray Fluorescence (XRF). Examples of typical miscellaneous exterior tasks includes; work impacting signs, guiderails, minor bridge rehabilitation, catenary structures, canopy structures, spot/localized paint removal, etc.

All activities shall be performed in accordance with the OSHA Lead in Construction Regulations (29 CFR 1926.62), the USEPA RCRA Hazardous Waste Regulations (40 CFR Parts 260 through 274), and the CTDEEP Hazardous Waste Regulations (RCSA 22a-209-1 and 22a-449(c)).

All activities shall be performed by individuals with appropriate levels of OSHA lead awareness and hazard communication training and shall supervised by the Contractors Competent Person on the job site at all times. The Contractors Competent Person is one who is capable of identifying existing and predictable hazards in the surroundings or working conditions which are unsanitary, hazardous or dangerous to employees, and who has authorization to take prompt corrective measures to eliminate them.

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

Materials:

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

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

The following material requirements are to be met if to be used during the work:

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

Polyethylene disposable bags shall be minimum six (6) mils thick.

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

Cleaning Agents and detergent shall be lead specific, such as TriSodium Phosphate (TSP).

Chemical strippers and chemical neutralizers shall be compatible with the substrate as well as with each other. Such chemical stripper shall contain less than 50% Volatile Organic Compounds (VOCs) by weight in accordance with RCSA 22a-174-40 Table 40-1.

Labels and warning signs shall conform to 29 CFR 1926.62, 40 CFR 260 through 274 and 49 CFR 172 as appropriate.

Air filtration devices and vacuum units shall be equipped with High-Efficiency Particulate Air (HEPA) filters.

Construction Methods:

(1) Pre-Abatement Submittals and Notices

A. 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. 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 ug/m³, 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:

**DANGER
LEAD WORK AREA
MAY DAMAGE FERTILITY OR THE UNBORN CHILD
CAUSES DAMAGE TO THE CENTRAL NERVOUS SYSTEM
DO NOT EAT, DRINK, OR SMOKE IN THIS AREA**

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.

Bridge No. 00524, Arrigoni Bridge, Middletown, CT

- **No detectable levels of lead were identified on the painted structural steel/metal surfaces of Bridge No. 00524.**
- **Detectable levels of lead were identified on the concrete posts associated with railing system on the east side of Bridge No. 00524.**

Girders, Cross Beams, Beam Ends, Bearings, Rockers, Diaphragms, Connection plates, Railings, etc.	Metal	Blue/Grey	0.0 mg/cm² ND<0.10% by weight
Concrete Posts	Metal	Grey	0.2-0.4 mg/cm² 2.7 mg/cm²

- **Since no detectable levels of lead in paint were identified on the structural steel/metal bridge components, any paint waste generated would be characterized as non-hazardous, non-RCRA waste.**
- **TCLP waste stream sampling/analysis of the paint associated with the concrete post surfaces characterized the paint waste as non-RCRA, non-hazardous waste.**

Paint debris (concrete posts)	0.016 mg/L
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- **The painted concrete posts may be disposed of as non-hazardous construction and demolition (C&D) bulky waste per CTDEEP/USEPA clarification memo of January 26, 2004.**

While conducting work to the bridge, where it is necessary to impact the lead painted surfaces, the Contractor shall either:

- a. Remove the paint to be impacted prior to impacting the metal in accordance with OSHA Lead in Construction Standard 29CFR 1926.62, or**
- b. Impact the metal using mechanical means with the paint in place in accordance with OSHA Lead in Construction Standard 29CFR 1926.62.**

The Contractor shall submit a Work Plan to ConnDOT outlining the exact procedures that will be used to perform the work, contain the spread of lead debris and protect the employees performing the required renovation work impacting the lead paint. No work shall be started by the Contractor until the Work Plan is approved by the Engineer.

All work impacting the lead paint materials shall be conducted within an established Regulated Area with a remote wash facility/decontamination system in accordance with “C. Wash Facilities” and the OSHA Lead in Construction Standard. In accordance with 29 CFR 1926.62, engineering controls and work practices shall be utilized to prevent the spread of lead dust and debris beyond the Regulated Area and limit the generation of airborne lead. All wastes containing lead paint shall be properly contained and secured for storage, transportation and disposal.

The Engineer has characterized the paint waste stream associated with the concrete post surfaces at Bridge No. 00524 as non-hazardous. If the paint is removed from the metal railing surfaces, the paint shall be handled and disposed of as non-hazardous, non-RCRA waste. Further, the painted concrete posts may be disposed of as non-hazardous construction and demolition (C&D) bulky waste per CTDEEP/USEPA clarification memo of January 26, 2004.

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

Should lead contamination be discovered outside of the Regulated Area, the Contractor shall immediately stop all work in the Regulated Area, eliminate causes of such contamination and take steps to decontaminate non-work areas.

Special Requirements:

1. Demolition/Renovation:

- a. Demolish/renovate in a manner which minimizes the spread of lead contamination and generation of lead dust.
- b. Implement dust suppression controls, such as misters, local exhaust ventilation, etc. to minimize the generation of airborne lead dust.
- c. Segregate work areas from non-work areas through the use of barrier tape, drop cloths, etc.
- d. Clean up immediately after renovation/demolition has been completed

2. Chemical Removal:

- a. Apply chemical stripper in quantities and for durations specified by manufacturer.
- b. Where necessary, scrape lead paint from surface down to required level of removal (i.e. stabilized surface, bare substrate with no trace of residual pigment, etc.). Use sanding, hand scraping, and dental picks to supplement chemical methods as necessary.
- c. Apply neutralizer compatible with substrate and chemical agent to substrate following removal in accordance with manufacturer's instructions.
- d. Protect adjacent surfaces from damage from chemical removal.
- e. Maintain a portable eyewash station in the work area.
- f. Wear respirators that will protect workers from chemical vapors.
- g. Do not apply caustic agents to aluminum surfaces.

3. Mechanical Paint Removal:

- a. Provide sanders, grinders, rotary wire brushes, or needle gun removers equipped with a HEPA filtered vacuum dust collection system. Cowling on the dust collection system for orbital-type tools must be capable of maintaining a continuous tight seal with the surface being abated. Cowling on the dust collection system for reciprocating-type tools shall promote an effective vacuum flow of loosened dust and debris. Inflexible cowlings may be used on flat surfaces only. Flexible contoured cowlings are required for curved or irregular surfaces.
- b. Provide HEPA vacuums that are high performance designed to provide maximum static lift and maximum vacuum system flow at the actual operating vacuum condition with the shroud in use. The HEPA vacuum shall be equipped with a pivoting vacuum head.

- c. Remove lead paint from surface down to required level of removal (i.e. stabilized surface, bare substrate with no trace of residual pigment, etc.). Use chemical methods, hand scraping, and dental picks to supplement abrasive removal methods as necessary.
 - d. Protect adjacent surfaces from damage from abrasive removal techniques.
 - e. "Sandblasting" type removal techniques shall not be allowed.
4. Component Removal/Replacement:
- a. Wet down components which are to be removed to reduce the amount of dust generated during the removal process.
 - b. Remove components utilizing hand tools, and follow appropriate safety procedures during removal. Remove the components by approved methods which will provide the least disturbance to the substrate material. Do not damage adjacent surfaces.
 - c. Clean up immediately after component removals have been completed. Remove any dust located behind the component removed.

G. Prohibited Removal Methods:

The use of heat guns in excess of 700 degrees Fahrenheit to remove lead paint is prohibited.

The use of sand, steel grit, air, CO₂, baking soda, or any other blasting media to remove lead or lead paint without the use of a HEPA ventilated contained negative pressure enclosure is prohibited.

Power/pressure washing shall not be used to remove lead paint.

Compressed air shall not be utilized to remove lead paint.

Chemical strippers containing Methylene Chloride are prohibited. Any chemical stripping may be prohibited on a project by project basis.

Power tool assisted grinding, sanding, cutting, or wire brushing of lead paint without the use of cowed 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.

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.

Method of Measurement:

The completed work shall be paid as a lump sum. This item will include all noted services, equipment, facilities, testing and other associated work for up to three (3) ConnDOT project representatives. Services provided to any ConnDOT project representatives in excess of three (3) representatives will be measured for payment in accordance with Article 1.09.04 – “Extra and Cost-Plus Work.”

Basis of Payment:

The lump sum price bid for this item shall include: services, materials, equipment, all permits, notifications, submittals, personal air sampling, personal protection equipment, temporary enclosures, incidentals, fees and labor incidental to activities impacting lead removal, treatment and handling of lead contaminated materials, and the transport and disposal of any hazardous non-hazardous, non-RCRA lead waste or 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.

Pay Item

Pay Unit

Lead Compliance for
Miscellaneous Exterior Tasks

l.s

ITEM #0100427A – WATER RESCUE OPERATIONS

Description:

The Contractor shall furnish, maintain and operate one or more water rescue operation boat(s) for Contract work over or adjacent to water. The boat shall patrol in the vicinity of each above-water work location and be available for water rescue operations. These water safety measures will be required to protect all Contractor and Department staff. The Contractor shall also obtain all necessary permits and licenses for the boat and its operators.

Construction Methods:

Work under this item shall be performed in accordance with OSHA Article 29 CFR 1926.106 and the following requirements:

1. Boat(s) shall be a minimum of twenty (20) feet in length with a stable, flat-bottom and shall be designed specifically for emergency life-rescuing operation.
2. Boat(s) shall be equipped with oars and a motor with power within the minimum and maximum horsepower requirements indicated by the manufacturer of the boat(s) provided.
3. Each boat shall be equipped with required safety equipment: life vests, protective clothing, life line, anchor, emergency first aid kit, oxygen equipment and backboard.
4. A communication system, such as a walkie-talkie, shall be used to inform the boat operator(s) of an emergency and to inform the operator(s) where the boat is needed. The operator(s) and at least one worker at each work location over water shall be equipped with a communication device.
5. The operator(s) must possess the following current certifications issued by the American Red Cross or equivalent certifications approved by the Engineer:
 - Adult First Aid including CPR training
 - Life Guard Training or Water Rescue Operations
6. Boat(s) shall remain in the water when workers are above water and must be capable of being quickly launched to respond to an emergency within three (3) to four (4) minutes.
7. There must be at least two (2) rescue operators available on-board each boat when work is being performed over or adjacent to water.
8. Each boat shall be operable and available at all times when work is being performed over or adjacent to water. In the event of a breakdown, above-water work must be discontinued until a boat is repaired or a replacement boat is on Site and in the water.
9. The number of boats required must be determined based on the following:
 - The number of work locations where there is a danger of falling into water
 - The distance to each of those locations
 - Water temperature, currents, dams, rapids and other hazards
 - Appropriate response times for rescue

Method of Measurement:

Water Rescue Operations, being paid for on a lump sum basis, will not be measured for payment. The Contractor shall submit a proposed schedule of values to the Engineer for review and approval.

Basis of Payment:

This work will be paid for at the Contract lump sum price for “Water Rescue Operations,” which price shall include all labor, equipment, materials, maintenance, fuel, repairs, storage and services incidental thereto.

Pay Item

Pay Unit

Water Rescue Operations

l.s.

ITEM #0100600A – CONSTRUCTION ACCESS

Description:

The item “Construction Access” shall consist of the design, construction, maintenance and removal of temporary works that the Contractor elects to use in order to access the work above the Connecticut River, its shoreline, Route 9, Local Roads, and the (2) Providence & Worcester Rail Road Tracks as shown on the plans and allowed by the permits which may include a temporary suspended work platform.

The information on the plans and in the special provisions pertaining to construction access, and sequence of construction procedures conveys the assumptions made by the Designer and is for information only. The Contractor shall be responsible for selecting the means and methods for construction, subject to the design parameters and environmental permit restrictions. The Contractor shall submit information in accordance with Article 1.05.02-2, and as noted below, and shall include design calculations, construction schematics, construction sequences and procedures to the Engineer for review.

The information depicted on the plans has been permitted by the governing local, State and Federal agencies. The Contractor shall be responsible for obtaining any revised permits due to changes or modifications to the permitted plans which affects environmental or navigational impacts from all governing local, State and Federal agencies.

The Contractor shall note that obtaining approvals from DEEP, and USCG may be a lengthy process and should be taken into consideration when selecting the means and methods for construction.

Construction Methods:

The Contractor’s means and methods for construction shall meet all requirements established in the regulatory permits for the Project. At least 30 days prior to construction of temporary works or any work above the river, the Contractor shall submit detailed construction access working drawings and computations in accordance with Article 1.05.02. The working drawings and calculations must be prepared, stamped and signed by a Professional Engineer licensed in the State of Connecticut. These plans shall include, but shall not be limited to:

- 1) Temporary suspended work platform.
- 2) The sequence and methodology for localized paint removal, structural steel repair and touch up painting of the structure and all limitations of operations outlined in these specifications.
- 3) Any temporary and permanent impact area calculations and tables.

If the Contractor's means and methods for construction do not meet all requirements established in the regulatory permits for the Project, additional time to obtain revised permits and the Engineer's approval shall be shown in their construction schedule.

The furnishing of such plans, methods and calculations shall not serve to relieve the Contractor of its responsibility for the safety of the work and the successful completion of the Project. The Contractor's proposal must meet all requirements established in regulatory permits for the Project.

Method of Measurement:

All work for the design and construction of temporary works as well as providing the use of a suspended work platform, will not be measured for payment but shall be included in the lump sum cost of this item.

Basis of Payment:

Construction Access will be paid for at the Contract lump sum price for "Construction Access" which price shall include the design, construction, maintenance and removal of temporary works, and all materials, tools, equipment, labor and work incidental thereto.

Pay Item

Pay Unit

Construction Access

l.s.

ITEM #0101143A – HANDLING AND DISPOSAL OF REGULATED ITEMS (ESTIMATED COST)

Description:

Work under this item shall include the management (handling and disposal) of regulated items and all associated work by persons who are employed by a CTDEEP permitted Spill Contractor and trained/certified in accordance with OSHA Hazard Communication regulations. Regulated items include hazardous and other materials and wastes, the disposal of which is restricted by Federal and/or State laws and regulations, and which may be a component of equipment or other items located on-site. Regulated items include those listed herein, or additional similar items identified on site by the Engineer. Work under this item does not include asbestos containing materials, lead paint, contaminated or hazardous soils.

Activities shall be performed in accordance with, but not limited to, the current revision of the USEPA & CTDEEP Hazardous Waste Regulations (40 CFR 260-282, 22a-209 and 22a-449(c)), USEPA PCB Regulations (40 CFR 761), USEPA Protection of Stratospheric Ozone (40 CFR 82), OSHA Hazard Communication (29 CFR 1910.1200), OSHA Hazardous Waste & Emergency Response Regulations (29 CFR 1910.120), USDOT Hazardous Materials Regulation (49 CFR 171-180), OSHA, RCRA, CERCLA, CAA, TSCA, and all other laws and regulations.

The work activities include the removal, handling, packing, labeling, transport, manifesting, and recycling or disposal of various regulated items at the Project site prior to beginning planned renovation/demolition activities.

The Contractor is solely responsible for verifying actual locations and quantities of the items with hazardous/regulated material/waste constituents and for their proper handling and disposal. The recycling or proper disposal, as appropriate, of all regulated items shall be completed prior to the initiation of any demolition or renovation activities.

Materials:

All materials shall be suitable for the management of regulated items and shall meet all applicable federal, state and local regulations. Such materials include, but are not limited to, proper containers, packing materials, labels, signs, shipping papers, personnel protective equipment (PPE) and spill kits.

Construction Methods:

(1) Allowable Disposal/Recycling Facilities

Disposal facilities for RCRA-hazardous, TSCA-hazardous, Connecticut Regulated, and Universal wastes shall be chosen from among those listed below. No other facility shall be used for these types of wastes without the written approval of the Engineer.

Advanced Disposal Services
Greentree Landfill
635 Toby Road
Kersey, PA 15846
Phone: (814) 265-1744 Fax: (814) 265-8745
MSW, C&D, asbestos, PCB remediation waste <50
ppm, petroleum contaminated soils, nonhazardous solid
wastes

Advanced Disposal
(managed by Interstate Waste Services)
7095 Glades Pike
Summerset, PA 15501
Phone: (814) 444-0112 Fax: (814) 444-0127
MSW, C&D debris, residual waste, sewer sludge,
incinerator ash, asbestos

Allied Waste Niagara Falls Landfill, LLC
5600 Niagara Falls Blvd.
Niagara, NY 14304
Phone: (716) 285-3344 Fax: (716) 285-3398
Non-hazardous waste, industrial solid waste, municipal
sewage treatment sludge, contaminated soil & debris,
asbestos waste, C&D debris, industrial process sludge

American Lamp Recycling, LLC
26 Industrial Way
Wappingers Falls, NY 12590
Phone: (845) 896-0058 Fax: (845) 896-1520
Mercury containing device, universal waste

Tradebe (Bridgeport United Recycling, Inc.)
50 Cross Street
Bridgeport, CT 06610
Phone: (203) 334-1666 Fax: (203) 334-1439
RCRA & CRW waste oil, fuel, wastewater

Clean Earth of Carteret
24 Middlesex Ave.,
Carteret, NJ 07008
Phone: (732) 541-8909 Fax: (732) 541-8505
Concrete, brick, block, street sweepings, stone, rock,
asphalt and petroleum contaminated soil

Clean Earth of Philadelphia, Inc.
3201 South 61 St.,
Philadelphia, PA 19153

Phone: (215) 724-5520 Fax: (215) 724-2939
Petroleum contaminated soil

Clean Earth of North Jersey, Inc. (aka CENJ)
115 Jacobus Ave,
South Kearny, NJ 07105
Phone: (973) 344-4004 Fax: (973) 344-8652
RCRA liquid and solid, asbestos

Clean Earth of Southeast Pennsylvania, Inc.
7 Steel Road,
Morrisville, PA 19067
Phone: (215) 428-1700 Fax: (215) 428-1704
Petroleum contaminated soil
Clean Harbors Environmental Services, Inc.
2247 South Hwy. 71,
Kimball, NE 69145
Phone: (308) 235-1012 Fax: (308) 235-4307
RCRA liquid, solid & sludge

Clean Harbors Environmental Services, Inc.
Cleveland Facility
2900 Rockefeller Ave.,
Cleveland, OH 44115
Phone: (216) 429-2401 Fax: (216) 883-1918
RCRA liquid: aqueous organic & inorganic wastewater

Clean Harbors Environmental Services, Inc.
Spring Grove Facility
4879 Spring Grove Ave.,
Cincinnati, OH 45232
Phone: (513) 681-6242 Fax: (513) 681-0869
RCRA liquid, solid & sludge: aqueous organic &
inorganic wastewater, PCB wastewater treatment

Clean Harbors of Baltimore, Inc.
1910 Russell St,
Baltimore, MD 21230
Phone: (410) 244-8200 Fax: (410) 752-2647
RCRA liquid: aqueous organic & inorganic wastewater

Clean Harbors of Braintree, Inc.
1 Hill Avenue,
Braintree, MA 02184
Phone: (781) 380-7134 Fax: (781) 380-7193
RCRA & TSCA liquid & solid

Clean Harbors of Connecticut, Inc.
51 Broderick Road,
Bristol, CT 06010
Phone: (860) 583-8917 Fax: (860) 583-1740
RCRA & CRW liquid

Clean Harbors of Woburn
(Murphy's Waste Oil Services, Inc.)
252 Salem Street,
Woburn, MA 01801
Phone: (781) 935-9066 Fax: (781) 935-8615
RCRA liquid: oil, oil/water mixtures; CRW oil filters,
oily soil & debris, F001/F002 contaminated oils,
antifreeze

Clinton Landfill
242 Church Street
Clinton, MA 01510
Phone: (978) 365-4110 Fax: (978) 365-4106
Comm-97 soils and other materials subject to a BUD
and additional review by MADEP (*2-week lead time
for review by MADEP)

Colonie Landfill (Waste Connections, Inc.)
1319 Loudon Rd,
Cohoes, New York 12047
Phone: (518) 783-2827 Fax: (518) 786-7331
Non-haz. wastes, special wastes, contaminated soil

Cumberland County Landfill
(aka Community Refuse Services
Managed by Interstate Waste Services)
135 Vaughn Road,
Shippensburg, PA 17257
Phone: (717) 729-2060 Fax: (717) 423-6822
Municipal solid waste, non-hazardous waste

ACV Enviro (aka Cycle Chem & General
Chemical Corp.)
217 South First Street,
Elizabeth, NJ 07206
Phone: (908) 355-5800 Fax: (908) 355-0562
RCRA, TSCA liquid and solid

Envirite of PA (US Ecology)
730 Vogelsong Road,
York, PA 17404
Phone: (717) 846-1900 Fax: (717) 854-6757
RCRA hazardous wastes

Environmental Quality Company:

Wayne Disposal Facility
(aka EQ Michigan Disposal Waste Treatment Plant
and Wayne Disposal Inc. Site #2)
49350 North I-94 Service Drive
Belleville, MI 48111
Phone: (734) 697-2200 Fax: (734) 699-3499
RCRA & TSCA liquid and solid

US Ecology (Environmental Quality Detroit Inc.)
1923 Frederick Street,
Detroit MI 48211
Phone: (734) 329-8017 Fax: (313) 923-3375
RCRA & CRW liquid wastewater
Environmental Soil Management of New York,
LLC (ESMI of New York)
304 Towpath Road,
Fort Edward, NY 12828
Phone: (518) 747-5500 Fax: (518) 747-1181
Petroleum contaminated soil

Environmental Soil Management of NH
67 International Dr.
Loudon, NH 03307
Phone: (603) 783-0228 Fax: (603) 783-0104
Petroleum contaminated soil

Triumvirate (Formerly EnviroSafe Corporation
Northeast & Jones Environmental Services)
263 Howard Street,
Lowell, MA 01852
Phone: (978) 453-7772 Fax: (978) 453-7775
RCRA & TSCA liquid and solid

Hazelton Creek Properties, LLC*
(Hazelton Mine Reclamation Project)
280 South Church St.,
Hazelton, PA 18201
Phone: (570) 574-1010 Fax: (570) 457-3395
Fresh, brackish or marine dredge material, coal ash,
cement kiln dust, lime kiln dust, co-gen ash, regulated
fill
*Please note that if this facility is to be used, each bin
letter will require an additional 10 day (or more) waiting
period on top of the 15 day lab period designated in the
specs to allow for PADEP review.

Heritage Hazardous Waste Landfill (Heritage
Environmental Services, LLC)
4370 W County Rd 1275 N
Roachdale, IN 46172

Phone:(765) 435-2704 Fax: (315) 687-3898
Hazardous Wastes, Asbestos

Manchester Landfill
311 Olcott St.,
Manchester, CT 06040
Phone: (860) 647-3248 Fax: (860) 647-3238
Municipal solid waste, non-hazardous waste,
contaminated soil

Northeast Lamp Recycling, Inc.
250 Main Street,
East Windsor, CT 06088
Phone: (860) 292-1992 Fax: (860) 292-1114
CRW solid waste, mercury containing devices &
universal waste
Stericycle (Northland Environmental, LLC)
(aka PSC Environmental Systems)
275 Allens Ave.,
Providence RI 02905
Phone: (401) 781-6340 Fax: (401) 781-9710
RCRA liquid and solid

Ontario County Landfill
(Managed by Casella Waste)
3555 Post Farm Road,
Stanley, NY 14561
Phone: (585) 526-4420 Fax: (585) 526-5459
Municipal solid waste, non-hazardous waste solid,
special wastes including asbestos, ash from
boilers/incinerators, contaminated soil, demo debris

Paradise Heating Oil, Inc.
Quimby Street,
Ossining, NY 10562
Phone: (631) 926-2576 Fax: (718) 294-2226
CRW waste oil liquid

Phoenix Soil, LLC
58 North Washington Street
Plainville, CT 06062
Phone: (860) 747-8888 Fax: (203) 757-4933
Contaminated Soil

Red Technologies Soil
232 Airline Avenue
Portland, CT 06980
Phone: (860) 342-1022 Fax: (860) 342-1042
Temporary Storage & Transfer of contaminated soil

Republic Services Conestoga Landfill
420 Quarry Road
Morgantown, PA 19543
Phone: (610) 286-6844 Fax: (610) 286-7048
MSW, C&D debris, residual waste, contaminated soil,
asbestos *Please note that if this facility is to be used,
each bin letter will require an additional 10 day (or
more) waiting period on top of the 15 day lab period
designated in the specs to allow for PADEP review.

Stericycle (Formerly Republic Environmental
Systems (aka Philip Services Corporation (PSC)
Republic)
2869 Sandstone Dr.,
Hatfield PA 19440
Phone: (215) 822-8995 Fax: (215) 997-1293
RCRA & TSCA industrial solid & sludge, aqueous
waste, contaminated soil, PCB waste, oil & petroleum
waste, organic waste
Soil Safe, Inc.
378 Route 130, Logan Township,
Bridgeport NJ 08085
Phone: (410) 872-3990 x1120
Fax: (410) 872-9082
Soil contaminated with petroleum or metals, some
industrial waste solids

The Southbridge Recycling & Disposal Park
165 Barefoot Rd.
Southbridge, MA 01550
Phone: (508) 765-9723, (603) 235-3597
Fax: (508) 765-6812
MSW, non-hazardous C & D waste, contaminated soil
for cover

Stablex Canada, Inc.
760 Industrial Blvd.
Blainville Quebec J7C 3V4
Phone: (450) 430-9230 Fax: (450) 430-4642
RCRA liquid and solid, industrial wastes

Ted Ondrick Company, LLC
58 Industrial Road,
Chicopee, MA 01020
Phone: (413) 592-2566 Fax: (413) 592-7451
Petroleum contaminated soil

Tradebe Treatment & Recycling
136 Gracey Ave.

Meriden, CT 06451
Phone: (203) 238-8114 Fax: (203) 238-6772
RCRA, CRW wastewater, oil, hazardous waste fuels,
hazardous and non-hazardous waste water

Tunnel Hill Reclamation
2500 Township Road, 205 Route 2
New Lexington, OH 43764
Phone: (914) 713-0203 Fax: (914) 713-0672
Municipal solid waste, non-hazardous waste,
contaminated soils

Waste Management
RCI Fitchburg Landfill
Fitchburg Princeton Road,

The category of material accepted by each facility listed above is for informational purposes only. The Contractor shall verify facility acceptance of each type of regulated item.

Westminister, MA 01473
Phone: (978) 355-6821 Fax: (978) 355-6317
Solid: MSW, non-hazardous waste, C&D, contaminated
soil for use as cover material under MADEP COMM-97
policy

Turnkey Landfill (Waste Management of NH)
TLR III Refuse Disposal Facility
90 Rochester Neck Road, PO Box 7065
Rochester, NH 03839
Phone: (603) 330-2197 Fax: (603) 330-2130
Solid: MSW, C&D, PCB remediation waste (<50ppm),
virgin petroleum contaminated soil, CRW solid waste

(2) Submittals

Thirty (30) days prior to commencement of work involving the management of regulated items, the Contractor shall submit to the Engineer for approval, the following documentation:

1. Copy of Spill Contractor Permit registration issued by the CTDEEP.
2. Hazard communication training for all employees performing this work.
3. Names of the treatment facilities, recycling facilities and/or disposal facilities the Contractor intends to use to receive each type of regulated item.
4. Hazardous Material Transporter USDOT Certificate of Registration for each waste transporter.
5. Hazardous Material Transporter Permit for the State of Connecticut, the destination state(s), and all other applicable states for each waste transporter.

Contractor shall provide the Engineer with a minimum of 48 hours notice in advance of scheduling, changing or canceling work activities.

(3) Regulated Item Management Provisions

(a) General Requirements

The Contractor's OSHA Competent Person shall be in control on the job site at all times during hazardous material management work activities. This person must be capable of identifying existing hazards, possess the authority to implement corrective measures to reduce/eliminate the hazards, comply with applicable Federal, State and Local regulations that mandate work practices, and be capable of performing the work of this contract. All employees who perform regulated material management related work shall be properly trained and qualified to perform such duties.

All labor, materials, tools, equipment, services, testing, insurance, 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.

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.

Inventory data from investigative surveys throughout the buildings are included herein and are presented for informational purposes only. Under no circumstances shall this information be the sole means used by the Contractor for determining the quantities or extent of the regulated items to be managed. The Contractor shall be responsible for verification of all field conditions affecting performance of the work. The Contractor shall submit to the Engineer for concurrence any additional items not listed herein that it believes to be regulated items included under this item. However, compliance with applicable requirements is solely the responsibility of the Contractor.

The Engineer will provide a Project Monitor to monitor the activities of the Contractor and inspect the work required. Environmental sampling shall be conducted as deemed necessary by the Engineer. Spill areas shall be cleaned by the Contractor until accepted by the Engineer. The Engineer may sample the spill area to demonstrate Contractor compliance with an acceptable standard.

(b) Personnel Protection

Prior to commencing work, the Contractor shall provide hazard communication training to all employees as necessary in accordance with OSHA 29 CFR 1926.59 and 29 CFR 1910.1200 and instruct all workers in all aspects of personnel protection, work procedures, emergency procedures and use of equipment including procedures unique to this project. Worker health and safety protocols that address potential and/or actual risk of exposure to site specific hazards are solely the responsibility of the Contractor.

The Contractor shall provide respiratory protection that meets the requirements of OSHA as required in 29 CFR 1910.134 and 29 CFR 1926.1000. A formal respiratory protection program, including appropriate medical surveillance, must be implemented in accordance with OSHA standards. The Contractor shall, as necessary, conduct exposure assessment air sampling, analysis and reporting to ensure the workers are afforded appropriate respiratory protection.

The Contractor shall provide and require all workers to wear appropriate personnel protective equipment, including protective clothing and respiratory protection, as required, within regulated work areas which exceed OSHA Personnel Exposure Limits (PELs) or when handling hazardous materials.

(c) Regulated Item Management Work Procedures

The Contractor shall not begin work until the Project Monitor is on-site.

Prior to beginning work on-site, the Contractor shall prepare waste characterization profile forms for each type of waste stream to be generated and forward such forms to the Engineer for review, approval and signature. Upon approval, the Contractor shall forward such forms to the appropriate disposal facilities for acceptance.

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 Connecticut Department of Public Health DPH regulations.

The Contractor shall employ work practices so as to minimize the disturbance of the constituents in the regulated items, and prevent breakage and spills. In the event of a spill, the Contractor shall cordon off the area and notify the Engineer. The Contractor is responsible to have spills and the effected areas decontaminated to the acceptance of the Engineer by personnel trained in hazardous waste operator emergency response.

The Contractor shall carefully and properly remove, handle, pack, label and manifest all of the regulated items in waste containers specified and suitable to contain the waste in accordance with all federal and state regulations.

Prior to transportation and recycling and/or disposal, all proper USEPA, OSHA, CTDEEP and USDOT labels and placards shall be affixed to the waste containers and hazardous materials shipping papers such as waste manifests/bills of lading shall be completed.

Prior to renovation/demolition, properly remove, handle, pack, label, transport, manifest and recycle or dispose of the regulated items from those listed below:

The following hazardous/regulated materials, wastes and items have been identified at the following Bridge No. and will be impacted by the rehabilitation work.

Bridge No. 00524, Arrigoni Bridge, Middletown, CT

Light Fixtures associated roadway luminaires, the navigation light system and aviation light system:

- **Connecticut Regulated Waste (CRW) – PCB/DEHP ballasts**
- **Universal waste (UW) –Hg lamps & Used Electronic Ballasts**

Upon discovery of any previously unidentified regulated items during renovation activities, the Contractor shall immediately notify the Engineer and work shall cease in that area until the Engineer can determine the extent of any impact and proper handling procedures are implemented.

Efforts shall be made to recycle the constituents of the regulated items rather than dispose of them in accordance with the waste minimization efforts required under RCRA.

RCRA hazardous waste shall not be stored on the job site in excess of 90 calendar days from the accumulation start date.

Connecticut Regulated Waste shall not be transported to a RCRA or TSCA permitted facility for disposal, unless otherwise allowed by the Engineer in writing.

All non-RCRA hazardous waste materials, regulated waste materials and recyclable waste items shall be manifested separately from RCRA and TSCA hazardous waste, and documented properly on non-hazardous waste manifests, waste shipment records, bills of lading or other appropriate shipping papers for transportation to the recycling and/or disposal facility.

The Contractor shall prepare each lab pack list and shipping document (manifests, waste shipment records, bills of lading, etc.) with all of the required information completed (including types of waste, proper shipping name, categories, packing numbers, amounts of waste, etc.) in accordance with applicable federal and state regulations. The document will be signed by an authorized agent representing ConnDOT as the Generator for each load that is packed to leave the site.

The Contractor shall forward the appropriate original copies of shipping papers to the Engineer the same day the regulated items leave the project site.

All vehicles departing the site transporting hazardous materials shall display proper USDOT placards, as appropriate for the type of waste being transported.

(d) Project Closeout Documents:

Within thirty (30) days after completion of the on-site project work, the Contractor shall submit to the Engineer copies of the following completed documents:

1. Hazardous Waste Manifests
2. Waste Shipment Records/Bills of Lading
3. Recycling Receipts

Documents 1. through 3. must include the signature of an authorized disposal facility representative acknowledging receipt of hazardous materials.

Method of Measurement:

The work of “Handling and Disposal of Regulated Items” shall be provided for in accordance with Article 1.04.05 – Extra Work.

Basis of Payment:

The work of “Handling and Disposal of Regulated Items” shall be paid for in accordance with Article 1.04.05 – Extra Work, which price shall include the management, removal, handling, packing, labeling, transport, manifesting, recycling or disposal of the regulated constituents in the specific equipment/items scheduled for impact at the project site, and all equipment, materials, tools and labor incidental to the work.

Final payment will not be made until completed copies of all Manifest(s), Waste Shipment Records, Bills of Lading and/or Recycling Receipts have been provided to the Engineer. Once completed and facility-signed copies have been received in their entirety, the Engineer will make the final payment.

<u>Pay Item</u>	<u>Pay Unit</u>
Handling and Disposal of Regulated Items (Estimated Cost)	est.

ITEM #0201001A – CLEARING AND GRUBBING

Description:

This work shall consist of clearing the ground of trees, stumps, brush, rubbish and all objectionable material in accordance with these specifications or as directed by the Engineer. This work shall also include the clearing of the ground necessary for the construction and installation of drainage, structures, ditches, channels, fences and other appurtenances. Included in this work shall be the preservation from injury or defacement of vegetation and objects designated to remain.

Construction Methods:

The Contractor shall mark all trees, shrubs and plants to be removed in accordance with the plans and these specifications. The Engineer shall have 7 days to field review the markings and make any adjustments prior to the start of the clearing operation.

Within the excavation lines all trees shall be cut off and stumps removed to a depth of not less than 12 inches below the graded surface.

Within the fill lines where an embankment is to be made not more than 5 feet deep, trees, stumps, roots, etc., shall be removed. Where the embankments to be made exceed 5 feet deep, trees, stumps, roots, etc., shall be cut off to within 6 inches of the ground surface.

In areas where clearing is necessary for the construction and installation of various appurtenances, all trees and stumps shall be cut flush with the ground; and all dead or uprooted trees, brush, roots or otherwise objectionable material shall be removed as directed unless otherwise indicated on the plans.

Prior to clearing operations, a meeting must be held. Those attending the meeting should include the Contractor, the Engineer, the designer, local tree warden or equivalent, and the District Environmental Coordinator. All clearing issues shall be resolved to the satisfaction of the Engineer before any trees are cut.

All trees scheduled to be removed outside of the proposed gutter or curb lines shall be visibly marked or flagged by the Contractor at least 7 days prior to cutting of such trees.

The Engineer will inspect the identified trees within 7 days of the marking of the trees and verify the limits of clearing and grubbing prior to the Contractor proceeding with his cutting operation.

All branches of trees extending within the roadway shall be trimmed as directed to provide a 16 foot minimum vertical clearance including selective trimming of such trees as directed.

The Contractor shall dispose of all such trees, stumps, brush, etc., in a satisfactory manner and shall remove all rubbish and refuse from within the highway limits.

All excavations made below subgrade surface by the removal of trees, stumps, etc., shall be filled with suitable material, which shall be compacted thoroughly in accordance with the provisions governing formation of embankments.

All fences, stonewall fences and ornamental and utilitarian domestic accessories, such as, but not limited to garden pools, arbors, stair railings, fireplaces, sheds and incinerators, within the highway limits shall be removed as directed. However, the removal of materials in stonewalls, that are to be removed and not used in a new stonewall fences, will be paid for according to the provisions of Section 2.02.

All road signs, mail boxes, etc., shall be removed and reset as directed.

Method of Measurement:

When no price for "Clearing and Grubbing" is asked for on the proposal form, the cost of the work as described above shall be included in the cost of the grading items and no direct payment for "Clearing and Grubbing" will be made.

The work, material, tools, equipment and labor incidental to the disposal of trees, stumps, etc., will not be measured for payment.

Basis of Payment:

Prior to beginning work, the Contractor shall submit a proposed schedule of values for review and concurrence by the Engineer. If the bid price for this item exceeds 4% of the original Contract value, the amount in excess of 4% of the original Contract value will not be paid until 90% of all work in the Contract is complete.

Payment for this work will be at the Contract lump sum for "Clearing and Grubbing," except as noted above, and shall include all equipment, tools and labor incidental to the completion of this item.

All costs incidental to the disposal of trees, stumps, etc., shall be included in the price of "Clearing and Grubbing."

Pay Item

Pay Unit

Clearing and Grubbing

l.s.

ITEM #0201315A – RELOCATE EXISTING ROCK MONUMENT

Description: Work under this item shall consist of the removal, storage, resetting or relocating an existing rock monument to the locations shown on the plans, or as ordered by the Engineer.

Materials: Existing rock monument(s).

Construction Methods: At least 7 days prior to the start of construction, the Contractor shall stake the following features:

- Existing monument location.
- Proposed monument location as shown on the plans.
- Proposed curb line for at least 25 feet on each side of each monument(s).
- Provide stakes at a maximum spacing of 10 feet, unless otherwise directed by the Engineer.

Within 7 days of the completed staking, the Engineer will review the staked monument locations in the field, and may make any adjustments necessary to the proposed locations. Prior to the removal, the Contractor shall provide the Engineer with photos of the existing monument and storage location during the duration of the Project. Upon acceptance, the Contractor shall remove and store the existing rock monument, until the Site for the existing monument is finalized and ready to be relocated to the location as shown on the plans or as directed by the Engineer.

Monuments to be relocated shall be removed with care to avoid damage. If the monument becomes damaged during the removal and/or storage, it shall be restored to the original condition at the Contractor’s expense.

The designated location must be compacted, leveled, and shaped to accommodate the monument. Monument shall be set upright, matching its existing orientation. Consideration shall be taken verifying the proposed grades and matching the existing reveal of the monument. When the installation of monument results in disturbance of surrounding surfaces, said surfaces shall be restored to their original condition at no additional cost to the State.

Method of Measurement: This work will be measured for payment by the number of each existing rock monument(s) removed, stored, relocated and accepted.

Basis of Payment: This work will be paid for at the Contract unit price for each “Relocate Existing Rock Monument” completed and accepted. The price shall include all materials, equipment, tools and labor incidental thereto. The unit price shall include the cost of all staking, bed preparation, removal, photos, protection, storage, relocation and backfilling of each monument.

Pay Item	Pay Unit
Relocate Existing Rock Monument	ea.

ITEM #0202000A – EARTH EXCAVATION

Work under this item shall conform to the requirements of Form 817, Section 2.02 – Roadway Excavation, Formation of Embankment and Disposal of Surplus Material, supplemented as follows:

Article 2.02.03 – Construction Methods: *Add the following:*

All surplus excavated material shall be used where directed by the Engineer, to uniformly widen embankments, to flatten slopes, to fill low places in the right of way, or for such other purposes as the Engineer may direct, provided the area designated for deposit does not conflict with 2.02.035. Any surplus or unsuitable material not required, nor permitted to be used for such purposes, shall be disposed of in accordance with 2.02.03-10.

The Contractor shall salvage the following item for the City of Middletown:

- Existing Granite Stone Curbing that is removed along Main Street and adjacent side streets.

The salvaged Granite Stone Curbing in good, reusable condition shall be banded to pallets. (curbing will not be accepted if not properly banded.) Elements with damage will not be accepted.

The Engineer will determine the condition of the materials to be satisfactory for salvage purposes.

The salvaged granite curbing shall be delivered to the City of Middletown Yard at 465 Washington Street, Middletown, CT 06457.

48 hours prior to delivery the contractor shall contact Mr. Christopher Holden, Deputy Public Works Director at (860) 638-4850 or via email at Chris.Holden@MiddletownCT.gov to make arrangement for receiving shipment.

The salvaged material shall be loaded, transported and unloaded by the Contractor. All material shall be stacked and stored by the Contractor according to the direction of the Deputy Director or his/her representative.

Article 2.02.05 – Basis of Payment: *Revise first paragraph as follows:*

Roadway excavation will be paid for at the Contract unit price per cubic yard for "Earth Excavation," "Rock Excavation," "Rock Excavation (No Explosives)," "Channel Excavation—Earth," or "Channel Excavation—Rock" as the case may be, in accordance with the classification given herein and subject to the method of measurement described above. The price shall include

ITEM #0202000A

all equipment, tools, compaction testing and labor incidental to the completion of the excavation, the formation and compaction of embankments, salvaging of granite curbing material including transporting and unloading and the disposal of surplus or unsuitable material in accordance with the provisions of the plans and of these specifications.

Pay Item	Pay Unit
Earth Excavation	c.y.

ITEM #0202000A

ITEM #0202452A – TEST PIT

Description: Work under this item shall consist of digging of exploratory test pits by mechanical and/or manual methods. The purpose of the test pits are to locate drains, pipes, rocks, utilities, structure foundations, or any other obstacles that may interfere with proposed drainage modifications.

Construction Methods: The Contractor shall excavate at the locations called out on the plans by either mechanical or manual means to locate underground utility conflicts. Excavation shall continue until the conflict is located or it is determined by the Engineer that there is no conflict with the proposed design.

Test pit excavations shall have neat, clean-cut, and vertical sides; hand digging shall be employed when required by the Engineer. Saw cuts shall be performed where necessary and as directed by the Engineer.

The Contractor is hereby notified that unforeseen obstacles or soil conditions may be encountered. The Contractor shall include in the bid price the assumptions of the risks and the associated cost. The Contractor shall “Call Before You Dig” before any excavation work.

The Contractor shall ensure that underground utilities or structures are not damaged. The Contractor is solely responsible for any damages incurred during excavation operations. Repair or replacement of any damages as a result of the test pit excavation will be to the satisfaction of the Engineer at the Contractor’s own expense.

The Contractor shall notify the Engineer as early as possible of any revealed conflicts, which may require design revisions, relocations, and/or adjustments. The Engineer will perform all necessary design revisions in a reasonable amount of time. No work shall start within areas of conflict until authorized by the Engineer.

The Contractor shall protect each test pit with steel plates, fences, barriers, or other appropriate materials as deemed necessary by the Engineer. Do not backfill test pits until authorized by the Engineer. Compact backfill materials to a density consistent with the existing or adjacent conditions to the sub-grade elevation or as otherwise directed.

The surface of the test pit areas shall be restored to a condition equal to or better than the original condition. Test pits throughout the project area are to be completed prior to beginning actual construction activities.

Method of Measurement: This work will be measured by the actual number of completed and accepted test pits.

Basis of Payment: This work will be paid for at the Contract unit price each for “Test Pits”, which price shall include all materials, tools, equipment, and labor incidental thereto.

Pay Item	Pay Unit
Test Pit	ea.

ITEM #0202452A

ITEM #0202512A – CUT CONCRETE SIDEWALK

Work under this item shall conform to the requirements of Form 817, Section 2.02 – Roadway Excavation, Formation of Embankment and Disposal of Surplus Material, supplemented as follows:

Description:

The work shall include saw cutting the existing concrete sidewalks at the limits of removal as shown on plan, ordered by the engineer, and in accordance with these specifications.

Method of Measurement:

The work of cutting concrete sidewalk will be measured for payment by the number of linear feet of saw cut made with an approved concrete saw to the lines delineated on the plans or as directed by the engineer.

Basis of Payment:

The work of cutting concrete sidewalk will be paid for at the contract unit price per linear foot for “Cut Concrete Sidewalk”, including any bituminous surfacing material immediately thereon which price shall include all materials, equipment, tools and labor incidental thereto.

Pay Item	Pay Unit
Cut Concrete Sidewalk	l.f.

ITEM #0219011A – SEDIMENT CONTROL SYSTEM AT CATCH BASIN

Description:

This work shall consist of furnishing, installing, cleaning, maintaining, replacing, and removing sedimentation control at catch basins at the locations and as shown on plans and as directed by the engineer.

Materials:

Sack shall be manufactured from a specially designed woven polypropylene geotextile sewn by a double needle machine, using a high strength nylon thread. Sack shall be manufactured by one of the following or an approved equal:

Siltsack®

SI Geosolutions: www.sigeosolutions.com (800)621-0444

Dandy Sack™ Dandy Products Inc.

P.O. Box 1980 Westerville, Ohio 43086 Phone: 800-591-2284 Fax: 740-881-2791

Email: dlc@dandyproducts.com Website: www.dandyproducts.com

FLeXstorm Inlet Filters Inlet & Pipe Protection 24137 W. 111th St - Unit A Naperville, IL 60564

Telephone: (866) 287-8655

Fax: (630) 355-3477

The sack will be manufactured to fit the opening of the catch basin or drop inlet. Sack will have the following features: two dump straps attached at the bottom to facilitate the emptying of sack and lifting loops as an integral part of the system to be used to lift sack from the basin. The sack shall have a restraint cord approximately halfway up the sack to keep the sides away from the catch basin walls, this cord is also a visual means of indicating when the sack should be emptied. Once the strap is covered with sediment, the sack should be emptied, cleaned and placed back into the basin.

Construction Methods:

Installation, removal, and maintenance shall be per manufacturer instructions and recommendations.

Method of Measurement:

Sedimentation Control at Catch Basin will be measured as each installed, maintained, accepted, and removed. There will be no separate measurement for maintenance or replacement associated with this item.

Basis of Payment:

Sedimentation Control at Catch Basin will be paid for at the contract unit price each complete in

place and accepted, which price shall include all maintenance throughout construction, materials, equipment, tools, and labor incidental thereto.

Pay Item

Pay Unit

Sediment Control System at Catch Basin

ea

ITEM #0406125A – BITUMINOUS CONCRETE SURFACE PATCH

Description:

This work shall consist of milling out deteriorated bituminous concrete pavement to a depth between 1.5 to 2.5 inches, disposing of pavement millings, sweeping and cleaning, application of tack coat on all surfaces within the milled area, and placement of Hot-Mix Asphalt (HMA) or an equivalent Polymer Modified Asphalt (PMA) to match the elevation of the surrounding pavement.

For road sections being milled and paved, all patching operations must be completed after milling is complete and before paving begins. All patching operations shall be completed within one working day following milling and shall be completed before traffic is permitted to resume on the exposed roadway.

Materials:

Materials for this work shall meet the requirements of Section M.04 and shall consist of the following:

1. HMA S0.375 or an equivalent PMA. All HMA or PMA shall be Traffic Level 2 unless indicated otherwise on the plans.
2. Tack coat.

Construction Methods:

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 bituminous concrete pavement.

The rotary drum of the machine shall use carbide tip tools spaced not more than 5/8 inches apart. The forward speed of the milling machine shall be a maximum of 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 machine shall be equipped with an integral pickup and conveying device to immediately remove milled material from the surface of the roadway and discharge the millings into a truck 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 Contractor may be permitted to use a lesser equipped milling machine, if approved by the Engineer.

The minimum milling width shall be 20 inches, making the minimum achievable patch size 20 inches by 20 inches, or 0.30 square yards.

2. 10-foot straight edge.
3. Sweeper: A sweeper, equipped with a water tank, capable of remove millings and loose debris.
4. Air compressor: An air compressor capable of producing 100 psi oil free compressed air for cleaning the milled pavement surface.
5. Hot air lance: A hot air lance that can deliver 100 psi oil free heated air to clean and dry the pavement surface. The compressed air emitted from the tip of the lance shall achieve a temperature of at least 1500°F.
6. Paving and compaction equipment: Paving and compaction equipment meeting the requirements of Section 4.06. It is expected that much of the placement will require hand work or a mixture of equipment and hand tools to achieve the required results. Smaller compaction equipment, including vibratory plate compactors, will be allowed by the Engineer 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.
7. Portable lighting equipment: If the work is performed at night a truck towed light tower and driver shall be provided for use by the Engineer for all marking, installation, and inspection of the patches.
8. Tack Coat Distributor: A minimum 150-gallon capacity tank that is trailer mounted or self-propelled and capable of applying tack coat meeting the requirements of Section 4.06.

The work shall include, but is not limited to, the following:

1. Demarcating: The Engineer will mark out areas for patching and will determine the appropriate milling depth between 1.5 inches and 2.5 inches. The minimum length and width dimensions of the patch shall be 20 inches. Any area to be patched shall completely encompass the entire distressed pavement area and extend at least 6 inches beyond into the surrounding pavement wherever possible.
2. Milling: Mill marked out areas to the specified depths.
3. Sweeping, Cleaning, and Drying: Sweep the milled surface clean, and allow milled areas to dry. Any moisture in or on the milled areas must be allowed to evaporate or be removed with the assistance of the hot air lance. When the milled area is dry to the satisfaction of the Engineer, it shall be blown clean of any residual dust or debris using compressed air.

4. Applying Tack Coat: Apply tack coat to the entire clean and dry milled area, including the sides/walls of the area to be patched, in accordance with the requirements of Section 4.06.
5. Placing Patch Material: After the tack coat has had sufficient time to cure or break, HMA S0.375 or equivalent PMA shall be placed and compacted to the requirements above and in Section 4.06. The Contractor shall confirm that the surface elevation of the finished patch matches the elevation of the surrounding pavement surface to within 1/4 inch using the 10-foot straightedge. The Contractor shall confirm that all patch material placed is uniform in appearance without segregation.

Method of Measurement:

This work will be measured by the number of square yards of patched bituminous concrete completed and accepted.

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 all tools, materials, labor and equipment; milling, removing, and disposing of pavement millings; sweeping and cleaning of the milled area; drying the milled area; applying tack coat to the milled area; and placement and compaction of HMA or PMA.

Pay Item	Pay Unit
Bituminous Concrete Surface Patch	s.y.

ITEM #0406272A – MILLING OF BITUMINOUS CONCRETE – (0 - 4 INCHES)

Description:

This work shall consist of the milling, removal, and disposal of existing bituminous concrete pavement.

Construction Methods:

The Contractor shall remove the bituminous concrete 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 as directed by the Engineer.

The bituminous concrete material shall be disposed of offsite by the Contractor at an approved disposal facility unless otherwise stated in the Contract.

Any milled surface, or portion thereof, that is exposed to traffic shall be paved within five (5) calendar days unless otherwise stated in the plans or Contract.

The equipment for milling the pavement surface shall be designed and built for milling bituminous concrete 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 bituminous concrete 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 use carbide or diamond tipped tools spaced not more than $\frac{5}{8}$ inch 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.

For projects that are 5000 feet in length or greater, the Contractor may submit a request in writing to perform a test strip(s) to demonstrate that the same surface tolerance can be attained at an increased forward speed. The submission shall include:

- Increased forward speed(s) to be tested
- Location of the test strip(s)
- Length of test strip(s)
- Make and model of the milling machine

- Type of drum (Standard or Fine)

The increased forward speed shall be made in 5 ft/min. increments from the maximum 45 ft/min. per test strip. The test strip(s) shall have a minimum length of 250 feet, a maximum length of 500 feet and shall have the same criteria for surface tolerance as noted in this Specification. The surface tolerance shall be verified by a Contractor supplied 10 foot straightedge with measurements taken every 50 feet and at any location the Inspector deems appropriate within the test strip. In no case shall the forward speed be allowed to increase beyond 60 feet/minute. The final decision for implementing or continuing approved increased forward speed will be at the discretion of the Engineer.

If an increase in forward speed is approved, the same equipment used for the test strip shall be used throughout the milling operation. If at any time during approved increased speed there is evidence of gouging, cupping, delamination or any surface texture outside of the tolerances within this specification is evident, the forward speed shall be reduced to a maximum of 45 feet/minute for the remainder of the project.

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 (5) 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 measurements 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 bituminous concrete layers or a surface delamination of bituminous concrete 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 +/- 1/2 inch to eliminate the condition.

When removing bituminous concrete pavement entirely from an underlying Portland cement concrete pavement, all of the bituminous concrete 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 the requirements below are met. 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 shall 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 one (1) inch exposed to traffic as a result of milling. All structures within the roadway that are exposed to traffic and greater than one (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 (24:1) taper in all directions.
3. All rectangular structures with a vertical face greater than 1 inch shall receive a transition of bituminous concrete formed at a minimum 24 to 1 (24:1) taper in all directions.

*Bituminous concrete tapers at a minimum 24 to 1 (24:1) taper in all directions may be substituted for the protection rings if approved by the Engineer.

For roadways with a posted speed limit of 40, 45 or 50 mph:

1. All structures shall receive a transition of bituminous concrete formed at a minimum 36 to 1 (36:1) taper in the direction of travel. Direction of travel includes both the leading and trailing side of a structure. The minimum taper shall be 24 to 1 (24:1) in all other directions.

For roadways with a posted speed limit of greater than 50 mph:

1. All structures shall receive a transition of bituminous concrete formed at a minimum 60 to 1 (60:1) taper in the direction of travel. Direction of travel includes both the leading and trailing side of a structure. The minimum taper shall be 24 to 1 (24:1) in all other directions.

All roadway structure edges and bituminous concrete tapers shall be clearly marked with fluorescent paint. The paint shall be maintained throughout the exposure to traffic.

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 truck. The sweeper truck shall be equipped with a water tank and be capable of removing the millings and loose debris from the surface. The sweeper truck shall operate at a forward speed that allows for the maximum pickup of millings from the roadway surface. Other sweeping equipment may be provided in lieu of the sweeper truck 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 measurements 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 Bituminous Concrete (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 or paved transition; removal and disposal of millings; furnishing a sweeper truck and sweeping after milling. The costs for these items shall be included in the Contract unit price.

Pay Item

Pay Unit

Milling of Bituminous Concrete – (0 - 4 inches)

s.y.

ITEM #0406275A – FINE MILLING OF BITUMINOUS CONCRETE (0 TO 4 INCHES)

Description:

This work shall consist of the milling, removal, and disposal of existing bituminous concrete pavement for spans 10 & 11 of Bridge No. 00524.

Construction Methods:

The Contractor shall remove the bituminous concrete 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 as directed by the Engineer.

The bituminous concrete material shall be disposed of offsite by the Contractor at an approved disposal facility unless otherwise stated in the Contract.

Any milled surface, or portion thereof, that is exposed to traffic shall be paved within five (5) calendar days unless otherwise stated in the plans or Contract.

The equipment for milling the pavement surface shall be designed and built for milling bituminous concrete 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 bituminous concrete 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 use carbide or diamond tipped tools spaced not more than $\frac{5}{16}$ inch 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 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 (5) 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 measurements 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 bituminous concrete layers or a surface delamination of bituminous concrete 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 +/- ½ inch to eliminate the condition.

When removing bituminous concrete pavement entirely from an underlying Portland cement concrete pavement, all of the bituminous concrete 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 the requirements below are met. 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 shall 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 one (1) inch exposed to traffic as a result of milling. All structures within the roadway that are exposed to traffic and greater than one (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 (24:1) taper in all directions.
3. All rectangular structures with a vertical face greater than 1 inch shall receive a transition of bituminous concrete formed at a minimum 24 to 1 (24:1) taper in all directions.

*Bituminous concrete tapers at a minimum 24 to 1 (24:1) taper in all directions may be substituted for the protection rings if approved by the Engineer.

For roadways with a posted speed limit of 40, 45 or 50 mph:

1. All structures shall receive a transition of bituminous concrete formed at a minimum 36 to 1 (36:1) taper in the direction of travel. Direction of travel includes both the leading and trailing side of a structure. The minimum taper shall be 24 to 1 (24:1) in all other directions.

For roadways with a posted speed limit of greater than 50 mph:

1. All structures shall receive a transition of bituminous concrete formed at a minimum 60 to 1 (60:1) taper in the direction of travel. Direction of travel includes both the leading and trailing side of a structure. The minimum taper shall be 24 to 1 (24:1) in all other directions.

All roadway structure edges and bituminous concrete tapers shall be clearly marked with fluorescent paint. The paint shall be maintained throughout the exposure to traffic.

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 truck. The sweeper truck shall be equipped with a water tank and be capable of removing the millings and loose debris from the surface. The sweeper truck shall operate at a forward speed that allows for the maximum pickup of millings from the roadway surface. Other sweeping equipment may be provided in lieu of the sweeper truck 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 Bituminous Concrete (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 or paved transition; removal and disposal of millings; furnishing a sweeper truck and sweeping after milling. The costs for these items shall be included in the Contract unit price.

Pay Item

Pay Unit

Fine Milling of Bituminous Concrete (0 to 4 Inches)

s.y

ITEM #0406314A – 80 MIL PAVEMENT MARKING GROOVE 5” WIDE
ITEM #0406315A – 80 MIL PAVEMENT MARKING GROOVE 7” WIDE

Description:

Work under this item shall consist of grooving the pavement surface in a continuous or regularly spaced fashion for the placement of recessed pavement markings. Unless otherwise noted, the groove shall be 1 inch wider than the anticipated pavement marking. The groove for double-yellow centerline markings shall consist of two grooves, each 5 inches wide.

Groove Width: 5 inches wide for 4-inch markings
7 inches wide for 6-inch markings

Groove Depth: 0.080 inches ± 0.010 inches

The groove shall not be installed continuously for intermittent pavement markings, but only where markings are to be applied.

The groove shall not be installed on metal bridge decks, on bridge joints, at drainage structures, at loop detector sawcut locations, or in other areas identified by the Engineer.

Equipment:

The grooving equipment shall be equipped with a free-floating, depth-controlled head which provides a consistent groove depth over irregular pavement surfaces. The grooving head shall only be equipped with diamond saw blades. Any ridges in the bottom of the groove shall have a maximum height of 0.015 inches.

The grooving equipment shall be capable of installing a groove 6 inches away from any vertical or horizontal obstruction.

Construction Methods:

The pavement marking groove shall be installed in accordance with the current ConnDOT pavement marking standard drawings.

The Contractor shall establish control points for measuring offsets and pre-marks along the entire distance of pavement being grooved. Prior to installation of the groove, the Contractor shall verify the equipment is capable of installing the correct width and spacing of the groove. The control points, pre-marks, and equipment will be reviewed by the Engineer prior to commencement of the work.

The groove will be considered defective if any edge of the groove varies more than 0.25 inch in a 10-foot length, or if the alignment of the groove visibly deviates from the normal alignment of the road.

Final Cleaning: The Contractor shall immediately collect all debris and dust resulting from the grooving operation by vacuuming the pavement groove and adjacent pavement surface. Collected debris and any waste material shall be properly disposed of by the Contractor.

The work area shall be returned to a debris-free state prior to re-opening to traffic.

Repair of Unacceptable Groove:

The Contractor shall repair any defective groove(s) to the satisfaction of the Engineer. All work in conjunction with this repair shall be performed at no additional cost to the State.

Pavement Marking Requirements:

The Contractor is required to install permanent epoxy resin pavement markings in the grooves before the lane or roadway is opened to live traffic. If the permanent pavement markings cannot be installed before the lane or roadway is opened to live traffic, temporary 0.005-inch hot-applied waterborne pavement markings without glass beads shall be installed before the lane or roadway is opened to live traffic at no additional cost to the State. Within 10 calendar days, permanent epoxy resin pavement markings shall be applied in the groove over the 0.005-inch hot-applied waterborne pavement markings.

Groove Depth Gauge:

The Contractor shall supply the Engineer with two accurate, easily readable gauges with which to verify groove depth for the duration of the project. The gauges shall be delivered no less than one week prior to the anticipated beginning of grooving operations. Gauges shall be accompanied by manufacturer’s instructions for their use. The gauges will be returned to the Contractor at the conclusion of the project.

Method of Measurement:

This work will be measured for payment by the number of linear feet of groove installed in the pavement as ordered and accepted by the Engineer.

Basis of Payment:

This work will be paid for at the contract unit price per linear feet of “Pavement Marking Groove” installed in the pavement and accepted. This price shall include cleaning of the pavement, all materials, equipment, tools, depth gauges, and labor incidental thereto, and disposal of any waste material resulting from the operation.

<u>Pay Item</u>	<u>Pay Unit</u>
80 Mil Pavement Marking Groove 5” Wide	l.f.
80 Mil Pavement Marking Groove 7” Wide	l.f.

ITEM #0406993A – BITUMINOUS CONCRETE PAVEMENT COLORING AND STAMPING

Description: Work under this item shall consist of constructing aggregate reinforced preformed thermoplastic Bituminous Concrete Pavement Coloring and Stamping.

Materials: All materials and specialized application equipment for this work shall meet the requirements outlined in the manufacturer specification. Approved materials for this item are:

- 1) TrafficPatternsXD[®] Preformed Thermoplastic Decorative Crosswalks
- 2) ThermoPrintHT[®] Pre-Formed Imprinted Thermoplastic Decorative High Traffic Pavement Surfacing System
- 3) An approved equal

Panels:

- Pattern and size:
 - TrafficPatternsXD[®]: The pattern shall be “Offset Brick” with a brick size of 4-3/4” x 9-5/8”
 - ThermoPrintHT[®]: The pattern shall be “Running Bond” with a brick size of 4-3/4” x 8-3/4”
- Color: The color shall be “Colonial Brick”

Construction Methods: The methods used to complete this work shall meet the requirements outlined in the manufacturer specification, which can be located at:

- 1) TrafficPatternsXD[®]
http://www.ennisflintamericas.com/downloads/dl/file/id/140/product/942/specification_trafficpatternsxd_branded.pdf
- 2) ThermoPrintHT[®]
<http://www.patternpaving.com/catalog/thermoprintHT/ThermoPrintHT%20Sample-Spec2.pdf>
- 3) Upon approval of another product, the manufacturer specification for the installation shall be followed.

The Contractor shall supply a copy of a valid license agreement between the manufacturer and the accredited applicator (herein Applicator) for the construction calendar year. Written

verification from the manufacturer that the Applicator is qualified to perform this Work will suffice as well. This documentation shall be provided no later than one week (7 calendar days) prior to the award of the contract to:

Mr. Stephen D. Hall, P.E.
Project Engineer
Connecticut Department of Transportation
Bureau of Engineering and Construction
2800 Berlin Turnpike – P.O. Box 317546
Newington, CT 06131-7546
(860) 594-2591

Mr. Donald L. Ward, P.E.
Transportation District Engineer
Connecticut Department of Transportation
Bureau of Engineering and Construction
1107 Cromwell Avenue
Rocky Hill, CT 06067
(860) 258-4604

Alignment and sequencing:

Align the panels so that the long axis of the pattern is perpendicular to the direction of vehicular travel traffic. Adjacent travel lane pavement markings shall not be applied prior to the thermoplastic application.

Method of Measurement: This work will be measured by the actual number of square feet of completed and accepted of Bituminous Concrete Pavement Coloring and Stamping.

Basis of Payment: This work will be paid for at the Contract unit price per square foot for “Bituminous Concrete Pavement Coloring and Stamping” complete in place, which price shall include all equipment, tools, materials, and labor incidental thereto.

Pay Item	Pay Unit
Bituminous Concrete Pavement Coloring and Stamping	s.f.

ITEM #0406999A – ASPHALT ADJUSTMENT COST (ESTIMATED COST)

Description

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 during the Contract.

The Asphalt Price is available on the Department of Transportation website at:

<http://www.ct.gov/dot/asphaltadjustment>

Construction Methods

An asphalt adjustment will be applied only if all of the following conditions are met:

I. For HMA and PMA mixtures:

- a. The HMA or PMA mixture for which the adjustment would be applied is listed as a Contract item with a pay unit of tons.
- b. *The total quantity for all HMA and PMA mixtures in the Contract or individual purchase order (Department of Administrative Service contract awards) exceeds 1000 tons or the Project duration is greater than 6 months.*
- c. The difference between the posted *Asphalt Base Price* and *Asphalt Period Price* varies by more than \$5.00 per ton.

II. For Ultra-Thin Bonded HMA mixtures:

- a. The Ultra-Thin Bonded HMA mixture for which the adjustment would be applied is listed as a Contract item.
- b. The total quantity for Ultra-Thin Bonded HMA mixture in the Contract exceeds:
 - 800 tons if the Ultra-Thin Bonded HMA item has a pay unit of tons.
 - 30,000 square yards if the Ultra-Thin Bonded HMA item has a pay unit of square yards.
- c. The difference between the posted *Asphalt Base Price* and *Asphalt Period Price* varies by more than \$5.00 per ton.
- d. No Asphalt Adjustment Cost will be applied to the liquid emulsion that is specified as part of the Ultra-Thin Bonded HMA mixture system.

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 item Special Provision.

III. Regardless of the binder used in all HMA or PMA mixtures, the Asphalt Adjustment Cost will be based on PG 64-22.

The Connecticut Department of Transportation (CTDOT) will 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 United States dollars per standard ton (US\$/ST).

Method of Measurement

Formula: $HMA \times [PG\%/100] \times [(Period\ Price - Base\ Price)] = \$ \underline{\hspace{2cm}}$

Where:

- **HMA:**

1. For HMA, PMA, and Ultra-Thin Bonded HMA mixtures with pay units of tons: The quantity in 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 square yards:

The quantity of Ultra-Thin Bonded HMA mixture delivered, placed, and accepted for payment, calculated in tons as documented according to the Material Documentation provision (Construction Methods, paragraph G) of the Ultra-Thin Bonded HMA Special Provision.

- **Asphalt Base Price:** The asphalt price posted on the CTDOT website 28 days before the actual bid opening posted.

- **Asphalt Period Price:** The asphalt price posted on the CTDOT website during the period the HMA or PMA mixture was placed.

- **PG%:** Performance-Graded Binder percentage

1. For HMA or PMA mixes:

- PG% = 4.5 for HMA S1 and PMA S1

- PG% = 5.0 for HMA S0.5 and PMA S0.5

- PG% = 6.0 for HMA S0.375, PMA S0.375, HMA S0.25 and PMA S0.25

2. For Ultra-Thin Bonded HMA mixes:

PG% = Design % PGB (Performance Graded Binder) in the approved job mix formula, expressed as a percentage to the tenth place (e.g. 5.1%)

The asphalt adjustment cost shall not be considered as a changed condition in the Contract as result of this provision since all bidders are 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 the adjustment 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.

Pay Item

Pay Unit

Asphalt Adjustment Cost (Estimated Cost)

est.

ITEM #0503010A – SIDEWALK REMOVAL (STRUCTURE)

Description: Work under this item shall consist of the removal concrete sidewalk from existing structures by pneumatic hammers or hydro-demolition methods, as directed by the Engineer and specified herein.

Work under this item shall also include the furnishing and installation of wire ties for reinforcing bar and vertical supports on inadequately supported or vibrating reinforcing steel within concrete sidewalk areas to be replaced, as ordered by the Engineer.

Construction Methods:

Removal of concrete for partial depth patch will be performed by one of two methods: Hammer Demolition or Hydro-demolition. Prior to beginning any work, the Contractor shall provide submittals outlining intended method, as defined herein.

- 1) **Hammer Demolition:** The maximum allowable noise level caused by equipment used for the removal of deck concrete shall not exceed 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 the equipment will meet this requirement before the use of such equipment will be allowed.

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.

- 2) **Hydro-Demolition Water and Equipment:** All hydro-demolition equipment shall be capable of removing concrete sidewalk 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 the 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 acceptance by the Engineer. No hydro-demolition work shall be initiated until this acceptance 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 Energy and 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) Hydro-Demolition Drainage Runoff Control: At least 2 weeks prior to the planned initiation of hydro-demolition operations, the Contractor shall submit to the Engineer for acceptance a comprehensive plan for the hydro-demolition operation. This Hydro-Demolition Plan shall include the following:
- a) Equipment
 - b) Containment
 - c) Filtration
 - d) Location of trial areas
 - e) Disposal of hydro-demolition runoff and concrete debris in conformance with these specifications

The Plan shall ensure that all concrete debris and particulate 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 acceptable to 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 Hydro-Demolition 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.

The Plan shall additionally conform to all applicable requirements of Section 1.10 Environmental Compliance of the Standard Specifications.

The acceptance by the Engineer of the Hydro-Demolition 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 will be designated by the Engineer to demonstrate that the equipment, personnel and methods of operation are capable of producing satisfactory results. The trial area will consist of a patch of approximately 20 square feet pf sidewalk determined by the Engineer.

If, after calibrating the hydro-demolition equipment and beginning removal operations in a particular zone or area, insufficient removal of concrete is observed, 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 Concrete Sidewalk: The concrete sidewalk 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 removed 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 1/2 inch with a powersaw capable of making straight cuts prior to pneumatic demolition. 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 acceptable manner. Where sawing is impractical, the area shall be outlined by chisel or other acceptable means.

All concrete sidewalk shall be removed by pneumatic hammers or hydro-demolition methods.

The depth of concrete removal shall be at least 1 inch below the top reinforcing steel mat but shall be such as to include removal concrete sidewalk in its entirety. Within 1 hour following the initiation of a concrete removal operation in any patch area, all loose concrete debris shall 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 frame, 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 its 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 or vibrating reinforcing steel, as directed by the Engineer.

The concrete surface and reinforcing steel to receive concrete 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 acceptable to 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 surface 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 surface area, 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 where concrete will be placed shall be dampened. All excess free water shall be removed from the surface area.

Method of Measurement: This work will be measured for payment by the actual volume in cubic feet of concrete sidewalk removed except where the Engineer determines that the Contractor has unnecessarily removed sound concrete from the bridge deck. Where sound concrete has been unnecessarily removed, the replacement concrete will not be measured for payment. Providing safe access for delineation and inspection of the performed work 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 under "Sidewalk Removal - Structure," complete and accepted in place, which price shall include removal of concrete sidewalk, surface preparation of areas where concrete sidewalk is replaced, the furnishing and installation of reinforcing bar wire ties and vertical supports for inadequately supported existing reinforcing steel, inspection access, all materials, equipment, including the tools, labor and work incidental thereto.

Replacement of deteriorated rebar, if required, will be paid for under the item "Deformed Steel Bars."

Pay Item	Pay Unit
Sidewalk Removal (Structure)	c.f.

ITEM #0503030A – REMOVAL OF BRIDGE DECK CONCRETE

Description:

Work under this item shall consist of the removal and satisfactory disposal of the existing reinforced bridge deck concrete, bituminous concrete overlay, steel armored joints, steel scupper frames and grates including fiberglass hoppers, barrier curbs and sidewalk concrete including the MC18 sidewalk fascia channel as shown on the plans from Bridge No. 00524 in accordance with these specifications, the plans, and as directed by the Engineer. Work under this item shall also include all saw cutting of concrete bridge decks where required for stage or phased construction or for the removal operations of the bridge deck concrete.

Material:

The materials required for this work shall be of a quality satisfactory to the Engineer.

Construction Methods:

Prior to the removal of any concrete, the Contractor shall submit detailed working drawings and design calculations for demolition procedure and sequences, and debris shielding and workman safety systems. These drawings shall include complete details of equipment, materials, locations, dimensions, and methods. Working drawing and calculations shall be prepared by and sealed by a Professional Engineer registered in the State of Connecticut in accordance with Article 1.05.02. Work shall not be started until approval from the Engineer has been obtained and required materials and equipment are available at the site. Working drawings for the intended method of removal with supporting computations for any false work or other appurtenances required for the protection of traffic and property during removal operations, shall also account for all construction loads and conditions the structure will encounter during the removal process, including, but not limited to, temporary cantilever slab loading and conditions caused by the longitudinal saw cut of the slab delineated by phased construction sequences.

Concrete shall be removed by suitable methods approved by the Engineer. Care shall be taken so as not to damage any adjacent concrete that is to remain and any protruding reinforcing steel that is to remain. Concrete removal over the flange of the fascia stringer will be limited to 30 lb. hammers. The reinforcing steel and spiral shear connectors are to remain above the fascia girder and are to be cleared of all concrete to the dimensions shown on the plans. Solid shielding where needed, will be installed below the work area to prevent debris from falling to the area below.

Any debris that is not retained by the shielding shall be immediately cleaned up to the satisfaction of the Engineer.

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 items "Maintenance and Protection of Traffic" and "Prosecution and Progress", contained elsewhere in these Specifications.

Steel Railings: The steel rails, including posts and connection devices, shall be removed prior to demolition of the concrete parapets. This work is to be paid for under item 0503274A - Remove, Store, and Re-assemble Handrail.

Parapets and Deck Concrete: The portions of the concrete deck slab to be removed shall first be delineated by longitudinally saw cutting the deck slab at the location identified in the plans. The concrete deck shall then be removed by methods that will not cause damage to existing structure elements which will remain in place. The concrete deck area above the fascia stringer is to be removed with chipping hammers not to exceed 30 lbs. in weight. Care is to be taken not to damage the reinforcing steel and spiral shear connectors to remain. If any damage does occur it shall be repaired by the Contractor to the satisfaction of the Engineer at no additional cost to the State.

The outline of the area to be removed shall be sawcut to a depth of 1/2- inch with an approved power saw capable of making straight cuts. In the event that reinforcing steel is encountered within the upper 1/2-inch depth during sawing operations, the depth of 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, provided reinforcing steel is not again encountered. Where over-breakage occurs resulting in a feather-edge, the featheredge shall be squared up to a vertical edge in an approved manner. Where sawing is impractical, the areas shall be outlined by chisel or other approved means.

As part of the removal operations, all embedded components of the portions of the existing deck joint shall be removed, including the armored steel plates and shapes. Care shall be taken so as not to damage existing scuppers, any existing deck joint components, spiral shear connectors present and all reinforcing steel detailed to remain protruding from the removal limit.

Method of Measurement:

Concrete reinforced deck, bituminous concrete overlay, barrier curbs, sidewalks, steel armored joints and steel scupper frames and grates including fiberglass hoppers removed under this item shall be measured for payment by the volume in cubic yards of concrete removed and measured in place prior to removal.

Basis of Payment:

Payment for removing the concrete bridge deck shall be made at the contract unit price per cubic yard for "Removal of Bridge Deck Concrete," which price shall include all equipment, tools and labor incidental to the removal of the material and the disposal thereof as directed by the Engineer. This price shall also include the cost for the design, installation and removal of the debris shield required for the execution of this work.

Pay Item

Pay Unit

Removal of Bridge Deck Concrete

c.y.

ITEM #0503274A – REMOVE, STORE AND RE-ASSEMBLE HANDRAIL

Description:

Work under this item shall consist of the removal, temporary storage and re-assembly of the existing handrail and ornamental bridge rail in the Middletown and Portland approach spans of Br. No. 00524, as directed by the Engineer and in conformity with these specifications.

This work shall also include the removal and disposal of all handrail fasteners and furnishing and installing replacement fasteners to the same size and dimensions as the existing fasteners.

Replacement of any deteriorated or damaged steel handrail and bridge rail components directed by the Engineer will be paid for under the item “Structural Steel”.

This work includes the rehabilitation (shop blast clean and paint) of the fascia mounted approximately four-foot-high ornamental bridge rail.

The approximately two-foot-high tubular barrier mounted railing separating the sidewalk and roadway shall be removed, stored and re-assembled. Rehabilitation of the galvanized coating of this rail is not anticipated, repairs shall be as directed by the engineer.

Materials:

Fasteners for the ornamental bridge rail shall be high strength bolts (ASTM F3125 Grade A325), nuts and washers meeting the requirements of Section M.06 for use with coated steel.

Fasteners for the tubular rail shall be stainless steel.

The surface preparation and painting of the ornamental bridge rail shall be in accordance with Special Provision Item No. 0603801A.

Construction Methods:

Existing handrail pieces shall be carefully removed together with all fittings and attachments in such a manner as to safeguard all pieces from damage or loss. The different parts of the handrail shall be match-marked to facilitate re-assembly.

Removal of existing handrail shall be coordinated with the sidewalk replacement.

Where rivet removal is required, the contractor shall submit to the Engineer for approval his proposed method for rivet removal. Rivet removal will not be permitted until the removal method has been approved and demonstrated successfully in the judgment of the engineer. In the event that the Engineer determines that rivet removal work is resulting in damage to the existing steel, the contractor shall cease rivet removal operations until a new method has been demonstrated and approved by the Engineer.

Unless otherwise noted, all bolts shall be the same diameter as the rivets being replaced. High strength bolt installation shall be in accordance with Article 6.03.03. All high strength bolts that replace rivets shall have a washer under the head and nut. Rivets shall be replaced one at a time. If the bolts will not fit the existing rivet holes, the holes may be carefully reamed to accommodate the bolts. No flame cutting will be permitted.

Any components of the handrail assembly damaged during removal, storage or re-assembly as a result of the Contractors' carelessness shall be replaced by the Contractor at no additional cost to the State.

The Contractor shall take necessary precaution in removing the sidewalk in the vicinity of the handrail post so as not to damage the handrail pieces.

When sidewalk removal operations within the work zone are completed and before the replacement sidewalk is placed, the handrail components shall be re-assembled to the sidewalk stringers with new connection material and fasteners.

Any paint damaged as a result of handrail removal, storage and re-assembly shall be cleaned and coated with field touch up paint in accordance with specifications contained elsewhere within these contract documents.

Method of Measurement:

This work will be measured for payment by the number of linear feet of handrail measured on a horizontal line along the centerline of handrail. Temporary storage of handrail components, furnishing and installing replacement fasteners and connection angles and plates will not be measured for payment but the cost shall be included in the price bid for the removal, storage and re-assembly of handrail.

Nearby work regarding the removal and re-installation of the existing pedestrian railing mounted on the approach spans concrete barrier curb is covered under item #0904520A – Pedestrian Railing – Approach Spans.

New material ordered by the Engineer to replace defective material will be paid for under the item “Structural Steel”.

Basis of Payment:

This work will be paid for at the contract unit price per linear foot for “Remove, Store and Re-assemble Handrail”, complete in place, which price shall include the removal of all handrail components, storage, all material noted for replacement, re-assembly, equipment, disposal of surplus material and labor incidental to the completion of this item.

Pay Item

Remove, Store and Re-assemble Handrail

Pay Unit

l.f

ITEM #0503889A – JACKING EXISTING SUPERSTRUCTURE

Description:

Work under this item shall include the furnishing and construction of jacking frames and other temporary installations as necessary to jack the superstructure at the locations shown on the plans in order to replace the elastomeric bearings.

Work under this item shall also include providing temporary bearing stiffeners on existing girders under jacking points at the locations shown on the plans.

Work under this item shall also include the removal of elastomeric bearings including existing anchor bolts at the locations shown on the plans.

The work shall be performed in accordance with these specifications, as shown on the plans and as directed by the Engineer.

Materials:

Structural steel shapes, plates and bars for the jacking beams and other temporary installations shall be fabricated from structural carbon steel and from high-strength low-alloy structural steel, meeting the requirements of ASTM A709, Grade 36 and the requirements of Subarticle M.06.02-1 and shall be of a condition suitable for their proposed use. Welding materials shall be in accordance with article M.06.04. Other suitable materials proposed by the Contractor for jacking shall be in accordance with the applicable materials sections of the Standard Specifications.

Hydraulic jacks shall be high tonnage double acting cylinder type.

All jacks shall be subject to approval by the Engineer.

Construction Methods:

The Contractor shall, prior to preparing his working drawings, take all necessary field measurements of the existing structure to verify existing conditions and to insure that all temporary installations can be erected and subsequently removed as shown on the plans or the approved working drawings, without interference with the existing structure, and to insure the proper fit of all work to be installed under this item, and also without undue interference with traffic, in accordance with 1.05.02.

The Contractor is hereby advised that under Project 82-223, jacking beams were temporarily mounted to the tower columns in field drilled bolt holes. Upon removal of the temporary installations bolt holes were filled with high strength bolts, nuts and hardened washers. To the extent possible, the Contractors' jacking frames shall be temporarily mounted to the tower columns with sufficient fasteners utilizing the bolt holes drilled under Project 82-223.

The Contractor is hereby advised that under Project 82-223, jacking stiffeners were temporarily mounted to the superstructure girders in field drilled bolt holes. Upon removal of the temporary jacking stiffeners bolt holes were filled with high strength bolts, nuts and hardened washers. To the extent possible, the Contractors' jacking stiffeners shall be temporarily mounted to the superstructure girders with sufficient fasteners utilizing the bolt holes drilled under Project 82-223.

The Contractor shall submit working drawings based on this information detailing the fabrication of the jacking beams, temporary bracing and other temporary facilities proposed to be used in the performance of the work.

The Contractor may salvage and reuse the jacking beams and other temporary material, exclusive of high strength bolts, in the performance of the work at all superstructure jacking locations. The Contractor shall furnish and use new high strength bolts at each jacking beam installation.

Where the work under this item requires the removal of rivets the Contractor shall use suitable mechanical pneumatic rivet chippers to remove the rivets so as not to damage or enlarge the holes or cause damage or injury to adjacent material. If necessary rivets shall be drilled out.

The design of the jacking frame work and lift points shall be done by Service Load Method. All allowable stresses shall be in accordance with the latest edition, including interims, of the AASHTO Standard Specifications for Highway Bridges. The design of the jacking frame work and lift points shall be designed for 100% of the jacking frame work dead load and the total girder reactions as shown on the plans.

Jacks shall be of sufficient capacity to perform the designated jacking operation. Each jack shall have the rated capacity clearly shown on the manufacturer's nameplate attached to each jack. Jacks or other lifting equipment shall have a rated capacity of at least one and a half times the total girder reaction as shown on the plans. The Engineer may require that any lifting equipment which he deems to be inadequate or faulty be removed from the project site.

Jacks or other lifting equipment shall be equipped with pressure gages or other load measuring devices that will enable the applied lifting force to be monitored at all times. The jacks shall have a locking device to allow removing the load from the piston. All jacks at each tower location shall be hydraulically interconnected by means of a manifold to insure even jacking loads on the tower columns at all times during each jacking operation.

The jacking locations shall be as shown on the plans. Jacking shall not begin until the bearing stiffeners, on existing steel girders, as shown on the plans, are in place and the temporary jacking frame works, etc., are completed.

The Contractor shall be responsible for providing any other fabrications to accommodate the jacks on the frame work and to transfer the load evenly to the four (4) brackets fastened to the existing columns.

The approximate girder reactions are shown on the plans.

Just before jacking, the Contractor shall release the 1/4” set screw and move the expansion dowel so the sidewalk handrail in the span being jacked is free to displace vertically. After jacking operations are complete, the Contractor shall reverse the procedure.

Just before jacking, the Contractor shall measure the exact gap(s) between the bottom flange of girders to be jacked and the top plate on temporary frame work and raise each bearing point by applying the equal lifting force at each lift point. Jacking shall be stopped when the steel girders are lifted by 1/8 inch to 1/4 inch from original recorded gap. At no time will the Contractor be allowed to apply a lifting force in excess of one and a half times the calculated lifting force.

The Contractor shall use extreme care during jacking operations and bearing removal to protect the existing structure from damage caused by his work. Any damage to the structure caused by the Contractors’ work under this Contract shall be immediately repaired, by the Contractor, to the satisfaction of the Engineer, at no additional cost to the State.

Method of Measurement:

The jacking of the superstructure will be measured for payment as a unit. One jacking existing superstructure unit is required for each bearing replacement requiring the superstructure to be jacked.

There will be no measurement or direct payment for the jacking frame work, but the cost of this work shall be considered as included in the general cost of the work.

Measurement for payment for work and materials involved with installing steel laminated elastomeric bearings will be as provided under the contract item “Bearing Replacement with Elastomeric Bearing Pads”.

Basis of Payment:

This work will be paid for at the contract unit price per each for “Jacking Existing Superstructure”, which price shall include the development of the jacking procedure, the furnishing of all materials, equipment, tools, including installing, removing and relocating temporary jacking frames and other temporary installations, rivet removal, bolt removal, drilling bolt holes, furnishing and installing high strength bolt assemblies, removal of existing bearings and anchor bolts, disposing of removed materials not proposed to be reused, and disposing of temporary materials when no longer needed and all incidentals necessary to complete the work.

Pay Item

Pay Unit

Jacking Existing Superstructure

ea.

ITEM #0503900A – REMOVAL OF STRUCTURAL STEEL

Work under this item shall conform to the requirements of Section 5.03 amended as follows:

Article 5.03.01 - Description: Delete and replace with the following:

Work under this item shall consist of the removal and satisfactory disposal of the existing steel sidewalk brackets, steel sidewalk struts, steel rail posts, and luminaires on the approach spans as shown on the plans or as directed by the Engineer.

Work under this item shall also consist of the removal and satisfactory disposal of the existing structure mounted light standards as shown on the plans or as directed by the Engineer. The removed materials shall remain the property of the Contractor.

All materials removed regarding the structure mounted light standards shall be properly disposed of by the Contractor. The removed luminaire contains regulated materials. All regulated materials shall be as described and disposed of under Item No. 0101143A – Handling and Disposal of Regulated items.

This item shall include removing the various components in stages to facilitate the maintenance and protection of public traffic.

It is anticipated that some or all of the work included in this item will be performed on temporary work platforms. The installation and removal of the work platform will be considered as included in the Item No. 0100600 “Construction Access”.

Work under this item shall also consist of removing, containing, and collecting paint from all areas on steel superstructures where the Contractor will use flame cutting, arc gouging, or welding for the demolition.

Article 5.03.03 - Construction Methods: Add the following:

1 - Certification: The Contractor or subcontractor who performs paint removal is required to be certified by the Steel Structures Painting Council (SSPC) Painting Contractor Certification Program (PCCP) QP-2. The Contractor or subcontractor who performs the paint removal shall be certified for the duration of the project.

2 - Paint Removal: Prior to applying the heat of welding and/or cutting equipment to localized areas on steel superstructures, the existing paint shall be removed to a minimum of 6 inches from wherever the heat will be applied, and as directed by the Engineer.

3 - Methods of Paint Removal: Where required, the existing paint shall be removed by chemical paint removers, vacuum peening or grinding. A test patch shall be done on the existing

steel to demonstrate the Contractor's proposed methods of paint removal to the satisfaction of the Engineer.

The Contractor is advised that chemical paint removers may require several days to completely remove the existing paint, especially in temperatures below 60 deg. F.

The Contractor is also advised that chemical paint removers may not be effective in removing some paints.

4 - Containment of Debris: A containment enclosure shall be erected to collect the debris of all locations where paint is removed, and wherever sawing or grinding of paint is done. This containment enclosure or enclosures shall be designed and erected to contain, as well as facilitate the collection of debris. The containment enclosure shall conform to the requirements of SSPC-Guide 61 (CON) Class 5, modified to include subarticles A) through F):

A) The containment enclosure shall extend from the bottom of the deck down to a solid work platform.

B) The tarpaulins shall be impervious and fire retardant.

C) All seams on the containment enclosures shall be lapped a minimum of 24 inches and shall be tied off at intervals not to exceed 12 inches.

D) All attachments to bridge parapets and/or the underside of the bridge deck shall be sealed to prevent the escape of dust.

E) The area between beams under the bridge deck shall be enclosed with a solid bulkhead and sealed to prevent the escape of dust.

F) Drawings and details of the containment enclosure or enclosures shall be submitted to the Engineer for review prior to any paint removal. Review of the containment enclosure by the Engineer shall in no way relieve the contractor of his responsibility for the containment enclosure.

5 - Storage of Collected Debris: All of the debris resulting from the Contractor's operations shall be contained and collected. Debris within containment enclosures shall be removed by vacuum collection prior to disassembly of the enclosures. The debris, rust and paint chips shall be stored in leakproof storage containers near the site or as ordered 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.

All work shall proceed as directed by and to the satisfaction of the Engineer in accordance to the details shown on the plans and requirements of the Special Provisions "Maintenance and

Protection of Traffic" and "Prosecution and Progress", contained elsewhere in these Specifications.

Prior to initiating any of the work included under this item, the Contractor shall install temporary work platforms, as directed by the Engineer.

The coordination of the work is the responsibility of the Contractor.

The demolition of the structural steel shall be completed as designated in the "Typical Sections Stage Construction" unless directed otherwise by the Engineer.

All material removed from the superstructure shall become the property of the Contractor and shall be removed and disposed of by him.

The removal 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 be responsible for all temporary measures including, support for all or part of the structure or individual structural element, required to maintain the structure during his operations until the demolition has been completed.

Adequate measures shall be taken by the Contractor to prevent concrete chips, tools and/or materials from dropping to areas below the structure beyond the protective shield. All debris falling on the shield and beyond shall be promptly cleaned up and removed from the site.

The Contractor shall determine and be responsible for the actual sequence of removal with the approval of the Engineer. The Contractor shall prepare and submit to the Engineer for approval working drawings, computations and written procedures in accordance with Article 1.05.02-2. The drawing shall be prepared and stamped by a professional Engineer licensed in the State of Connecticut fully depicting his proposed demolition methods and sequencing. These drawings shall include, but not be limited to complete details of the methods, materials and equipment he proposes to use for this purpose.

Article 5.03.04 - Method of Measurement: Delete the entire article and replace with the following:

This work, being paid for on a lump sum basis, will not be measured for payment.

Article 5.03.05 - Basis of Payment: Delete the second and third paragraphs and replace with the following:

This work will be paid for at the contract lump sum price for "Removal of Structural Steel", which price shall include the removal and disposal of steel sidewalk brackets, steel sidewalk struts and steel rail posts, structure mounted light standards, the containment, removal, collection

and storage of paint debris generated by removal operations, and all equipment, tools and labor incidental thereto.

Pay Item

Pay Unit

Removal Structural Steel

l.s

ITEM #0506015A – RESETTING STONE MASONRY

Description: This work shall consist of removing the existing misaligned masonry stones and resetting existing masonry stone at the locations indicated on the plans or as ordered by the Engineer. The masonry stones shall be laid in a mortar bed and reset in alignment with the existing adjacent stones in the wall. This work shall also include all testing of the existing mortar and submittal of the mortar mix, as required in accordance with this specification.

The Contractor to perform this work shall demonstrate a minimum of five (5) years of experience in masonry restoration projects for historic structures. The workers employed by the Contractor to perform the work described herein this specification shall be stone or brick masons with a minimum of three (3) years experience.

Testing: Prior to commencing work, Contractor will sample the existing mortar for testing and analysis by a qualified petrographer or architectural conservator per ASTM C 1324 “Standard Test Method for Examination and Analysis of Hardened Masonry Mortar”. The examination will provide a sample of the sands and aggregates that are a component of the sampled mortar. The information gathered by this test will inform the replication design mix for the replacement mortar.

Materials: The Contractor shall use the existing masonry stones salvaged from the existing wall. If needed, additional stones shall be of suitable size, color and of a quality satisfactory to the Engineer. Stones that are damaged during removal or construction shall be replaced with stones of suitable size and of a quality and appearance consistent with the existing stones as determined by the Engineer at the Contractor’s expense.

The type of mortar cement shall be selected based on above-mentioned tests. The mortar shall meet the requirements of ASTM C 1713 - Standard Specification for Mortars for the Repair of Historic Masonry. Type M, N, and S mortar shall not be used. Proposed mortar cement mixes are to be submitted to the Design Engineer for review and approval before proceeding to resetting the stone masonry.

Delivery, Storage, and Handling: The Contractor shall:

1. Deliver mortar materials to Project site in manufacturer's original and unopened containers, labeled with manufacturer's name and type of products
2. Store cementitious materials on elevated platforms, under cover, and in a dry location
3. Not use cementitious materials that have become damp
4. Store hydrated lime in manufacturer's original and unopened containers
5. Discard lime if containers have been damaged or have been opened for more than two days
6. Store lime putty covered with water in sealed containers
7. Store sand where grading and other required characteristics can be maintained and contamination avoided.

Construction Methods: The masonry shall be constructed at the location and to the dimensions shown on the plans or as ordered. No work shall be performed prior to the approval of the mortar mix.

1. Stone Removal: Remove the section of the existing masonry wall using methods that prevent undue damage to the stones. The existing salvaged stones shall be stored on site in a location approved by the Engineer.

2. Dressing Stone: All necessary dressing or shaping shall be done before the stone is laid in the wall. No dressing or hammering which will loosen the stone will be permitted after it is placed. Stone at angles or at ends of walls shall be roughly squared and dressed to the required lines.

3. Laying Stone: Stone shall not be laid when the air temperature in the shade and away from artificial heat is 40°F or below and falling or over 90°F, except with the approval of the Engineer and subject to such conditions as the Engineer may impose.

The masonry shall be laid to line and in roughly level courses. Each stone shall be cleaned using hand tools. A continual mist of water shall be applied to the stone for a few hours before being placed in the mortar bed. Stone shall not be dropped or slid over the wall but shall be carefully set without jarring stone already laid. All stone shall be well bedded in freshly made mortar. The mortar joints shall be full and the stones carefully settled in place before the mortar has set. No spalls will be permitted in the beds. Joints and beds shall be of the same type and approximate thickness of the existing joints.

Whenever possible the face joints shall be properly pointed before the mortar becomes set. Joints that cannot be so pointed shall be prepared for pointing by raking them out to a depth of about 2 inches before the mortar has set. The face surfaces of stones shall not be smeared with the mortar forced out of the joints or that used in pointing.

If any stone is moved or the joint broken, the stone shall be taken up, the mortar thoroughly cleaned from bed and joints, and the stone reset in fresh mortar.

4. Pointing: Pointing shall not be done in freezing weather, or when the stones contain frost. Joints not pointed at the time the stones are laid shall be thoroughly wet with water and filled with mortar. The mortar shall be well driven into the joints and finished with an approved pointing tool. The wall shall be kept wet while pointing is being done.

After the pointing is completed and the mortar set, the wall shall be thoroughly cleaned and left in a neat and workman-like condition.

5. Curing: Periodically wet the area after the mortar joints are thumb-print hard. Misting using a hand sprayer with a fine nozzle shall be used for the first two days. Walls shall be covered with burlap for the first three days after being reset into the mortar bed.

Method of Measurement: This work will not be measured for payment but shall be paid for on a lump sum basis.

Basis of Payment: This work will be paid for at the contract lump sum price for “Resetting Stone Masonry,” which price shall include: testing of the existing mortar, submittal of proposed mortar mix, removal, stockpiling, transporting and re-use of masonry stones from the existing

stone walls, mortar, repointing of joints, disposal of surplus materials, and all materials, equipment, tools, labor and work incidental thereto.

Pay Item	Pay Unit
Resetting Stone Masonry	l.s.

ITEM #0511301A – REMOVAL OF EXISTING BRIDGE DRAINAGE SYSTEM

Description:

This work shall consist of removing existing under bridge drain pipes, downspouts and supports at the locations shown on the contract plans and specified herein. Section 5.03 of the Standard Specifications for Roads, Bridges, Facilities, and Incidental Construction applies to all removal work on this project with the following additions and exceptions.

Materials:

None specified.

Construction Methods:

All existing drain pipes, downspouts and supports shall be removed. Existing bridge scuppers and their structural steel supports are excluded from this work.

The Contractor shall take care not to damage any existing structural steel or concrete to remain.

Existing pipe supports shall be removed. Eliminate any stress concentrations on existing structural member where existing welded attachments were used to support drain pipe and have been removed as part of this item. Grind smooth all existing structural steel surfaces to remain upon removal of such details. Fill abandoned bolt holes with new high strength bolts.

Method of Measurement:

This work is to be paid for on a Lump Sum basis. No measurements will be taken on materials removed from the structure to perform the work governed by this specification.

Basis of Payment:

The pay item “Removal of Existing Bridge Drainage” shall include all labor, equipment, hardware, and materials needed to remove the existing drainage pipe, drainage supports, downspout pipes, pipe fittings, and support steel and hardware as shown on the contract plans, directed by the Engineer, and in accordance with the specifications. Elimination of stress concentrations as noted herein is incidental to the work and included for payment as part of this item.

Pay Item

Pay Unit

Removal of Existing Bridge Drainage System

l.s.

ITEM #0511801A – BRIDGE SCUPPER – FIBERGLASS HOPPER

Description

Work under this item shall consist of furnishing and installing scuppers and grates where shown on the plans or where directed by the Engineer. All work to be done shall conform to the pertinent provisions of Sections 6.03, M.06 and M.08.

Materials

Materials for the frames and grates of the scuppers shall be structural steel conforming to the provisions of ASTM A709 Grade 36 and shall be manufactured in accordance with the plans. The bolts, nuts and locking device shall be stainless steel conforming to the provisions of ASTM A276 Type 304.

The caulking shall be silicone sealant conforming to ASTM C-920 Type S, Grade NS, Class 40 or Federal Specifications TT-S-001543A (COM-NBS) Class A and TT-S-00230C (COM-NBS) Class A.

The hoppers shall be custom molded, reinforced polyester chemical resistant fiberglass, as shown on the plans.

The resin shall be corrosion resistant and shall be, evaluated as a laminate by test or previous service to be acceptable for the environment. The resins used shall not contain fillers except as required for viscosity control or fire retardance. Up to 5% by weight of the isotropic agent which will not interfere with visual inspection, may be added to the resin for viscosity control. Resins may contain pigments and dyes if authorization for their use is obtained from the Department. Antimony compounds or other fire retardant agents shall be added as required for improved fire resistance. The resin shall be protected by an ultra violet system concurrent with good practice.

The contractor shall furnish Certified Test Reports for each batch in conformance with the requirements set forth in the Specifications.

The reinforcing material shall be of commercial grade of glass fiber having a coupling agent which will provide a suitable bond between the glass reinforcement and the resin. The glass and resin shall be applied in proper quantities to achieve maximum strength. However, the glass fiber shall be not less than 25% by mass. The laminate shall have a minimum ultimate tensile strength of 12 psi, a minimum flexural strength of 20 psi, and minimum tangent flexural modulus of elasticity of 800 psi. The material used as reinforcing on the surface exposed to chemical attachment shall be a commercial grade chemical resistant glass having a coupling agent.

The laminate shall consist of an inner surface, an interior layer, and no exterior layer of laminate body. The composition of the inner surface and interior layer are intended to achieve optimum chemical resistance. The inner surface shall be free of cracks and crazing with a smooth finish and with an average of not over 2 pits per 4 inches, providing the pits are less than 1/8 inch in diameter and not over 1/32 inch deep and are covered with sufficient resin to avoid exposure of inner surface fabric. Some waviness is permissible as long as the surface is smooth and free of

pits. Between 250 microns and 500 microns of reinforced resin rich surface shall be provided. This surface shall be reinforced with 1 ply glass reinforcing mat.

The laminate shall be built to finished thickness in stages to prohibit warping.

The laminate shall come to room temperature before successive plys are built-up.

All manufacturing practices shall conform to Society of the Plastics Industry Standards.

Each hopper shall be shipped to the job site paper wrapped in a cardboard carton or box of other suitable material.

Steel frames and grates shall be galvanized by the hot-dip process in accordance with the requirements of ASTM A 123.

Construction Methods

Shop Drawings: Before fabricating any materials, the Contractor shall submit shop drawings to the Engineer for approval in accordance with Article 1.05.02-3. These drawings shall include; but not be limited to the following information:

- a. A plan and elevation with details showing all lengths, fittings, supports and material designation needed to fabricate the scupper.
- b. Commercial items shall be identified by manufacturer, trade name and catalog number and shall indicate sufficient details.

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

The scuppers shall be located and set to grade as shown on the plans or as directed by the Engineer. All connections shall be secure and watertight, including the connections to adjacent concrete.

Method of Measurement

The scuppers will be measured for payment by the number of units installed, completed and accepted. Scuppers and grates with necessary welded studs, bolts, nuts and washers and pipe extension will constitute one unit.

Basis of payment

This work will be paid for at the contract unit price each for "Bridge Scupper - Fiberglass Hopper", complete in place, which price shall include all materials including, caulking, welded studs and all equipment, tools and labor incidental thereto.

Pay Item
 Bridge Scupper – Fiberglass Hopper

Pay Unit
 ea.

ITEM #0512113A – 8 INCH PIPE FOR BRIDGE DRAINAGE(FIBERGLASS)

Description:

This item shall consist of furnishing and installing fiberglass pipe and fittings including reducers, cleanouts, hangers, supports and appurtenances, at the locations and to the lines and grades designated on the plans, or as directed by the Engineer. This item shall also include the furnishing and installation of chemical anchors.

Materials:

All fiberglass components of the bridge drainage piping system shall be supplied by a single manufacturer.

The fiberglass pipe shall be reinforced Thermosetting Resin Pipe (RTRP) which shall satisfy the requirements of ASTM Specification D 2996 RTRP-11AA-1111. The pipe shall qualify for a 10,000 psi minimum short term rupture strength hoop tensile stress.

Pipe joints shall be straight bell-and-spigot or tapered bell-and-spigot.

Fittings including wyes, cleanouts, reducers, and other types of manufactured elbows shall have a smooth interior with a minimum centerline radius of one and one half (1-1/2) times the pipe diameter. Cleanout end caps shall be fiberglass and shall attach to the cleanout pipe fitting using a flanged connection with a minimum of 4 bolts and a sealing gasket.

All fittings shall be static rated at 100 psi with a safety factor of three (3) times the static rating, in accordance with ASTM D1599.

The adhesive to be used for joining pipe segments shall consist of epoxy resin and a hardener curing agent having a minimum pot life of 15 minutes at 80°F which when fully cured develops the strength capacity of the pipe, in accordance with the manufacturer's recommendations.

The color of all fiberglass piping components shall match the color of the bridge steel after painting. The Contractor shall submit a color sample to the Engineer for approval. A U.V. inhibitor shall be incorporated in the epoxy resin.

Pipe supports and hangers shall be steel conforming to ASTM A709 Grade 50 and shall be galvanized after fabrication in accordance with ASTM A123.

Neoprene pads, 0.125 inch thick shall be bonded to all surfaces of steel pipe supports or hangers in direct contact with the fiberglass pipe. The neoprene shall conform to the requirements of ASTM D4637, Type II, Class SR. The adhesive bonding agent for attaching the neoprene to the pipe support clamp surface shall be "Quick Gel Instant Adhesive" manufactured by Loctite

Corporation, Newington, Connecticut, or an approved equal recommended by the manufacturer of the neoprene.

High strength bolts shall conform to requirements of ASTM F3125 Grade A325. Threaded rods and associated nuts and washers shall be Type 304 Stainless Steel.

Hex nuts shall conform to ASTM A563, Grade DH or ASTM A194, Grade 2H. Washers shall conform to ASTM F436.

High strength bolts including hex nuts and washers shall be mechanically galvanized in conformance with ASTM B695, Class 50.

Pipe support anchors and associated nut and washers shall be Type 304 Stainless Steel.

The Contractor shall furnish a Certified Test Report, a Materials Certificate for the pipe joining adhesive, all fiberglass components of the piping system, and the chemical anchors, in conformance with the requirements set forth in 1.06.07.

Construction Methods:

1) Shop Drawings: Before fabricating any materials, the Contractor shall take all field measurements necessary to assure proper fit of the finished work, and shall submit shop drawings to the Engineer for approval in accordance with Article 1.05.02-3. These drawings shall include, but not be limited to the following information:

a) A layout plan and elevation showing all lengths, fittings, supports, cleanouts, expansion devices if required, appurtenances and material designations.

b) Commercial items shall be identified by manufacturer, trade name and catalog number and shall indicate sufficient details.

c) Pipe supports and hangers and all other support devices shall be fully detailed.

d) All field measurements shall be submitted for reference.

2) Installation: The pipe shall be installed to the lines and grades shown on the plans and shall be securely attached to the structure.

The adhesive for joining the pipes shall be mixed and applied in strict accordance with directions included in the adhesive kit, or as directed by the representatives of the manufacturer. The surfaces of the joint shall be coated with the adhesive immediately before joining adjacent lengths of pipe. After properly joining two adjacent sections, the pipe supports and clamps shall be properly tightened to hold the pipe in place.

Method of Measurement:

This work will be measured for payment by the actual number of linear feet of pipe for bridge drainage of the size specified, completed and accepted, measured in place along the axis of the pipe through all fittings.

Basis of Payment:

This work will be paid for at the contract unit price per linear foot of 8 Inch Pipe for Bridge Drainage – (Fiberglass)”, complete in place, which price shall include all materials including fiberglass pipe, cleanouts, hangers, supports including hardware, adhesive bonding agent, gaskets, all equipment, tools and labor incidental thereto.

Pay Item

Pay Unit

8 Inch Pipe for Bridge Drainage (Fiberglass)

l.f.

ITEM #0520032A – ELASTOMERIC CONCRETE HEADER

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.

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.

Elastomeric Concrete Properties at 24 hr. Cured Stage	Test Method	Requirement
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
Bond Strength to Concrete	ASTM C 882	Min 450 psi

The following Elastomeric Concrete products are qualified for use under this item:

Silspec 900 Polymer Nosing System
Silicone Specialties Corp.
P.O. Box 50009
Tulsa, OK 74150
Phone: (918) 587-5567

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

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

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.

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.

Blockouts 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 produced 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.

Method of Measurement:

This work will be measured for payment by the number of cubic feet 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.

Basis of Payment:

This work will be paid for at the contract unit price per cubic foot for "Elastomeric Concrete Header", 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 Header".

Pay Item

Pay Unit

Elastomeric Concrete Header

c.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

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

A sample of the aggregate shall be submitted to the Department with a Certified Test Report in accordance with Article 1.06.07 for each 20 tons of loose material or its equivalent number of bags delivered to the job site. The Certified Test report must include a gradation analysis resulting from a physical test performed on the actual material that accompanies the report.

Anti-Tacking Material: This material shall be a fine graded granular material with 100% passing the 3/16” sieve and no more than 5% passing the #200 when tested in accordance with AASHTO T-27.

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

Bridging Plate: The bridging plates shall be steel conforming to the requirements of ASTM A36 and be a minimum ¼” thick and 8” wide. For joint openings in excess of 3” the minimum plate dimensions shall be ¾” thick by 12” wide. Individual sections of plate shall not exceed 4’ in length. Steel locating pins for securing the plates shall be size 16d minimum, hot-dip galvanized, and spaced no more than 12” apart.

Concrete Leveling Material: Shall be a cementitious-based material that conforms to ASTM C928 Standard Specification for Packaged, Dry, Rapid-Hardening Cementitious Materials for Concrete Repair, for R3 performance requirements in Table 1 and achieve the following:

- a. Final set in 45 Minutes
- b. 2500 psi compressive strength in 24 hours
- c. 5000 psi compressive strength in 7 days

Parapet Sealant: The sealant used in parapet joint openings shall be a single component non-sag silicone sealant that conforms to the requirements of ASTM D5893.

Sidewalk Sealant: The sealant used in sidewalk joint openings shall be a rapid cure, self-leveling, cold applied, two-component silicone sealant. The silicone sealant shall conform to the requirements listed in Table B:

Table B

Properties - As Supplied	Test Method	Requirement
Extrusion Rate	ASTM C1183	200-600 grams/min
Leveling	ASTM C639	Self-Leveling
Specific Gravity	ASTM D792	1.20 to 1.40
Properties - Mixed	Test Method	Requirement
Tack Free Time	ASTM C679	60 min. max.
Joint Elongation – Adhesion to concrete	ASTM D5329 ^{1,2,3}	600% min
Joint Modulus @ 100% elongation	ASTM D5329 ^{1,2,3}	15 psi max
Cure Evaluation	ASTM D5893	Pass @ 5 hours

1. Specimens cured at 77±3⁰F and 50±5% relative humidity for 7 days
2. Specimens size: ½”wide by ½”thick by 2” long
3. Tensile Adhesion test only

The date of manufacture shall be provided with each lot. No sealant shall be used beyond its maximum shelf-life date.

The two-part silicone sealants shown in Table C are known to have met the specified requirements:

Table C

Product	Supplier
Dow Corning 902RCS	Dow Corning Corporation 2200 W Salzburg Road Auburn, Michigan 48611
Wabo SiliconeSeal	BASF/Watson Bowman Acme Corporation 95 Pineview Drive Amherst, New York 14228

Other two-component silicone joint sealants expressly manufactured for use with concrete that conform to the aforementioned ASTM requirements will be considered for use provided they are submitted in advance for approval to the Engineer. Other joint sealants will be considered for use only if a complete product description is submitted, as well as documentation describing at least five installations of the product. These documented installations must demonstrate that the product has performed successfully for at least three years on similar bridge expansion joint applications.

A Materials Certificate and Certified Test Report for the asphaltic binder shall be submitted by the Contractor in accordance with the requirements of Article 1.06.07 certifying that the asphaltic binder satisfies the requirements of the most current version of ASTM D6297.

A Materials Certificate for all other components of the APJ, leveling material, backer rod and sealant used in sealing parapet and sidewalk joint openings, shall be submitted by the Contractor in accordance with the requirements of Article 1.06.07

Construction Methods

The APJ shall be installed at the locations shown on the plans and in stages in accordance with the traffic requirements in the special provisions “Maintenance and Protection of Traffic” and “Prosecution and Progress”.

At least 30 days prior to start of the work, the Contractor shall submit to the Engineer for approval a detailed Quality Control Plan for the installation of the APJ. The submittal shall include:

- a) A list of all manufactured materials and their properties to be incorporated in the joint system, including, but not limited to the asphaltic binder, anti-tack material, backer rod, sealant, leveling material, as well as the aggregate’s source.
- b) A detailed step by step installation procedure and a list of the specific equipment to be used for the installation. The Quality Control Plan must fully comply with the specifications and address all anticipated field conditions, including periods of inclement weather.

The APJ shall not be installed when bituminous concrete overlay or joint cutout is wet. The APJ shall only be installed when the bridge superstructure surface temperature is within the limits specified in Table D and when the ambient air temperature is within the range of 45⁰F to 95⁰F. The bridge superstructure surface temperature range is determined using the thermal movement

range provided on the contract plans for the proposed APJ deck installation location and the selected APJ product.

Table D

Installation Restrictions	
Designed Deck Joint Thermal Movement Range²	Bridge Superstructure Surface Temperature¹
0" to 1"	45° F to 95° F
1-1/8"	45° F to 90° F
1-1/4"	45° F to 80° F
1-3/8"	45° F to 70° F
1-1/2"	45° F to 65° F

- 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.*
- 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 1/4". 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.

Pay Item

Pay Unit

Asphaltic Plug Expansion Joint System

c.f

ITEM #0520041A – PREFORMED JOINT SEAL

Description:

Work under this item shall consist of furnishing and installing a preformed joint as shown on the plans and in conformance with these Specifications or as directed by the Engineer. Work shall also include removal of existing sliding plates at median and parapet joints, and a pre-installation survey for measurement of the existing joint opening width. The preformed joint seal shall seal the deck surface in accordance with the plans and prevent water from seeping through the joint area

Materials:

The preformed joint seal shall be one of the following:

1. Silicoflex:

RJ Watson, Inc – Bridge and Structural Engineered Systems 78 John Glenn Drive
Amherst, New York 14228

Tel: (716) 691-3301 Fax: (716) 691-3305

Website: <http://www.rjwatson.com>

2. V-Seal:

D.S. Brown Company 300 East Cherry Street North Baltimore, Ohio Tel: (419) 257-3561

Website: <http://www.dsbrown.com>

3. Bridge Expansion Joint System (B.E.J.S.): EMSEAL Joint Systems Ltd.

25 Bridle Lane,

Westborough, MA 01581

Tel: (508) 836-0280

Website: <http://www.emseal.com>

A material Certificate for all components of the selected preformed joint seal shall be submitted by the Contractor in accordance with the requirements of Article 1.06.07.

Construction Methods:

All work at each joint location shall be accomplished in conformance with the traffic requirements in the Special Provisions, “Maintenance and Protection of Traffic” and “Prosecution and Progress”.

At all joint locations, the Contractor shall perform a survey of the existing joint openings.

Order of the Preformed Joint Seal requires a minimum of three weeks. This information shall include, but not be limited to:

- a) Joint opening width (taken at distances along the length of the joint not to exceed 6')
- b) Temperature at time of measurements of joint opening width.
- c) Identification of sharp discontinuities in the joint alignment or its surfaces

At least 30 days prior to start of work, the Contractor shall submit a detailed Quality Control Plan to the Engineer for review and comment for the installation of the selected joint system. The submittal shall include:

- a) All information gathered during field survey.
- b) A list of all manufactured materials and their properties to be incorporated in the joint system, including, but not limited to the primer, bonding agent, sealant, and the sealing element.
- c) A detailed step by step installation procedure and a list of the specific equipment to be used for the installation.
- d) The Quality Control Plan must fully comply with the specification's requirements and address all known and anticipated field conditions, including periods of inclement weather.

A technical representative of the selected joint 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.

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

The minimum temperature for installing any of the qualified preformed joint seals is 40 degrees Fahrenheit and rising, ambient air temperature. The joint surfaces shall be completely dry before installing any components of the selected joint seal. The selected joint seal cannot be installed immediately after precipitation or if precipitation is forecasted. Joint preparation and installation of the sealed preformed joint seal must be done during the same day.

Any discontinuities, projections, divots or other anomalies in the joint opening surfaces that would negatively affect the performance of the preformed joint seal shall be remedied by the Contractor by methods recommended by the manufacturer as approved by the Engineer.

All vertical faces adjacent to the opening shall be sandblasted prior to application of any of the joint seal components. All remnants of the prior existing joint seal system (rubberized gland, silicone sealant, etc...) shall be removed from the existing headers to remain. Any discontinuities or sharp projections into the plane of the joint shall be ground smooth prior to sandblasting. Whenever sandblasting is performed under this Specification, the Contractor shall take adequate measures to ensure that the sandblasting will not cause damage to adjacent traffic or other facilities. Traffic will not be allowed to pass over the joint after sandblasting has occurred.

Following sandblasting, the joint's surfaces shall be wiped down or blown clean as recommended by the manufacturer.

The selected joint sealing system shall be installed continuously with no splices in the preformed seal in the roadway section, as recommended by the manufacturer of the selected preformed joint seal.

When the sealing operations are completed, the joint opening shall be effectively sealed against infiltration of water. Any seal that does not effectively seal against water shall be removed and replaced at the Contactor's expense.

Treatment at gutterline and curb/parapets: At curb, the preformed joint sealing element shall run continuously from the roadway section through the upturn at the curb and continue as shown on the plans.

At parapets or walls, the joint sealing element shall be upturned at the parapet/wall for a continuous seal through this transition. Use of a prefabricated piece (fabricated a minimum of 24 hours prior to use) to "make" the bend at the wall is allowed though field splicing of this prefabricated piece shall not be allowed in the roadway section (BEJS by EMSEAL exempt from this requirement). Parapets and walls shall be sealed for the entire vertical portion and across the top with the sealing elements – bends and splices nine inches above curblines and higher are allowed to be field fabricated.

Method of Measurement:

This work will be measured for payment by the number of linear feet of preformed joint seal system installed. The measurement will be made at the top surface and along the center line of the joint shall include all portions of the installation in the roadway, in the curbs and sidewalk(s), and within parapets.

Basis of Payment:

This work will be paid for at the Contract unit price per linear foot for "Preformed Joint Seal System," complete in place, including all materials, equipment, tools, and labor incidental thereto.

Included in the contract unit price is the cleaning of concrete surfaces, a pre-installation survey of the existing joint opening and the cost of assistance from a technical representative of the selected joint system.

Pay Item

Pay Unit

Preformed Joint Seal

l.f.

ITEM #0521003A – BEARING REPLACEMENT WITH ELASTOMERIC BEARING PADS

Description:

Work under this item shall consist of removing existing elastomeric bearings and furnishing & installing steel-laminated elastomeric bearings with factory vulcanized external load plates as shown on the plans, as directed by the Department, and in accordance with these specifications.

Modifications to existing structural elements to allow installation of the new elastomeric bearing pads are incidental to bearing replacement and included with this item, except as noted otherwise on the plans or herein. This work includes shims between the external load plate and the structural steel bolsters as incidental to proper installation of the bearings.

Temporary support assemblies and hydraulic lifting of the superstructure to allow replacement of the bearings are not included as part of this item but are paid for under their respective items.

Materials:

Elastomer, laminae, fabricated pads, pads and adhesive for bonding the pads to steel shall conform to the requirements of Article M.17.01, as amended herein.

1. Elastomer: The elastomer compound shall be temperature zone “C”, Grade 3 (as defined by the testing requirements), with a shear modulus of 0.11 KSI. The elastomer must meet the requirements of the AASHTO LRFD Bridge Construction Specifications, 3rd edition, 2010, up to and including 2015 interim revisions.
2. Laminae: The internal steel laminates, used for reinforcement, shall be a mild rolled steel conforming to ASTM A709 (AASHTO M270), Grade 50, or an approved equal. The 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.
3. Fabricated Pads: The fabrication and fabrication tolerances of elastomeric bearings shall conform to the requirements of the AASHTO LRFD Bridge Construction Specifications and Article M.17.01-3(a)(2).

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.

(f) Each steel-laminated elastomeric bearing shall have embossed on it, the following: the word “CONN,” project number, the 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 orientation, order number, lot number, bridge number, bearing identification number, and elastomer type and grade (Neoprene, Grade3). The markings should be placed on a side of the bearing that is visible after

installation

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

4. Adhesive for Bonding: Adhesive bonding of the elastomer portion of the bearings to the external load plates is not permitted.

5. External Load Plates: The external load plates shall be fabricated from structural steel meeting the requirements of ASTM A709 Grade 50. External load plates shall be hot-dip galvanized in accordance with ASTM A123. Holes in external load plates shall be drilled prior to galvanizing.

The surface of the bonding region of the external load plates shall be prepared by abrasive blasting to remove galvanizing prior to vulcanization of the bearing to the plate. Vulcanization shall be performed by the bearing manufacturer.

Construction Methods:

Submit a removal procedure to the Resident Engineer for review and acceptance prior to removal of existing bearings. Existing rocker bearings shall be restrained from rotation prior to initiating the hydraulic lifting operation in a manner that prevents the rockers from falling from the pier top.

Prior to removing existing bearings, sole plates, and associated bolted and welded connections, the Contractor shall locally remove the existing lead paint. The Contractor shall be responsible for repair of any damage done to existing structural members to remain during removal of bearing components. Grind smooth the underside of the girder bottom flange after removal of existing sole plate welds. The faying surface between the existing girder and the bolster shall be prime coated prior to bolster installation.

Anchor bolts that remain after removal of the existing bearings shall be removed to 1/2" below the top of the pedestal and the recess filled with a non-shrink grout conforming to the requirements of Article M.03.05.

Before fabricating any materials, the Contractor shall submit shop drawings to the Department, for review and approval. These drawings shall include, but 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, material designations, nominal hardness of the elastomer, the quantity of bearings required, including test bearings, and the location of the bearing identification.

Bearing areas, upon which the elastomeric bearings will be set, shall be cleaned of all debris. Bearing areas, shall be carefully finished, by grinding, in necessary, to a smooth, even, level surface of the required elevation, and shall show no variations from a true plane greater than 1/16" over the entire area upon which the elastomeric bearings are to rest.

The elastomeric bearings shall be installed as shown on the plans. The elastomeric bearings shall be installed when the temperature of the ambient air and the bearings is between 41 F to 86 F and has been within this range for at least 2 hours. The Contractor shall jack the superstructure and reset all bearings erected outside of this range once conditions permit.

Adhesive bonding of the elastomeric bearings to steel and concrete surfaces is not permitted. Welding, with the elastomeric bearings in place, is permitted at locations where there is more than 1 ½ inches between the weld and the elastomer. In no case shall the elastomer be exposed to temperatures greater than 400 F. Welding shall conform to the requirements of Sub article 6.03.03. Existing coatings shall be removed, and the prime coat of the new steel shall be masked in the weld areas.

Assembly with high strength bolts shall conform to the requirements of Article 6.03.03.

The elastomeric bearings shall bear uniformly on all surfaces under full dead load. If uniform bearing is not present, the gaps beneath the bearing shall be filled with elastomeric shims. The Contractor, in the presence of the Department, shall measure the gaps to determine the limits of the areas requiring shims.

The Contractor shall raise the superstructure and install steel shims between the bolster and the external load plate as required to provide uniform bearing at all surfaces. Shims shall be shown and fully dimensioned as details on the shop drawings. Shims with open side or U-shaped holes for bolts will not be permitted. No shims shall have less than two holes for bolts. Bolt holes shall not be punched at the Fabricator's shop to prevent distortion of the shims.

In general, sufficient thickness shall be furnished to secure 1/64-inch variations of the shim allowance plus one shim equal to the full allowance. For example, a ½ inch nominal shim pack shall consist of the following thickness variations: one ½-inch, one ¼-inch, one 1/8-inch, one 1/16-inch, one 1/32-inch, and two-1/64-inch.

Method of Measurement:

This work shall be measured by each existing bearing removed and replaced with an elastomeric bearing, furnished, installed, and accepted. No allowance shall be made for test bearings. Furnishing, fabricating, and placing shims is incidental to this work. Shims shall not be measured.

The work to furnish and fabricate the galvanized external load plates and vulcanize the plates to the bearings, shall not be measured.

Removal of the existing elastomeric bearings shall not be measured.

Basis of Payment:

This work will be paid for at the contract unit price for each existing bearing that has been removed and replaced with an elastomeric bearing, complete in place, which price shall include all external steel load plates, primer, internal steel laminates, test bearings, shims, materials, testing,

equipment, tools and labor incidental thereto.

The contract price shall include local paint removal, removing and disposing of the existing expansion bearing assemblies, sole plates, and keeper angles, cutting of existing anchor bolts, and preparing bearing surfaces.

Existing bronze slide plate bearings shall remain the property of the Department.

Pay Item

Pay Unit

Bearing Replacement with Elastomeric Bearing Pads

ea.

ITEM #0601054A – ULTRA HIGH PERFORMANCE CONCRETE

Description: Work under this item shall consist of all materials, tools, equipment and labor necessary for the performance of all work to transport, mix, form, place, cure, grind and test Ultra-High Performance Concrete (UHPC) where required per plans.

Materials: The materials for this work shall be as follows:

Ultra High Performance Concrete (UHPC): The UHPC shall be mixed on Site from pre-packaged components, pre-proportioned by the UHPC Supplier.

Components: The following materials shall be as recommended by the UHPC Supplier:

- (a) Fine Aggregate
- (b) Cementitious Material and any replacement materials, such as silica fume
- (c) Steel Fibers (must be in accordance with Article 1.06.01)
- (d) Liquid Admixtures (such as super plasticizers or accelerators)

Water: Water for mixing shall meet the requirements of M.03.01-4 and the temperature at mixing shall be per UHPC Supplier recommendations for use in the UHPC mix.

Mix Design: The Contractor shall submit a mix design that meets the following criteria:

Table 1: UHPC Material Properties (after 28 days or as noted)		
Description	Test Method	Acceptance Criteria
Compressive Strength	ASTM C39 (as modified by ASTM C1856)	≥ 14 ksi at 4 days ≥ 20 ksi at 28 days
Shrinkage	ASTM C157 (initial reading after set)	≤ 800 micro-strain
Chloride Ion Penetrability	ASTM C1202	≤ 250 coulombs
Freeze-Thaw Resistance	ASTM C666 Procedure A (300 cycles)	Relative Dynamic Modulus of Elasticity, RDM > 95%
Flow	ASTM C1437 (as modified by ASTM C1856)	7 to 10 inches

Packaging: The fine aggregate and cementitious material must be premixed and proportioned in bags or supersacks, in accordance with the approved mix design, and shall be identified by batch or lot number.

Construction Methods:

1. Contractor Submittals:

- (a) Mix Design, including proportions of each component, water-to-cementitious materials ratio, mixing time, set time, compressive strength properties of the mix at ages of 2, 4, 7, 14, and 28 days, and Certified Test Reports addressing the material properties in Table 1, shall be submitted to the Engineer for approval at least 90 days in advance of the first UHPC placement.
- (b) UHPC Supplier and Technical Representatives: The Contractor shall obtain the

services of a Supplier experienced in designing, mixing, placing, curing and testing of UHPC. Technical representatives shall be certified or recognized by the UHPC Supplier in the mixing, and placing of UHPC in similar installations. The Supplier and Technical Representatives submittal shall be submitted to the Engineer for approval at least 90 days in advance of the first UHPC placement and shall include the following:

- i. Name and location of Supplier.
 - ii. Name of UHPC product and a list of bridge projects it was utilized on. For each bridge listed, provide a location, description, date of completion of work, the project owner's name, and the name, title and current contact information of a project owner representative.
 - iii. Identification of the potential Technical Representatives (minimum three).
 - iv. UHPC Supplier certification demonstrating that the Technical Representatives are qualified to oversee the UHPC operations.
 - v. Work experience of the Technical Representatives: For each Technical Representative, submit a list of projects they attended that included UHPC mixing and placing operations. For each project, provide a location, description, date of completion of work, the project owner's name, and contact information of a project owner representative.
- (c) Construction Work Plan: The Contractor shall submit a Construction Work Plan to the Engineer for review and comment at least 90 days in advance of the first UHPC placement, which shall include the following elements:
- i. Formwork
 1. Proposed formwork materials
 2. Procedure for installing, sealing and maintaining watertight formwork
 3. Procedure and schedule for installing top forms, chimneys and head pails
 4. Planned bulkhead locations
 5. Removal of formwork including tools and access to underside of deck
 - ii. Surface preparation
 1. Procedure to confirm precast concrete surfaces to be in contact with the UHPC are roughened and have exposed aggregate finish with average amplitude of 1/4 inch (at the precast plant or upon delivery to the Site)
 2. Procedures, including source of water, for ensuring saturated surface dry (SSD) connection interfaces prior to UHPC placement
 - iii. Mixing
 1. Storage plan for UHPC components
 2. Mixers and mixing setup including the type and number of mixers, mixing location, water source, and contingency plan if a mixer malfunctions
 3. Description of equipment for weighing UHPC components
 4. Procedure for controlling UHPC mix temperatures including methods of storing ice
 5. Sample batch identification sheet to be used during UHPC production
 - iv. Placement
 1. Placement sequence and schedule including all planned bulkheads
 2. Equipment for transportation and placement of UHPC
 3. Contingency plan if placement operations are interrupted by weather, equipment malfunctions or other issues
 - v. Protection and Curing
 1. Procedure to protect joints from live loads during curing

- 2. Cold weather protection plan, if required
- vi. Grinding
 - 1. Proposed equipment
 - 2. Method of collecting and disposing of debris
- vii. Trial placement plan, outlining procedures to be followed and a dimensioned drawing showing the proposed UHPC placement of a representative joint
- (d) Contractor Quality Control:
 - i. Quality Control Plan, including equipment list, testing setup, sampling methods, frequency and types of tests at least 90 days in advance of the first placement of UHPC.
 - ii. The proposed format for test reporting (or an example test report) shall be provided for the Engineer's review and comment at least 90 days in advance of the first placement of UHPC.
 - iii. The name and location of the Contractor's proposed AASHTO accredited testing laboratory shall be provided to the Engineer at least 90 days in advance of the first placement of UHPC.
 - iv. Reports of test results shall be provided to the Engineer within 7 days of each test.

- 2. Pre-Placement Meeting:** The Contractor shall arrange a pre-placement meeting to be held on Site after the approval of all submittals, and at least 7 days in advance of the trial placement. The meeting shall be attended by the UHPC Supplier's Technical Representatives, the Contractor's staff, any subcontractors involved in the work operation, and representatives from the Department. The objective of the meeting will be to review the Project plans, Contractor's Construction Work Plan and to review the procedures for mixing, placing, curing and testing of the UHPC, as well as the specifics of the trial placement.
- 3. Trial Placement:** The Contractor shall construct a cast-in-place joint trial placement at the Site (or a location approved by the Engineer), based on Pre-Placement meeting discussions, and as recommended by the UHPC Supplier.

The joint trial placement shall be a representation of the proposed joint and replicate the form pressure created by the plastic UHPC. Following placement and minimum 14 day cure of the UHPC, the Contractor shall cut the hardened trial placement transversely at two locations to allow for visual inspection of the joint interface and material bond. The Contractor shall make the completed joint trial placement cut sections available for review and approval by the Engineer a minimum of 28 days prior to placement of the UHPC.

The Contractor shall perform flow tests during joint trial placement casting to determine the duration that the plastic UHPC will remain workable. The flow tests shall be in accordance with ASTM C1437 (using modifications described in ASTM C1856) and the mix temperature shall be maintained between 50°F and 85°F as determined using ASTM C1064.

The Contractor shall perform the following workability procedure during the casting of joint trial placement:

- (a) Take initial samples prior to the start of the discharge of plastic UHPC and perform the flow tests. Record the time of sampling and initial flow value.

- (b) Measure the UHPC and ambient temperatures.
- (c) Continue sampling at 10-minute intervals and determine the flow of each sample, until flow measure is below 4 inches.
- (d) Plot the flow versus time for the duration of the test. From the plot of flow-time curve, determine the flow time at 8 inches, which is considered the mixture cutoff time.

The Contractor shall perform a Time of Setting test of UHPC during joint trial placement in accordance with ASTM C191 (as modified by ASTM C1856).

The Contractor shall cast five sets of 3 cylinders, in accordance with ASTM C1856, during joint trial placement for determination of compressive strength and test them in accordance with ASTM C39 (as modified by ASTM C1856) at 2, 4, 14, and 28 days.

4. **Safety:** The Contractor shall make UHPC material safety data sheets (MSDS) available and shall provide a safety briefing to all on-site personnel prior to UHPC placement. Proper personal protective equipment shall be used (including but not limited to goggles, dust masks, and respirators) as recommended by the UHPC supplier and as required by the MSDS based on proximity to specific operations.
5. **Storage:** The Contractor shall assure the proper storage of dry premixed components, steel fibers and admixtures as recommended by the Supplier and the following:
 - (a) All dry premixed components shall be stored on raised pallets, with vapor barrier between the pallets and the ground surface to prevent moisture ingress, and shall be covered thoroughly.
 - (b) Steel fibers shall be stored with the same protection as the dry premixed components and rusted fibers shall not be used in mixing.
 - (c) Liquid admixtures shall be stored in sealed containers above freezing temperatures and shall be protected from direct sunlight.
6. **Formwork:** Formwork shall be non-absorbing, watertight and of sufficient rigidity and strength to safely support all loads imposed. The Contractor shall form the UHPC locations to be overfilled according to the Plans.

Top forms, chimneys, and head pails shall be used, according to UHPC Supplier recommendations, to achieve the desired profile and confirm that the joint is completely full. Formwork removal shall not begin until the compressive strength has reached 12 ksi.

7. **Surface Preparation:** The Contractor shall confirm that precast concrete surfaces to be in contact with the UHPC are roughened and have exposed aggregate with an average amplitude of 1/4 inch. The Contractor shall pre-wet the precast concrete surfaces for at least 4 hours prior to placement of UHPC to confirm that a saturated surface dry (SSD) condition has been reached. During the pre-wetting operation, the Contractor shall check the formwork for leaks and shall seal any formwork that is not watertight. Just prior to placement of the UHPC, the Contractor shall air blast the joints to remove dirt, debris and standing water.
8. **Technical Representatives:** The Contractor shall arrange for two approved Supplier's Technical Representatives to be on Site for the duration of the UHPC mixing and placement operations. One representative shall remain with the mixing operations and the other representative shall remain with the placement operations. Mixing or placement shall not

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begin until the Supplier's representatives are on-Site and have checked in with the Engineer.

9. **Mixing:** In accordance with the approved Mix Design, the UHPC components shall be pre-weighed using a calibrated scale prior to the commencement of mixing. The Contractor shall provide a minimum of three portable mixing units for mixing of the UHPC. Mixing equipment that is not provided by the Supplier must be reviewed by the Supplier for adequacy. The Contractor shall keep the temperature of the UHPC below 85°F during mixing. Ice may be added to the mix as recommended by the Supplier's representative. Should the ambient temperature fall below 50°F, the batching water shall be heated to maintain the mix temperature between 50 and 85°F.

10. **Placement:** In accordance with the approved placement sequence, start at the low end of the joint to allow fluid mix to fill in up-hill. Confirm that the joint is overfilled according to the plans. Add top forms as flow progresses. If the formwork exhibits evidence of leakage at any location, the Contractor shall take remedial measures necessary to stop further leakage. The UHPC shall not be internally vibrated but where 2 successive batches meet, agitate the point of intersection with a rod. Cold weather placement procedures are required when the ambient temperature falls below 50°F.

11. **Curing:** Curing and cold weather protection shall be per Supplier recommendations and the following: Cover the UHPC and keep formwork in place until the Contractor's testing confirms that it has achieved a minimum compressive strength of 12 ksi. Prevent construction or traffic live loads from traveling over the UHPC until the Contractor's testing confirms that it has achieved a minimum compressive strength of 14 ksi.

12. **Grinding:** Immediately after removal of formwork, the UHPC overfill shall be removed using grinding equipment to level the joint material with the precast concrete surface. The grinding equipment shall be equipped with an on-board wet vacuum attachment capable of removing the debris and residue from the grinding process. The Contractor shall be responsible for proper disposal of the debris.

13. **Contractor QC requirements:**
 - (a) **Batch identification:** For each batch of UHPC, record the date and time, amounts of water and ice, and admixtures used.
 - (b) **Flow tests:** The Contractor shall conduct one flow test per batch of UHPC in accordance with ASTM C1437 (as modified by ASTM C1856) to verify workability and time of setting. The flow shall be 7 to 10 inches.
 - (c) **Mix temperature checks:** The Contractor shall conduct one temperature check per batch of UHPC in accordance with ASTM C1064. The temperature of the mix at discharge shall be between 50 and 85°F.
 - (d) **Compressive strength cylinder specimens:** A minimum of 12 cylinders, 3 inches x 6 inches shall be cast for each day's production. One set (3 cylinders) shall be cast at the beginning and one set at the end of the day's production. Two intermediate sets of cylinders shall be cast from the middle portion of the day's production.

All sets shall be cured initially in the field and shipped to the Contractor's AASHTO accredited testing lab for final curing, preparation of test specimens in accordance with ASTM C1856, and testing.

All cylinders shall be cured using the same method of curing used in the field. The temperature during curing shall be controlled to represent field conditions. The compressive strength of three cylinders shall be tested at 2, 4, 14, and 28 days after casting. The compressive strength shall be measured using ASTM C39 (as modified by ASTM C1856). The minimum compressive strength shall be 14 ksi at 4 days and 20 ksi at 28 days. Failure to meet the minimum at any point requires immediate notification to the Engineer and a written corrective action plan to be submitted to the Engineer for approval.

- (e) Pull out tests: The Contractor shall cast 6 cylinders 12 inches diameter and 7 1/2 inches deep. Each cylinder shall have one 32-inch-long reinforcing bar cast in the center of the circular face. The axis of the bar shall be perpendicular to the formed surface. Three (3) of the castings shall have #6 bars embedded 5 inches deep, and three (3) of the castings shall have #4 bars embedded 3 inches deep. These cylinders shall be kept wet for four (4) days then delivered to the Contractor’s AASHTO accredited testing lab for testing using a continuous rate of loading until failure in accordance with the tensile test requirements of ASTM E488. The test shall be performed as soon as practical after the corresponding compressive strength samples reach 14 ksi. The samples pass if the bars yield without the UHPC failing and without the bars pulling out of the UHPC. Failure to meet these requirements requires immediate notification to the Engineer and a written corrective action plan to be submitted to the Engineer for approval.
- (f) As-built records: The Contractor shall track and show the placement locations of UHPC production by day. A PDF copy of the records shall be submitted to the Engineer on a weekly basis.

Results of all the laboratory tests, conducted by the Contractor’s AASHTO accredited testing lab, shall be submitted to the Engineer for review. Testing frequency shall be as needed to maintain control of the operation.

Method of Measurement: The volume of UHPC will be calculated in cubic yards based on the nominal dimensions shown on the plans except the UHPC material used to overfill above top of deck elevation will not be measured for payment. No volume adjustments will be made for precast tolerances, or for embedded components such as reinforcing steel or shear studs.

Basis of Payment: This work will be paid for at the Contract unit price per cubic yard for “Ultra High Performance Concrete,” complete and accepted in place, which price shall include all materials, equipment, tools and labor incidental thereto.

Preparation of the mix design, trial mixes and Work Plan; transporting and mixing UHPC; formwork, testing, placing, curing and grinding, as well as the services of the Supplier’s Technical Representatives shall be included in the Contract unit price.

Pay Item	Pay Unit
Ultra High Performance Concrete	c.y.

ITEM #0601074A – STRUCTURAL REPAIR CONCRETE

Description:

Work under this item shall consist of locating and repairing voids in horizontal and vertical surfaces of concrete areas greater than 1 inch deep (exclusive of deck slabs and concrete pavement). This work shall include sawcutting, abrasive blast cleaning areas to be patched, roughening surfaces, installing welded wire fabric and reinforcement, and casting concrete as shown in the plans.

Access shall be provided for the Engineer to identify repair locations and limits prior to any repair work, and also shall be provided for the Engineer to verify soundness of the repairs.

Materials:

Materials shall meet the requirements of Special Provision Section M.03, modified as follows:

Special Provision Section M.03.02—Mix Design Requirements is amended and supplemented as follows:

<u>TYPE</u>	<u>PROPORT. BY WT. APPROX.</u>	<u>WATER PER BAG MAX.</u>	<u>CEM. FACTOR</u>
STRUCTURAL REPAIR CONCRETE	1:2.16:2.20	5.7 (Gals.)	7.0 (Bags/C.Y.)

1. Coarse Aggregate:

(c) Grading: Coarse aggregate for Structural Repair Concrete shall meet the following gradation requirements:

For Structural Repair Concrete, the required grading shall be obtained by using 100% 3/8 inch coarse aggregate.

3. Cement:

Type I or II Portland Cement shall be used for Structural Repair Concrete.

5. Admixtures:

Add the following:

(c) Superplasticizing Admixtures: The superplasticizer admixture shall be a high-range water reducer (HRWR) capable of increasing the slump of the mix from approximately 2 1/2 inches to 6 1/2 inches upon the addition of the amount recommended by the respective manufacturer. The HRWR shall conform to ASTM C494 Type F or Type G and shall be approved by the Engineer. The use of this material shall be in strict accordance with the respective manufacturer's written instructions and procedures.

Special Provision Section M.03.04—Curing Materials is amended and supplemented as follows:

3. Liquid Membrane Forming Compound: No liquid membrane forming compound shall be used for Structural Repair Concrete.

Add the following:

Welded Wire Fabric: Welded wire fabric shall conform to the requirements of ASTM A185.

Primer: Zinc rich primer shall conform to Federal Specification TT-P-641, Type 1 and shall be obtained from one of the suppliers on the American Galvanizers Association's most current Product Suppliers List for Zinc-Rich Paints and shall be brush-applied in accordance with the manufacturer's instructions. Spraying shall not be permitted. A Materials Certificate is required for the primer in accordance with Article 1.06.07, certifying the conformance of this material to the requirements stated herein.

Composition:

Structural Repair Concrete shall conform to the requirements as specified in Special Provision Section M.03 as amended herein. Structural Repair Concrete shall contain not less than 6.5% and not more than 8.5% entrained air at the time of placement.

Structural Repair Concrete shall have a minimum 4,000 psi compressive strength at 28 days.

Consistency:

Structural Repair Concrete shall have a slump range of 2 inches to 4 inches prior to the addition of the HRWR and from 6 inches to 8 inches slump after the addition of the HRWR. The addition rates of the air-entraining admixture (A.E.A.) 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 Structural Repair 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 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.

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.

Construction Methods:

All surfaces of exposed concrete and reinforcing steel shall be free of oil, solvent, grease, dirt, dust, bitumen, rust, loose particles and foreign matter.

When using abrasive blasting equipment, all work shall be shielded for the protection of the public.

Welded wire fabric reinforcement shall be installed in accordance with the plans.

Adequate measures shall be taken by the Contractor to prevent concrete chips, tools and/or materials from entering into adjacent roadway lanes or dropping to areas below the structure. All debris shall be promptly swept up and removed from the Site. All materials removed shall be satisfactorily disposed of by the Contractor.

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 system shall be properly designed in accordance with Article 6.01.03. Forms shall be so designed that placement access shall be allowed at the top of each respective formwork assembly for contiguous void areas.

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

No bonding compounds 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. 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.

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

Curing Concrete:

Concrete shall be cured by leaving forms on for seven (7) days.

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 their expense until a patch acceptable to the Department is in place.

Method of Measurement:

“Structural Repair Concrete” shall be measured by the actual volume in cubic feet of concrete placed and accepted by the Engineer. Welded wire fabric reinforcement and reinforcement will not be measured for payment.

Basis of Payment:

“Structural Repair Concrete” will be paid for at the Contract unit price per cubic foot, complete in place, which price shall include providing scaffolding or other access for the Engineer’s inspection, sandblasting, cleaning, welded wire fabric, reinforcement splices, forming, placing, curing, stripping and finishing new concrete, debris shields, and all materials, equipment, tools, labor and clean-up incidental thereto.

Pay Item

Pay Unit

Structural Repair Concrete c.f.

ITEM #0601192A – SURFACE PATCH

Description:

This work shall consist of sweeping and cleaning areas of deteriorated pavement of all loose and delaminated pavement materials, disposing of deteriorated pavement materials, application of tack coat, and placement of Hot-Mix Asphalt (HMA) or an equivalent Polymer Modified Asphalt (PMA) to match the elevation of the surrounding pavement.

For road sections being milled and paved, all patching operations must be completed after milling is complete and before paving begins. All patching operations shall be completed within one working day following milling and shall be completed before traffic is permitted to resume on the exposed roadway.

Materials:

Materials for this work shall meet the requirements of Section M.04 and shall consist of the following:

1. HMA S0.25, HMA S0.375, or an equivalent PMA. All HMA or PMA shall be Traffic Level 2 unless indicated otherwise on the plans.
2. Tack coat.

Construction Methods:

Equipment for this work shall include a sweeper capable of remove millings and loose debris, an air compressor capable of producing 100 psi oil free compressed air for cleaning the area to be patched, tools for the placement of bituminous concrete, and pavement compaction equipment to perform patching operations, such as a plate compactor.

1. The Engineer will mark out areas for patching that are broken, damaged, distorted, or delaminated in order to provide a suitable surface for placement of a layer of bituminous concrete. Examples of such areas to be patched include potholes, open longitudinal joints, ruts, and depressions.
2. Sweep and clean the areas to be patched in order to remove all loose and delaminated material to the satisfaction of the Engineer.
3. Clean off any residual dust or small debris using compressed air to the satisfaction of the Engineer, and allow area to fully dry.
4. A uniform application of tack coat meeting the requirements of Section 4.06 shall be applied prior to patching. It shall cover the entire surface area of the patch and be allowed to sufficiently cure or break.
5. Place and compact HMA S0.25, HMA S0.375, or an equivalent PMA by means acceptable to the Engineer and to the elevation meeting the surrounding pavement.

Method of Measurement:

This work will be measured by the number of square feet of patched roadway completed and accepted.

Basis of Payment:

This work will be paid for at the Contract unit price per square foot of "Surface Patch." The price shall include all tools, materials, labor, equipment, disposing of deteriorated materials, sweeping and cleaning, tack coat application, and placement and compaction of HMA or PMA.

Pay Item

Pay Unit

Surface Patch

s.f.

ITEM #0601242A – PRECAST CONCRETE DECK PANELS

Description:

The work shall consist of furnishing and installing precast concrete deck units at the locations and in accordance with the details indicated on the Contract Plans.

Materials:

Materials used in this work shall conform to the following:

Concrete, the materials for precast concrete bridge deck panels shall meet the applicable requirements of Article M.14.01

Reinforcing Steel, Bar reinforcement shall be epoxy coated meeting the requirements of Section M.06

Construction Methods:

The Contractor shall prepare and submit to the Engineer for approval fully detailed shop and working drawings in accordance with Article 1.05.02. Shop drawings shall show all materials, by the type and ASTM designations, and other pertinent information or as required by the Engineer.

Prior to ordering or fabricating any materials, the Contractor shall take complete and accurate field measurements. Field measurements shall be utilized to establish layout and geometry of the deck replacement.

Formwork for precast units shall use rigid molds, constructed to maintain precast uniformity in shape size and finish. Form inserts, if required, shall be utilized in accordance with manufacturers' instructions.

The work shall be performed in accordance with the details shown on the Plans, the approved shop drawings and the applicable requirements of Section 6.01 and 6.02.

Details of lifting inserts or other hardware to be cast into the precast deck units shall be included with the detail shop and working drawings submitted by the Contractor to the Engineer for review.

The Contractor shall coordinate this work with other scheduled work on this project. Installation of all precast deck panels shall be according to the approved shop and working drawings. All panels after installation and prior to cast-in-place closure pours will be inspected for cracks and other visible defects. All defective elements shall either be replaced or repaired using procedures approved by the Engineer and at no additional cost to the State.

Construction equipment shall not travel or rest on any uncompleted portion of the precast deck units unless the designer of the units has evaluated the loading conditions, submitted calculations to the Engineer, and has received written approval of the proposed loading. The Contractor shall repair any damage resulting from equipment passage at no additional cost to the State.

Method of measurement:

This work will be measured for payment by the number of square feet of precast concrete deck panels completed and accepted in place. Cast in place closure pours and joints between precast concrete deck panels will not be measured for payment under this item.

Basis of payment:

This work will be paid for at the Contract unit price per square foot for “Precast Concrete Deck Panels,” complete in place which price shall include the cost of all engineering, labor, materials, and equipment necessary to complete the work, including the furnishing, storing and protecting, transporting, unloading, and installation of all Precast Concrete Deck Panels.

Pay Item

Pay Unit

Precast Concrete Deck Panels

s.f.

ITEM #0601270A – FULL DEPTH PATCH (HIGH EARLY STRENGTH CONCRETE)

Description: This item shall consist of the saw cutting concrete, removal of all deteriorated concrete for the full depth of the deck slab, furnishing and installing deformed steel bars, and reconstructing the slab with new concrete, where directed by the Engineer and as hereinafter specified.

Work under this item shall also include the providing of a safe access to the structure for the delineation of the repair locations and review of the performed work. The Contractor shall not perform any repair work without prior approval of the Engineer for location, limits and types of repairs.

Materials: The materials shall conform to the following requirements:

1. High Early Strength Concrete – The high early strength concrete shall conform to one of the following:
 - A. The Contractor shall design and submit to the Engineer for approval a high early strength concrete mix. This mix shall be air-entrained, and shall be composed of Portland cement, fine and coarse aggregates, approved admixtures and additives, and water. The mix shall contain between 4% and 7% entrained air, and shall attain a 6-hour compressive strength of 2,500 psi. Additionally, the mix shall contain shrinkage compensating additives such that there will be no separation of the patched area from the parent concrete. This shrinkage-compensating additive shall be utilized so as to produce expansion in the high early strength concrete of no more than 0.3%.
 - B. In lieu of the above high early strength concrete mix, the Contractor may propose the use of a proprietary type mix that will meet the same physical requirements as those stated above. A mix design shall be submitted for this material, stating the percentage of each component to be utilized.
2. Regardless of the type of high early strength concrete proposed by the Contractor, substantive data that demonstrates the ability of the material to meet the specification requirements shall be submitted with the proposed mix design at least 2 weeks prior to its use.
3. Deformed Steel Bars: Section 6.02.

Construction Methods: Construction methods shall conform to the following requirements:

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.

The removal of these materials 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 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 (1) working day with suitable weather conditions per each 6,000 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 shall include any costs related to the allowance for this inspection in the general cost of the work.

2. Removal of Deteriorated Concrete: All deteriorated concrete 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 1/2 inch with an approved power-saw capable of making straight cuts. In the event that reinforcing steel is encountered within the upper 1/2 inch depth during sawing operations, the depth of 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 be squared up to a vertical edge in an approved manner. Where sawing is impractical, the areas shall be outlined by chisel or other approved means.

The removal of concrete shall be by hydro-demolition or pneumatic hammer methods and shall be governed by the requirements set forth in the special provision Item "Partial Depth Patch" and as directed by the Engineer.

The Contractor shall take adequate measures to prevent concrete debris from falling to any area below the structure and onto adjacent roadway lanes. All debris shall be promptly cleaned up and removed from the site. All material removed shall be satisfactorily disposed of by the Contractor.

Where existing reinforcing steel is damaged or has insufficient cover as determined by the Engineer, it shall be cut out and replaced with new reinforcing steel the same size, with a minimum length for lap splices as indicated on the plans or as directed by the Engineer.

3. Surface Preparation: Sound reinforcing steel which is in the proper position in the slab shall be left in place and cleaned of all concrete. The smaller fragments shall be removed with hand tools or by water blast cleaning.

The newly exposed reinforcing steel and concrete faces shall be cleaned of loose or powder-like rust, oil solvent, grease, dirt, dust, bitumen, loose particles, and foreign matter just prior to patching.

Existing concrete surfaces against which the new patch will be placed shall be dampened. All free water shall be removed from the surface.

Forms shall conform to the pertinent requirements of Subarticle 6.01.03-1.

The cleaned concrete surface area to receive patching material shall be wetted for a 1 hour period immediately prior to placement of the concrete patch. Any standing water shall be blown out with compressed air prior to application of binding grout and patch material.

After wetting of the deck patch area to receive patching, and removal of the standing water, cement binding grout shall be scrubbed into the concrete patch bonding surface with stiff bristled brushes. All bonding surfaces in the patch area shall receive a coating of bonding grout within a time period not to exceed 5 minutes prior to placement of the concrete patch material.

4. Mixing, Placing, and Finishing: Mixing and placing concrete shall be done in accordance with the applicable portions of Article 6.01.03. Mixing and placing shall not be executed unless the ambient temperature is above 40 °F and rising.

The concrete mix shall be properly placed to insure complete contact around all reinforcing steel and against existing concrete at patch edges and compacted to a level slightly above the surrounding deck surface. Vibrators of the appropriate size shall be used for all consolidation of the concrete, regardless of the size of the patch area, with no hand tamping or rodding allowed. Concrete may be moved horizontally with the aid of hand tools, but not with the use of vibrators (excess vibration shall be avoided).

Vibrating plates or vibrating screed 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 adjacent concrete 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.

5. Curing: Immediately after finishing of the patch area, a sheet of 4 mil polyethylene shall be placed over the repair area, in conjunction with insulating curing material. This material shall be a minimum of 2-inch thick closed cell extruded polystyrene insulation board that conforms with the requirements of ASTM C578. It shall have a minimum certified R-value of 10. The insulating material shall extend a minimum of 12 inches beyond the limits of the patch area, and shall be kept in intimate contact with the surrounding payment surface to prevent lifting of the material. It shall be weighted down with sandbags that weight at least 15 pounds each. The sandbags shall be placed a minimum of 2 feet on center around the patch area.

Cured patches, having a hollow sound when chain dragged or tapped (indicating delamination), shall be replaced by the Contractor at its expense until a patch acceptable to the Engineer is in place.

6. Tolerances in Finished Patch Surfaces: The surface profile of the patched area shall not vary more than 1/8 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 1/8 inch tolerance shall be ground down by approved machinery. Sags or depressions in the surface of the patch area that exceed 1/8 inch tolerance as determined by the Engineer shall be repaired by removal of the concrete in the depression to a depth of 1 inch and repaired in the previously described manner.

7. **Testing:** The Contractor shall form, cure and test all concrete test cylinders under supervision of a representative of the Department. The dimensions, type of cylinder mold, number of cylinders, and method of curing shall be as directed by the Engineer.

The Contractor shall provide a portable compressive testing machine, on Site, for the purpose of testing all compressive strength cylinders. All testing shall be in accordance with the requirements of ASTM C39. NOTE: This compressive testing machine must be calibrated in accordance with the provisions of Section 5, ASTM C39.

8. **Time Schedule:** Traffic will not be allowed on any areas where the Contractor has placed and finished concrete until the material has properly cured as specified, and has developed the required strength of 2,500 psi as determined by the compressive strength test, or until the Engineer authorizes its opening to traffic.

All work shall proceed as required by the “Maintenance and Protection of Traffic” and “Prosecution and Progress” specifications elsewhere within the Contract.

Method of Measurement: This work will be measured for payment by the actual volume in cubic yards of replacement concrete, complete and accepted. No deduction will be made for the volume of reinforcing steel. Removal of concrete will not be measured for payment.

Basis of Payment: This work will be paid for at the Contract unit price per cubic yard for “Full Depth Patch (High Early Strength Concrete)” complete in place, which price shall include sawcutting and removal of concrete, surface preparation, furnishing and installing deformed steel bars, concrete replacement, all equipment, tools, labor and work incidental thereto.

Pay Item	Pay Unit
Full Depth Patch (High Early Strength Concrete)	c.y.

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, approach slabs and headers by pneumatic hammers or hydro-demolition methods, and replacement with fast setting patching material as shown on the plans, as directed by the Engineer and specified herein.

Where ordered by the Engineer, work under this item shall also include inspecting the underside of the deck concrete for popouts caused by the removal of deteriorated concrete.

Work under this item shall also include the furnishing and installation of wire ties for reinforcing bar and vertical supports on inadequately supported or vibrating reinforcing steel within deck patch areas, as ordered by the Engineer.

Materials: The materials shall meet 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 1 hour after set and 3,000 psi within 3 days.

The Contractor shall design and submit a quick setting mix to the Engineer for acceptance. Said mix design shall meet the strength requirements noted above and shall attain a minimum of 2500 psi prior to allowing traffic on patched surfaces. 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 meet the requirements of Subarticle M.03.01-2.

The coarse aggregate shall meet the requirements of Subarticle M.03.01-1. The required grading shall be obtained by using 100% of No. 8 size coarse aggregate. Grading of the aggregate shall conform to the gradation for No. 8 stone in Article M.01.01.

Water shall meet the requirements of Subarticle M.03.01-4.

The quick setting cement shall be one of the following materials:

MasterEmaco T 415

BASF
23700 Chagrin Blvd.
Beachwood, OH 44122
216-839-7016
www.master-builders-solutions.basf.us

Perma Patch

Dayton Superior Corporation
7130 Ambassador Dr.
Allentown, PA 18106
800-745-3707
www.daytonsuperior.com

Rapid Set DOT Cement

CTS Cement Manufacturing Corporation
12442 Knott Street
Garden Grove, CA 92841
800-929-3030 ext. 188
www.ctscement.com

Speed Crete Green Line

Tamms Industries
730 Casey Ave.
Wilkes-Barre, PA 18702
800-218-2667
www.dpproducts.com/products/tamms.html

Fastcrete
Silpro Corporation
2 New England Way
Ayer, MA 01432
800-343-1501
www.silpro.com/products/fastcrete.shtml

Gypsum Based Materials will not be allowed.

Construction Methods:

Removal of concrete for partial depth patch will be performed by one of two methods: Hammer Demolition or Hydro-demolition. Prior to beginning any work, the Contractor shall provide submittals outlining intended method, as defined herein.

- 1) Inspection of the Deck: Before any existing concrete is removed, the Contractor shall provide the Engineer clear access to the bridge deck. During this time, the Engineer will perform an inspection of the structural slab and will designate areas where concrete removal shall be required. 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 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 (6,000) square feet, or portion thereof, of deck area.

The Contractor will not be allowed to do any further work to the structure, until all necessary inspection operations have been performed, unless given permission by the Engineer.

The Contractor shall include any costs related to the allowance for this inspection in the general cost of the work.

- 2) Hammer Demolition: The maximum allowable noise level caused by equipment used for the removal of deck concrete shall not exceed 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 the equipment will meet this requirement before the use of such equipment will be allowed.

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.

- 3) Hydro-Demolition Water and Equipment: All hydro-demolition equipment shall 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 the 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 acceptance by the Engineer. No hydro-demolition work shall be initiated until this acceptance 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 Energy and Environmental Protection, Water Resources Unit, in accordance with the Connecticut Water Diversion Policy Act PA 84-402, CGS Sections 22a-365 through 22a-378.

- 4) Hydro-Demolition Drainage Runoff Control: At least 2 weeks prior to the planned initiation of hydro-demolition operations, the Contractor shall submit to the Engineer for acceptance a comprehensive plan for the hydro-demolition operation. This Hydro-Demolition Plan shall include the following:

- a) Equipment
- b) Containment
- c) Filtration
- d) Location of trial areas
- e) Disposal of hydro-demolition runoff and concrete debris in conformance with these specifications

The Plan shall ensure that all concrete debris and particulate 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 acceptable to 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 Hydro-Demolition 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.

The Plan shall additionally conform to all applicable requirements of Section 1.10 Environmental Compliance of the Standard Specifications.

The acceptance by the Engineer of the Hydro-Demolition Plan shall in no way relieve the Contractor of any responsibility for its safe and effective performance.

- 5) Calibration and Testing of Hydro-Demolition Equipment: A trial area will be designated by the Engineer to demonstrate that the equipment, personnel and methods of operation are capable of producing satisfactory results. The trial area will consist of 2 patches, each of approximately 20 square feet, one area of deteriorated 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 sound concrete test area, the equipment shall be located over the deteriorated or defective concrete and, using the same parameters as for sound concrete removal, shall remove all deteriorated or defective concrete. If a satisfactory result is obtained, these parameters may be used as a basis for production removal.

If, after calibrating the hydro-demolition equipment and beginning removal operations in a particular zone or area, insufficient removal of concrete is observed, 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.

- 6) 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 1/2 inch with a powersaw capable of making straight cuts prior to pneumatic demolition. 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 acceptable manner. Where sawing is impractical, the area shall be outlined by chisel or other acceptable means.

All deteriorated concrete shall be removed by pneumatic hammers or hydro-demolition methods.

The depth of concrete removal 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 the sole determiner of what constitutes deteriorated concrete, using sounding methods or other evaluation measures.

Within 1 hour following the initiation of a concrete removal operation in any patch area, all loose concrete debris shall 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 frame, 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 its 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.

- 7) 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 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 acceptable to 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 excess free water shall be removed from the patch area.

- 8) Mixing, Placing, and Finishing: Unless a winter operations plan has been submitted to the Engineer by the Contractor, mixing and placing concrete shall only take place when the ambient temperature is above 35°F or per manufacturer's recommendations, whichever is higher. 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 its expense until a patch acceptable to the Engineer is in place.

- 9) Tolerances in Finished Patched Surfaces: The surface profile of the patched area shall not vary more than 1/8 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 1/8 inch tolerance shall be ground down by acceptable machinery. Sags or depressions in the surface of the patch area that exceed the 1/8 inch tolerance shall be repaired by removal of the concrete in the depression over an area determined by the Engineer to a depth of 1 inch and repaired in the previously described manner.
- 10) Underside of Bridge Deck Treatment: The Engineer will examine the underside of the bridge deck for popouts caused by the removal of deteriorated concrete. The exposed reinforcing steel shall be coated with epoxy resin where ordered by the Engineer. The exposed reinforcing steel, if any, which is to receive the epoxy resin coating material shall be cleaned of all loose or powder-like rust, oil, dust, dirt, loose particles, and other 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, 2 coats of the mixed material shall be applied in uniform coats of approximately 2 to 3 mils dry film thickness each.

If the popouts extend beyond the bottom layer of reinforcing steel, the popouts shall be repaired as ordered by the Engineer.

- 11) Test Cylinders: The Contractor shall make and perform compressive strength tests on representative cylinders under the supervision of the Engineer in accordance with ACI requirements. The dimensions, type of cylinder mold and number of cylinders will be specified by the Engineer. Traffic shall not be permitted on patched surfaces until the patch material attains a strength of 2500 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: The compression machine must be calibrated in accordance with the provisions of Section 5, ASTM C39.

12) 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.

Method of Measurement: This work will be measured for payment by the actual volume in 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. Providing safe access for delineation and inspection of the performed repairs will not be measured for payment.

Replacement of deteriorated epoxy rebar and repair of epoxy coated rebar at popouts, if required, will be measured for payment under other Contract items.

Basis of Payment: This work will be paid for at the Contract unit price per cubic foot of deck concrete repaired under "Partial Depth Patch," complete and accepted in place, which price shall include removal of deteriorated concrete, surface preparation of patch areas, concrete replacement, the furnishing and installation of reinforcing bar wire ties and vertical supports for inadequately supported existing reinforcing steel, inspection access, all materials, equipment, including the portable compression testing machine required for the testing of the repair material, tools, labor and work incidental thereto.

Replacement of deteriorated epoxy rebar, if required, will be paid for under the item "Deformed Steel Bars – Epoxy Coated."

Epoxy resin coating of exposed epoxy rebar at the underside of the deck, if required, will be paid for under the item "Clean and Coat Exposed Reinforcing Steel."

Pay Item	Pay Unit
Partial Depth Patch	c.f.

ITEM #0601954A – EPOXY INJECTION CRACK REPAIR

Description:

This item shall consist of surveying the existing areas, locating all cracks to be repaired under this item, and rebonding cracked concrete structures with a two-component modified epoxy resin system injected into the cracked structure under low pressure using continuous positive displacement metering and mixing equipment, as shown on the plans or as directed in accordance with these specifications.

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

Materials:

The modified epoxy resin shall be a pre-qualified epoxy resin (see attached Appendix A). A Materials Certificate and a Certified Test Report in accordance with Article 1.06.07 shall accompany each batch or lot of the material delivered to the job site to verify the epoxy resin's conformance with the manufacturer's supplied infrared spectroscopy test results. A sample of liquid epoxy resin Components A and B shall be taken and shall consist of one pint per batch of each component represented in each shipment. The samples shall be presented to the Laboratory a minimum of 14 calendar days before incorporation of any of the batch into the work. The Laboratory shall conduct the Infrared Spectroscopy Test on the samples (see attached Appendix A). Each test results shall be compared to the "Pre-qualification Procedures" test results on file with the Laboratory. Two materials are considered to be identical if all of the absorption points agree as to wave length and relative magnitude of the peaks in comparison with the other points of absorptions.

A batch of each component will be defined as that quantity of material that has been subjected to the same unit chemical or physical mixing process intended to make the final product substantially uniform.

Each component shall be packaged in steel containers not larger than 5 gallons in volume. The containers shall have lug type crimp lids with ring seals, shall be new, shall not be less than 0.024-inch nominal thickness, and shall be well sealed to prevent leakage. If a lining is used in the containers, it shall be of such character as to resist any action by the components. Each container shall be clearly labeled with the description (Component A or B), the manufacturer's name, date of manufacture, batch number, and the following warning:

CAUTION: *This material will cause severe dermatitis if it is allowed to come in contact with the skin or eyes. Use gloves and protective creams on the hands. Should this material contact skin, wash thoroughly with soap and water. Do not attempt to remove this material from skin with solvents. If any gets in the eyes, flush for 10 minutes with water and secure immediate medical attention.*

Any material, which shows evidence of crystallization or a permanent increase in viscosity or settling of pigments which cannot be readily redispersed with a paddle, shall not be used.

Construction Methods:

A survey shall be undertaken by the Engineer on the areas designated on the plans to determine the exact limits and location of the repair areas under this item. Cracks less than $\frac{1}{8}$ " in width need not be repaired under this item.

At the time of mixing, Components A and B and the substrate temperature shall be between 50°F and 85°F, unless the material has been prequalified at a temperature less than 77°F, in which case this lesser temperature shall govern the use of the material. Any heating of the adhesive components shall be done by application of the indirect heat. Immediately prior to filling the tanks of the mixing equipment, each component shall be thoroughly stirred with a paddle. Separate paddles shall be used to stir each component.

Prior to sealing, the crack shall be cleaned free of dust, silt and any other material which would impair bonding. Cleaning shall be done with oil-free compressed air jets or preferably by vacuum cleaning with an industrial vacuum cleaner.

Injection ports shall be inserted in the cracks at intervals recommended by the epoxy manufacturer. The Contractor may use either surface or insertable injection ports, whichever is recommended by the epoxy manufacturer. Spacing of the ports shall be such that the injected adhesive will substantially fill the crack without excessive waste. The spacing of the ports shall be adjusted as the injection process progresses in order to meet this requirement.

Drilling of the injection ports shall be done with a hollow drill bit to which vacuum is applied with an industrial vacuum cleaner. The Contractor shall avoid reinforcing steel during drilling operations. A pachometer may be used to locate and avoid reinforcing steel.

The surface of the crack between ports shall be sealed with tape and/or temporary surface sealant which is capable of retaining the epoxy adhesive in the crack during pressure injection and shall remain in place until the epoxy adhesive has hardened. Sealant tape and/or other temporary surface sealant shall be removed when no longer required and any spillage of epoxy shall be removed. No cleanup of surfaces not generally viewed by the public will be required unless the surface sealant will interfere with subsequent surface treatments.

Epoxy adhesive shall be pumped into the cracks through the injection ports. The pump, hose, injection gun and appurtenances shall properly proportion and mix the epoxy and shall be capable of injecting the epoxy at a sufficient rate and pressure to completely fill all designated cracks. A suitable gasket shall be used on the head of the injection gun to prevent the adhesive from running down the face of the concrete. Pumping pressure shall be kept as low as practicable.

The temperature of the concrete shall not be less than 50°F at the time epoxy is injected,

unless the epoxy has been prequalified at a lower temperature as hereinbefore provided, in which case the lower temperature shall govern.

For a crack with a uniform thickness, the epoxy adhesive shall be force into the first port at one end of the crack until adhesive runs in substantial quantity from the next adjacent port. The first port shall then be sealed and injection shall commence at the next port. Injection shall then continue from port to port in this manner until the crack is fully injected.

Cracks with varying thickness shall have the epoxy adhesive forced into the port at the widest gap in the crack until adhesive runs in substantial quantity from the two adjacent ports. The first port shall then be sealed and injection shall commence at the adjacent port corresponding to the shorter side of the crack. Injection shall then continue from port to port in this manner until the shorter side of the crack is fully injected. Similarly, injection shall continue from port to port on the longer side of the crack, beginning with the port that was filled with epoxy adhesive but not sealed, until the crack is fully injected.

For slanting or vertical cracks, pumping shall start at the lower end of the crack. Where approximately vertical and horizontal cracks intersect, the vertical crack below the intersection shall be injected first. The ports shall be sealed by removing the fitting, filling the void with epoxy and covering with tape or surface sealant.

Before starting injection work and at 2-hour intervals during injection work, whenever requested by the Engineer, a 3 fluid-ounce sample of mixed epoxy shall be taken from the injection gun. Should these samples show any evidence of improper proportioning or mixing, injection work shall be suspended until the equipment or procedure are corrected.

Samples obtained above shall be used directly, without further stirring, to make test pieces for the Slant Shear Strength on Dry Concrete. One test piece shall be made at the beginning, the middle and the end of daily operations. The samples shall be allowed to cure for 7 days in the "Concrete Cylinder Curing Box". On the 7th day, the samples shall be removed to the Laboratory and tested in accordance with the requirement for the Slant Shear Strength (see attached Appendix A).

Each sample shall be numbered consecutively and dated (with a waterproof marker) and shall note which sample represents which part of the structure.

Technical Advisor: The Contractor shall provide the Engineer with a notarized statement showing a specific record of epoxy injections actually made by the Contractor and/or a specific record of training of his employees in epoxy injection repairs taught by the epoxy manufacturer. If the statement is not produced or is deemed insufficient by the Engineer, the contractor shall obtain the services of a Technical Advisor who is employed by the epoxy manufacturer. The Technical Advisor shall assist the Engineer and the Contractor in the correct use of the injection resin. The Advisor shall be a qualified representative, approved by the Engineer, and shall be at the site of the work when the work begins in connections with the epoxy injection, and at such other times as the Engineer may request until completion of work under this item.

Methods of Measurement:

This work will be measured for payment by the total length of all cracks, which have been designated by the Engineer to be injected and which were subsequently filled with epoxy, completed and accepted by the Engineer.

Where a crack designated for repair under this item extends around a corner of a concrete member, the length of crack on both faces will be measured for payment.

Basis of Payment:

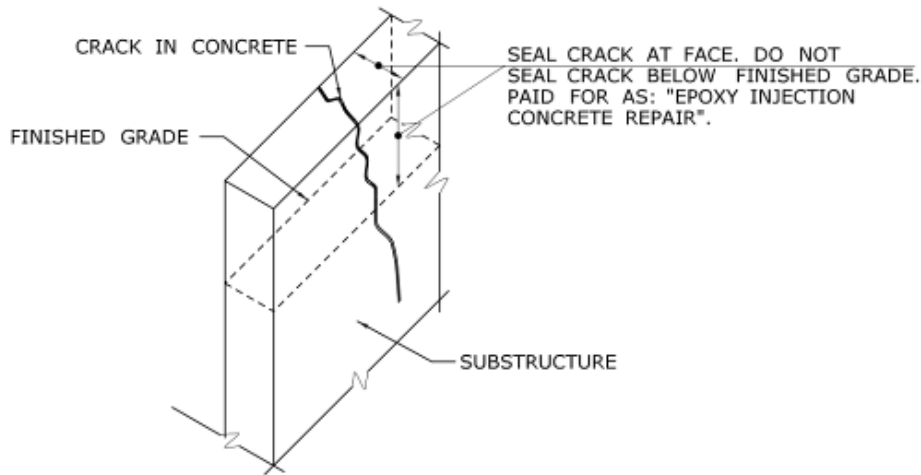
This work will be paid for at the contract unit price per linear foot for “Epoxy Injection Crack Repair”, complete in place, which price shall include cleaning and preparing cracks to be epoxy injected, all materials, equipment, tools, labor and clean up incidental thereto.

Pay Item

Pay Unit

Epoxy Injection Crack Repair

l.f.



**TYPICAL LIMITS OF EPOXY INJECTION
CONCRETE REPAIR**

NOT TO SCALE

SEALING CRACKS IN CONCRETE

IN GENERAL, CRACKS SHALL BE SEALED ONLY WHERE THERE IS NO EARTH FILL BEHIND THE CONCRETE FEATURE TO AVOID THE POSSIBILITY OF GROUND WATER PRESSURE BEING EXERTED ON THE SEALANT.

CRACK SEALING WILL BE PAID FOR UNDER "EPOXY INJECTION CONCRETE REPAIR"

APPENDIX A

Prequalification Procedure

The Prequalification Procedure shall consist of the following test procedures on the mixed epoxy resin at a temperature of 77°F, unless the Contractor desires to use the material at a lower temperature than 50°F, in which case the lower temperature shall be used to condition the material and test pieces.

Test: Viscosity

Requirement: 900 centipoise, maximum at 20°F ($\pm 2^\circ\text{F}$)
4000 centipoise, maximum at any test temperature

Test Method: ASTM D2393

Test: Gel Time (Pot Life)

Requirement: 4 to 60 minutes

Test Method:

A. Apparatus:

1. Unwaxed paper cups, 8 oz, 2 inches $4 \frac{1}{4}$ " at base (Dixie Cup No. 4338 or equivalent).
2. Wooden tongue depressor with ends cut square (Puritan No. 705 or equivalent).
3. Stainless steel spatula with 6"x1" blade and with end cut square.
4. Stopwatch, 1 second or smaller divisions.
5. Balance, 0.1 gram divisions.

B. Test Procedure:

1. Condition both Components A and B to required temperature ($\pm 2^\circ\text{F}$).
2. Measure proper volumes of well mixed Components A and B into an 8-oz. unwaxed cup to yield total mass of 60 (± 2.0) grams.
3. Start stopwatch immediately and mix components for 60 seconds, stirring with a wooden tongue depressor, taking care to scrape the sides and bottom of the cup periodically.
4. Place the sample at the required temperature ($\pm 2^\circ\text{F}$) on a wooden bench top which is free of excessive drafts.
5. Probe the mixture with the tongue depressor once every 30 seconds starting 4 minutes from the time of mixing.
6. The time at which a soft stringy mass forms in the cup is the gel time.

Test: Slant Shear Strength on Wet Concrete

Requirement: 1700 psi, minimum after 7 days of cure in air at the required temperature ($\pm 2^{\circ}\text{F}$).

Test: Slant Shear Strength on Dry Concrete

Requirement: 4500 psi, minimum after 7 days of cure in air at the required temperature ($\pm 2^{\circ}\text{F}$).

Test: Slant Shear Strength

A. Materials

1. Ottawa sand, ASTM C109
2. Portland cement, Type II
3. Water

B. Apparatus

1. Suitable mold to make diagonal concrete mortar block with a square base of 2-inch sides, and having one 2"x4" diagonal face, starting about $\frac{3}{4}$ " above the base. The diagonal faces of two such blocks are bonded together producing a block of dimensions 2"x2"x5".
2. Blocks are made from the following composition:

- Ottawa sand, ASTM C109	30.1 lbs
- Portland Cement Type II	12.1 lbs
- Water	4.8 lbs

Cure blocks 28 days in a fog room. Dry and lightly sandblast diagonal faces.

3. Suitable test press.

C. Test Procedure

Condition the components for 4 hours at the required temperature ($\pm 2^{\circ}\text{F}$). Without entrapping air, stir the separate components for 30 seconds and place the proper volumes of each component on a plate and mix with a spatula for 60 seconds. Apply a coat approximately 0.010-inch thick to each diagonal surface. Place four $\frac{1}{8}$ " square pieces of shim stock 0.012" thick on one block to control final film thickness. Before pressing the coated surface together, leave the blocks so that the coated surfaces are horizontal until the epoxy reacts slightly to prevent excessive flow. Press diagonal surfaces of each block together by hands and remove excess epoxy adhesive.

Align the blocks so that the ends and sides are square and form a 2"x2"x5" block. Use

blocks of wood or metal against each 2"x2" end to keep the diagonal faces from slipping until epoxy hardens.

After the required cure time, apply a suitable capping compound to each of the 2"x2" bases, and test by applying a compression load with a Universal Test Machine or other suitable testing apparatus at the rate of 5000 lbs/min until failure.

Report results in pounds per square inch = $\frac{1}{4}$ x (Load in Pounds)

For wet shear strength, soak another set of block in water for 24 hours at the require temperature ($\pm 2^{\circ}\text{F}$). Remove and wipe off excessive water. Prepare, cure and test sample according to above test procedure.

Test: Tensile Strength

Requirement: 4500 psi, minimum

Test: Elongation

Requirement: 15% maximum

Test Method: Tensile Strength and Elongation

A. Apparatus:

1. Leveling table about 12"x8" with removable rim $\frac{1}{4}$ " thick by $\frac{1}{2}$ " wide.
2. Mylar or similar plastic sheeting 0.004" thick.
3. Air circulation oven capable of maintaining 158°F ($\pm 3^{\circ}\text{F}$).
4. Cutting die, Figure 1.
5. Thickness gauge, $\frac{1}{8}$ ".
6. Release agent, non-silicone type.

B. Procedure:

1. Place mylar sheet on leveling table.
2. Coat inside edge and bottom of rim with the release agent and secure to table with screws.
3. Level the table.
4. Mix sufficient volume of well-mixed Component A and well-mixed Component B in the proper volumes so as to be able to form a layer $\frac{1}{8}$ " deep when placed inside the ring on the leveling table.
5. Introduce as few bubbles as possible during mixing.
6. Flush surface of epoxy with a heat gun or Bunsen burner to remove air bubbles on surface. Repeat if necessary.
7. Allow the specimen to cure for 18 hours at the required temperature ($\pm 2^{\circ}\text{F}$).

8. Remove specimen from table and strip off mylar sheet. Cure specimen at 158°F ($\pm 3^\circ\text{F}$) for 5 hours.
9. Allow specimen to cool to the required temperature and cut specimens using cutting die shown on Figure 1.
10. Proceed as specified in ASTM D638, using 0.2 inch/minute test rate and 1" gauge length.

Test: Infrared Curve

Requirement: Infrared Curved shall be obtained of Components A and B

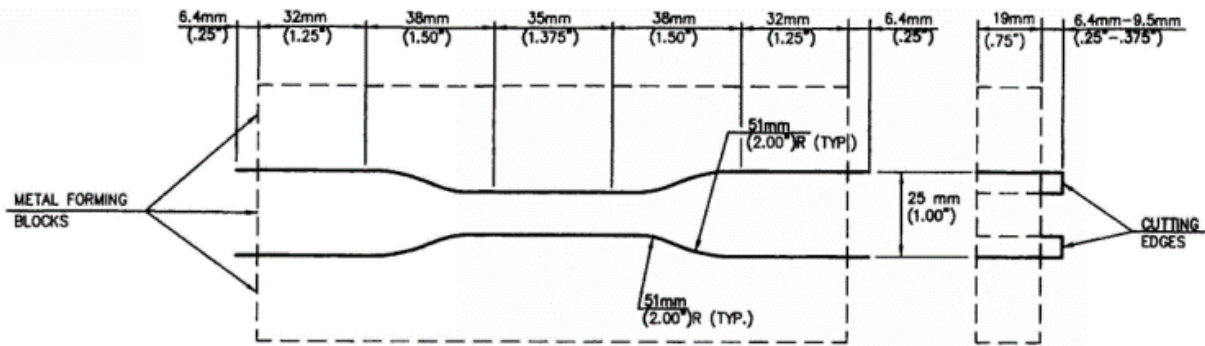
Test Method: Recording Spectrophotometer

A. Apparatus

1. Perkin-Elmer Model 137-B Infracord Spectrophotometer, automatic recording system from 2.5 to 15 microns with a two-speed recorder. Comparable results can be obtained with similar resolution.
2. Disk holder for a 1" diameter disk.
3. Two sodium chloride crystal disks, 1" in diameter.
4. Sorvall SS-3 Automatic Superspeed Centrifuge, or comparable centrifuge, which is able to separate the liquid and solid phases of the epoxy components without previous dilution with solvents.

B. Procedure

1. Place about 15 grams of Component A into a stainless centrifuge tube.
2. Counterbalance with Component B in a second centrifuge tube.
3. Centrifuge the two components at 17000 rpm until there is a supernatant liquid layer present in each tube. This takes 20 to 30 minutes.
4. Place a drop of Component A liquid layer on a sodium chloride disk.
5. Place another sodium chloride disk over the drop, rotate and press down until the liquid has flowed into a uniform layer of proper thickness between the two sodium chloride disks.
6. Place the disk in the holder and run an absorption curve with the infrared spectrophotometer.
7. More or less liquid may be used between the disks so as to produce a maximum absorption of 0.7 to 1.0 for the strongest absorption point on the curve.
8. Clean disks with toluene and dry.
9. Repeat steps 4 through 8 with the liquid layer from Component B.
10. Record each curve in order that they may be used for comparison purposes with lots of material delivered to the job site.



NOTE
CUTTING EDGES ARE OF 20 GAUGE SPRING STEEL AND ARE HELD BETWEEN THREE METAL BLOCKS MACHINED TO CONFORM TO THE ABOVE DIMENSIONS.

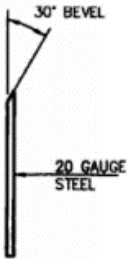


FIGURE 1
CUTTING DIE FOR TENSILE TEST
N.T.S.

ITEM #0602052A – WELDED WIRE FABRIC – EPOXY COATED

6.02.02 – Materials:

Add the following:

Epoxy coating of wire fabric shall be in accordance with ASTM A884.

6.02.04 – Method of Measurement:

Add the following:

This work shall be measured by the number of square yards of epoxy coated welded wire fabric installed and accepted.

6.02.05 – Basis of Payment:

Delete the article and replace with the following:

This work shall be paid for at the contract price per square yards for “Welded Wire Fabric – Epoxy Coated”, complete in place and accepted, including shop drawings, furnishing, fabricating, and placing welded wire fabric and all materials, equipment, tools, labor and work incidental thereto.

Pay Item	Pay Unit
Welded Wire Fabric – Epoxy Coated	s.y.

ITEM #0602903A – DRILLING HOLES

Description:

This work shall consist of drilling a 1/2" diameter hole in the bottom of an existing or new cast iron junction box at the location as shown on the plans, and in accordance with this specification. The drilled hole shall serve as a drain to shed accumulated water from the junction box.

Construction Methods:

The Contractor shall drill a 1/2" diameter hole in the bottom of an existing or new cast iron junction box at the location as shown on the plans.

Method of Measurement:

This work will be measured for payment by the actual number of holes drilled, complete and accepted.

Basis of Payment:

This work shall be paid for at the contract unit price each for "Drilling Holes" of the diameter and depth required, complete and accepted in place, which price shall include drill bits, drilling, and all material, tools, equipment, labor, and work incidental thereto.

Pay Item

Pay Unit

Drilling Holes

ea.

ITEM #0602910A – DRILLING HOLES AND GROUTING DOWELS

Description: Work under this item shall consist of drilling holes in concrete and grouting dowels at the locations shown on the plans, in accordance with the plans, the manufacturer's recommendations, and as directed by the Engineer. For the purposes of this specification, a dowel is defined as a reinforcing bar.

Materials: The chemical anchoring material shall conform to Subarticle M.03.01-15.

Construction Methods: Before fabricating any materials, the Contractor shall submit manufacturer's specifications and installation for the chemical anchoring material to the Engineer for review in accordance with Article 1.05.02.

Holes for the dowels shall be located as shown on the plans. The holes shall clear the existing reinforcement and provide the minimum cover as shown on the plans. A pachometer shall be used to locate existing reinforcing steel. If existing reinforcing is encountered during the drilling operation, the holes shall be relocated and the uncompleted holes shall be filled with the chemical anchoring material and finished smooth and flush with the adjacent surface.

The depth and diameter of each hole shall be as shown on the plans. If the diameter of a hole is not shown, the diameter of the hole shall conform to the manufacturer's recommendations for the diameter of the dowel being anchored. If the depth and diameter of a hole are not shown, the hole shall conform to the manufacturer's recommendations for the diameter of the dowel being anchored such that the grouted dowels will be able to develop, in tension, 100 percent of its specified yield strength.

Hole drilling methods shall not cause spalling, cracking, or other damage to the existing concrete. The weight of the drill shall not exceed 6 kg. Those areas damaged by the Contractor shall be repaired by him in a manner suitable to the Engineer and at no expense to the State.

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

The Contractor, as directed by the Engineer, shall take adequate precautions to prevent any materials from dropping to the area below, which may result in damage to any existing construction or to adjoining property. Should any damage occur to the structure as a result of the Contractor's operations, the Contractor shall make repairs at his own expense. The repair work shall be approved in advance and shall be of a quality acceptable to the Engineer.

Method of Measurement: This work will be measured for payment by the number of drilled holes in which dowels are embedded and accepted.

Basis of Payment: This work will be paid for at the contract unit price each for "Drilling Holes and Grouting Dowels," which price shall include drilling and preparing holes, furnishing and installing the chemical anchoring material in the holes and all material, equipment, tools and labor incidental thereto.

The cost for furnishing dowels shall be paid for under the item "Deformed Steel Bars".

<u>Pay Item</u>	<u>Pay Unit</u>
DRILLING HOLES AND GROUTING DOWELS	ea.

ITEM #0603236A – SUSPENDER CABLE SEPARATOR

Description: Work under this item shall consist of fabricating, furnishing, and installing suspender cable separators where shown and at the locations indicated on the plans and in accordance with this specification.

Materials: Materials shall conform to the following requirements:

Material for the separator shall be structural steel conforming to the provisions of ASTM A709 Grade 36 and shall be manufactured in accordance with the plans.

Wire Rope Clips shall meet or exceed all applicable requirements of ASME B30.26 including identification via name or trademark of manufacturer and size.

Steel plates and wire rope clips shall be galvanized by the hot-dip process in accordance with the requirements of ASTM A 123.

Construction Methods:

Shop Drawings: Before fabricating any material, the Contractor shall submit shop drawings to the Engineer for approval in accordance with Article 1.05.02-3. These drawings shall include; but not be limited to the following information:

- a. A plan and elevation with details showing all lengths, fittings and material designation needed to fabricate the separator.
- b. Field measurements showing the locations along the vertical cables of the separator plates for approval.
- c. Commercial items shall be identified by manufacturer, trade name and catalogue number and shall indicate sufficient details.

Suspender cable separators shall be installed where indicated on the Contract Plans, to the dimensions, details and requirements shown on the plan, or as ordered by the Engineer.

The furnishing of such plans and methods of attachments shall not serve to relieve the Contractor of its responsibility for the safety of the work and the successful completion of the project.

Method of Measurement: This work will be measured for payment by the number of suspender cable separators fabricated, installed, complete in place and accepted.

Basis of Payment: This work will be paid for at the contract unit price per each (Ea.) for “Suspender Cable Separator”, complete in place, which price shall include all work

associated with the fabrication, furnishing and installation of suspender cable separators and all materials, equipment, tools and labor incidental thereto.

Pay Item	Pay Unit
Suspender Cable Separator	Ea.

ITEM #0603237A – PACK RUST REMOVAL

Description:

This work shall consist of removing layers of rust and cleaning the surfaces of built up steel members that have been deformed by pack rust (rust build-up) at locations as directed by the Engineer.

Materials:

Materials for this work shall meet the following requirements:

1. Epoxy penetrating sealer shall be one of the following or an approved equal:
 - Rustbond Penetrating Sealer, as manufactured by the Carbolite Company, St. Louis MO
 - Amerlock Sealer as manufactured by PPG, Montvale NJ
 - MACROPOXY 646 Fast Cure Epoxy as manufactured by The Sherwin Williams Company, Cleveland OH
2. Polyurethane Sealant meeting the requirements of Federal Specification TT-S-00230C, Type II, Class A, Non Sag, One Component
3. Preformed, closed-cell foam material meeting the requirements of M.03.08-6.

Construction Methods:

1. The Engineer will determine and identify the locations and limits for pack rust repair. All areas shown on the plans and other locations where built-up steel plate sections are deformed over 3/8 inch, in the opinion of the Engineer, shall require repair.
2. Rivets that interfere with the work or are deteriorated, deformed, or failed shall be removed as directed by the Engineer. Removal of rivets along a gage line shall be staggered such that 2 adjacent rivets are not removed at the same time.
3. After the existing paint has been removed and prior to field painting, in accordance with the requirements of 0603729A Localized Paint Removal and Field Painting of Existing Steel, pack rust in the deformed area shall be removed by power tool cleaning to the depth of separation between the plies, to a minimum depth of 1 inch, unless authorized by the Engineer, but in no case shall the depth be less than 1/2 inch. The Contractor shall comply with all applicable OSHA worker protection requirements.
4. Pressure washing between steel plies where pack rust is present is prohibited.
5. With the pack rust removed, the repair area shall be dried by applying supplemental heat until the surface temperature reaches 250°F. The method of applying supplemental heat shall be approved by the Engineer prior to use. If torches are used, the Contractor shall demonstrate to the Engineer that the area can be dried without damaging the steel or coating that is to remain.

6. Immediately after the surface has been dried, saturate the repair area by applying an approved epoxy penetrating sealer, compatible with the approved coating system. The sealer shall be applied in accordance with the manufacturer's instructions.

7. After the sealer has cured, the empty rivet holes shall be filled with high strength bolts per 6.03.03-4(f) of the Specifications. The torqueing and sequencing of bolt installations shall be performed in such a manner that separated and deformed plies of plate may be sequentially drawn together.

8. After the bolting has been completed the exposed surfaces and edges of the repair area shall be encapsulated (caulked) with closed-cell foam material and polyurethane sealant. The areas to be sealed shall be free of dirt, dust, rust, or loose paint, and any other material that would interfere with the adhesion of the sealant (caulk). Sealed areas of pack rust repair shall be filled flush with the vertical edges of steel flanges and shall be without voids or air pockets. The sealant (caulk) shall be applied in accordance with the manufacturer's instructions.

Method of Measurement:

This work will be measured for payment by the number of square feet of pack rust removed and sealed, measured on the horizontal surface of the attached built-up steel members to the nearest whole square foot.

Basis of Payment:

This work will be paid for at the Contract unit price per square foot for "Pack Rust Removal," completed and accepted, which shall include all materials, equipment, tools and labor incidental thereto necessary to complete the work.

The cost of rivet removal and replacement with high strength bolts, removal of lead-based paint, and spot painting of cleaned steel surfaces will be paid for separately.

Pay Item

Pay Unit

Pack Rust Removal

s.f.

ITEM #0603659A – REPLACE REMOVED OR MISSING RIVETS AND BOLTS WITH HIGH STRENGTH BOLTS

Description:

Work under this item shall consist of removing and replacing existing fasteners with galvanized high strength bolts of the diameter shown on the plans. This item will only apply to fasteners (rivets or bolts) that are missing or do not meet the minimum acceptable condition as defined in the plans and as identified by the Engineer. All other fasteners, for which replacement is required as part of other construction operations, shall be included in their respective items and are not paid for as part of this item.

Materials:

High strength bolts shall conform to the requirements of M6.02-3 of the Standard Specifications and shall be galvanized in accordance with M6.02-3(d) of the Standard Specifications. Certified test reports for the fasteners and galvanizing shall be submitted with the required fastener samples.

Construction Methods:

Installation of the high strength bolts shall conform to the requirements of Subarticle 6.03.03-4(f).

Method of Measurement:

The measurement for this item will be each fastener actually furnished and installed in accordance with the contract documents.

Basis of Payment:

This work will be paid for at the contract unit price each for “Replace Removed or Missing Rivets and Bolts with High Strength Bolts”, which shall include all material, equipment, tools, and labor incidental to the completion of the work. No separate payment will be made for the removal of slugs in existing holes.

Pay Item

Pay Unit

Replace Removed or Missing Rivets and Bolts with High Strength Bolts

ea.

ITEM #0603726A – EMBEDDED GALVANIC ANODES

Description:

This item includes furnishing all labor, tools, materials, equipment and services necessary to install embedded galvanic anodes within concrete repair patches or in other locations as shown on the plans.

Materials:

The galvanic anodes shall be supplied by one of the following:

1. Vector Corrosion Technologies, Inc. Galvashield XP4
8413 Laurel Fair Circle, Suite 200A Tampa, FL 33610
Tel: (813) 830-7566
Website: www.vector-corrosion.com
2. Sika Corporation
Sika FerroGard - 675 201 Polito Avenue
Lyndurst, NJ 07071
Tel: (800)-933-7452
Website: www.sikaconstruction.com
3. BASF Corporation
Master Builders Solutions – MASTERPROTECT 8160CP 889 Valley Park Drive
Shakopee, MN 55379
Tel: (800)-243-6739
Website: www.basf.com
4. Euclid Chemical Company Sentinel Gold
19215 Redwood Road
Cleveland, OH 44110
Tel: (800)-321-7628
Website: www.euclidchemical.com

Repair concrete shall have a resistivity of 15,000 ohm-cm or less.

A Materials Certificate shall be submitted to the Engineer in accordance with 1.06.07 that certifies the anode as one of the listed products above and that the cast zinc core of the anode meets the requirements of ASTM B418 Type II (Z13000).

Construction Methods:

Submittals:

The following information shall be submitted to the Engineer:

- The selected product
- The Manufacturer's written instructions, including Manufacturer limitations on time during which anodes may be submersed in water as the substrate of the repair area is saturated.
- Certification for the Qualified Technical Representative (QTR) - The Qualified Technical Representative supplied by the anode manufacturer shall hold and maintain throughout the project a current certification as a NACE CP2 Cathodic Protection Technician with demonstrated experience in galvanic anode installation and quality control for concrete.

Installation:

The Qualified Technical Representative (QTR) shall be notified a minimum of two weeks in advance of the scheduled installation of the anodes to provide on-site training for the Contractor's and Department's employees. The QTR shall discuss details, inspection procedures to detect different reinforcing bar configurations, installation procedures, quality control procedures and documentation. The QTR shall be present to provide direction until the Contractor becomes proficient in the work and to the satisfaction of the Engineer. The QTR shall also be available for consultation at such additional times during the work as requested by the Engineer. The work for this item shall be performed in accordance with the Project details, the Manufacturer's product specifications, the Manufacturer's written instructions, and recommendations of the QTR and as directed by the Engineer.

Tools, equipment, and techniques used to prepare the patch locations for installation of the anodes shall be approved by the Engineer prior to the start of construction. Reinforcing steel shall be clean and securely fastened together with tie wire to provide the electrical conductivity specified within.

The Contractor shall install anodes and repair material following preparation and cleaning of the steel reinforcement to ensure proper connectivity of the anodes and to ensure that excessive corrosion of the reinforcing bars does not occur. Anodes will not actively protect the reinforcing steel until they are embedded in concrete. If significant surface rust forms before the repair material is placed, the anode-to-steel and bar-to-bar continuity shall be re-verified and corrected as necessary.

Galvanic anodes shall be installed along the perimeter of the repair as shown on the plans and as directed by the Engineer. Should the Engineer determine that the reinforcing steel size and spacing differs from the expected reinforcing layout, the Engineer will direct the Contractor to request an updated anode spacing from the QTR. The actual reinforcing bar density may be obtained by entering the bar size and spacing in the Table of Reinforcing Steel Density Ratios in the Appendix to this special provision. Maximum Anode Spacing shall not exceed that from the Maximum Anode Spacing table in the appendix. Proposed changes shall be submitted for approval and shall only be permitted in writing by the Engineer. All approved deviations from the plans should be accurately documented on As-Builts. Any changes shall maintain sufficient clearance between and around anodes to allow repair material to encase the anode and be

properly consolidated in the forms.

The Contractor shall secure the galvanic anodes to the reinforcing bars along the patch edge as shown on the plans, using the anode tie wires. The tie wires shall be wrapped around the cleaned reinforcing steel and twisted tight to allow little or no free movement and to allow repair material to encase the anode. The Contractor shall place the anodes along a single bar or at the intersection between two bars and shall secure the anodes to each clean bar. In addition, the Contractor shall place the anodes in a fashion to provide two (2) inches of space between the original concrete surface and the anodes. [Note: this is done to prevent the finished patch from sounding hollow, when hammer-tapped.] If less concrete cover is discovered due to shallow reinforcing, the anode shall be placed beneath the bar. This may require some additional, localized removal of concrete at the anode location.

The Contractor shall supply a multi-meter and shall test the connections between anodes and reinforcing steel for electrical continuity, as instructed by the QTR. The Contractor shall place additional tie wires or re-tie connections as directed to provide the specified continuity. The Contractor’s testing shall:

- Confirm electrical connection between anode tie wire and reinforcing steel by measuring DC resistance in ohms (Ω) or potential (mV). Electrical connection is acceptable if the DC resistance measured is less than 1 Ω or the DC potential is less than 1 mV.
- Confirm electrical continuity of the exposed reinforcing steel within the repair area. Electrical continuity between test areas is acceptable if the DC resistance is less than 1 Ω or the potential is less than 1 mV.

When preparing to place the concrete repair material by saturating the substrate, the anodes shall not be immersed in water for any period of time greater than recommended by the Manufacturer.

Method of Measurement:

The work under this item will be measured for payment as each single anode. Anodes must be properly installed, tested and accepted in accordance with these specifications, the contract plans and supplemental requirements of the QTR.

Basis of Payment:

This work will be paid for at the Contract unit price each for “Embedded Galvanic Anodes,” complete and accepted in place, which price shall include all applicable materials, equipment, tools, and labor incidental thereto. The services of a QTR, and testing of installed anodes are included in the Contract unit price.

The concrete repairs will be paid under a separate item(s).

Pay Item	Pay Unit
Embedded Galvanic Anodes	ea.

APPENDIX TO
ITEM #0603726A – EMBEDDED GALVANIC
ANODES

MAXIMUM ANODE SPACING Based on 160g Zinc Mass	
Steel Density Ratio	Maximum Anode Spacing (Inches)
< 0.31	24
0.31 - 0.60	20
0.61 - 0.90	16
0.91 - 1.20	14
1.21 - 1.50	10
1.51 - 1.80	8
1.81 - 2.10	6

Enter the left column in the table above with the Steel Density Ratio from TABLE OF REINFORCING STEEL DENSITY RATIOS below. Select the maximum anode spacing in the right column in the table above.

TABLE OF REINFORCING STEEL DENSITY RATIOS

Bar Size		5				6				7				8				9			
#	Spacing (inches)																				
		6	9	12	18	6	9	12	18	6	9	12	18	6	9	12	18	6	9	12	18
5	6	0.65	0.55	0.49	0.44	0.72	0.59	0.52	0.46	0.79	0.63	0.56	0.48	0.85	0.68	0.59	0.50	0.92	0.72	0.62	0.52
	9	0.55	0.44	0.38	0.33	0.61	0.48	0.41	0.35	0.68	0.52	0.45	0.37	0.74	0.57	0.48	0.39	0.81	0.61	0.51	0.41
	12	0.49	0.38	0.33	0.27	0.56	0.43	0.36	0.29	0.62	0.47	0.39	0.32	0.69	0.51	0.43	0.34	0.75	0.56	0.46	0.36
	18	0.44	0.33	0.27	0.22	0.50	0.37	0.31	0.24	0.57	0.41	0.34	0.26	0.63	0.46	0.37	0.28	0.70	0.50	0.40	0.31
6	6	0.72	0.61	0.56	0.50	0.79	0.65	0.59	0.52	0.85	0.70	0.62	0.55	0.92	0.74	0.65	0.57	0.98	0.79	0.69	0.59
	9	0.59	0.48	0.43	0.37	0.65	0.52	0.46	0.39	0.72	0.57	0.49	0.41	0.79	0.61	0.52	0.44	0.85	0.65	0.56	0.46
	12	0.52	0.41	0.36	0.31	0.59	0.46	0.39	0.33	0.65	0.50	0.43	0.35	0.72	0.55	0.46	0.37	0.79	0.59	0.49	0.39
	18	0.46	0.35	0.29	0.24	0.52	0.39	0.33	0.26	0.59	0.44	0.36	0.28	0.65	0.48	0.39	0.31	0.72	0.52	0.43	0.33
7	6	0.79	0.68	0.62	0.57	0.85	0.72	0.65	0.59	0.92	0.76	0.69	0.61	0.98	0.81	0.72	0.63	1.05	0.85	0.75	0.65
	9	0.63	0.52	0.47	0.41	0.70	0.57	0.50	0.44	0.76	0.61	0.53	0.46	0.83	0.65	0.57	0.48	0.89	0.70	0.60	0.50
	12	0.56	0.45	0.39	0.34	0.62	0.49	0.43	0.36	0.69	0.53	0.46	0.38	0.75	0.58	0.49	0.40	0.82	0.62	0.52	0.43
	18	0.48	0.37	0.32	0.26	0.55	0.41	0.35	0.28	0.61	0.46	0.38	0.31	0.68	0.50	0.41	0.33	0.74	0.55	0.45	0.35
8	6	0.85	0.74	0.69	0.63	0.92	0.79	0.72	0.65	0.98	0.83	0.75	0.68	1.05	0.87	0.79	0.70	1.11	0.92	0.82	0.72
	9	0.68	0.57	0.51	0.46	0.74	0.61	0.55	0.48	0.81	0.65	0.58	0.50	0.87	0.70	0.61	0.52	0.94	0.74	0.64	0.55
	12	0.59	0.48	0.43	0.37	0.65	0.52	0.46	0.39	0.72	0.57	0.49	0.41	0.79	0.61	0.52	0.44	0.85	0.65	0.56	0.46
	18	0.50	0.39	0.34	0.28	0.57	0.44	0.37	0.31	0.63	0.48	0.40	0.33	0.70	0.52	0.44	0.35	0.76	0.57	0.47	0.37
9	6	0.92	0.81	0.75	0.70	0.98	0.85	0.79	0.72	1.05	0.89	0.82	0.74	1.11	0.94	0.85	0.76	1.18	0.98	0.88	0.79
	9	0.72	0.61	0.56	0.50	0.79	0.65	0.59	0.52	0.85	0.70	0.62	0.55	0.92	0.74	0.65	0.57	0.98	0.79	0.69	0.59
	12	0.62	0.51	0.46	0.40	0.69	0.56	0.49	0.43	0.75	0.60	0.52	0.45	0.82	0.64	0.56	0.47	0.88	0.69	0.59	0.49
	18	0.52	0.41	0.36	0.31	0.59	0.46	0.39	0.33	0.65	0.50	0.43	0.35	0.72	0.55	0.46	0.37	0.79	0.59	0.49	0.39

How to use the Table of Reinforcing Steel Density Ratios:

1. Enter the table with the first bar size and spacing in the top two rows. Identify that column.
2. Enter the bar size and spacing in the transverse direction in the first two columns. Identify that row.
3. Follow the identified column and row to their intersection and read the reinforcing steel density in that cell.
4. Enter the Maximum Anode Spacing Table with the Reinforcing Steel Density to select the maximum anode spacing.

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 require the removal of the existing coatings to accomplish other Contract work (such as, but not limited to, arc gouging or welding). The paint removal is required because of the possible presence of hazardous paint containing lead or other hazardous metals. The paint removal is required to comply with OSHA and DEEP 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.

Submittals: A minimum of 20 calendar days before starting any paint removal, surface preparation and coating application work, the painting Contractor shall submit the following to the Engineer for acceptance:

1. A copy of the firm's written Quality Control Program used to control the quality of surface preparation and coating application including, but not limited to, ambient conditions, surface cleanliness and profile, coating mixing, dry film thickness and final film continuity.
2. 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.
3. A detailed description of the Contractor's enforcement procedures and the authority of personnel.
4. Containment plans (paint removal/collection of debris, surface preparation, coating applications, coating applications with heat, etc.).
5. 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.
6. Proof of SSPC-QP1 qualifications, CAS-certification(s) and QP2 qualifications, as applicable.
7. Proof that the finish coat complies with the color and gloss retention performance criteria of SSPC Paint 36, Level 3, for accelerated weathering.
8. Coating product information, including coating manufacturer, product name, application instructions, technical data, MSDS and color chips.

The Contractor shall not begin any 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 **2-coat systems**:

Carbomastic 15 Carbothane 133 LV, manufactured by:	Carboline 2150 Schuetz Road St. Louis, MO 63146 (800) 848-4645
-------------------------------------------------------	-------------------------------------------------------------------------

Epoxy Mastic Aluminum II HS Poly 250, manufactured by:	Sherwin Williams 425 Benton Street Stratford, CT 06615 (203) 377-1711 (800) 474-3794
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Carbomastic 90 Carbothane 133 LV, manufactured by:	Carboline 2150 Schuetz Road St. Louis, MO 63146 (800) 848-4645
-------------------------------------------------------	-------------------------------------------------------------------------

All materials for the complete coating system shall be furnished by the same coating material manufacturer with no subcontracted manufacturing allowed. Intermixing of materials within and between coating systems will not be permitted. Thinning of paint shall conform to the manufacturer's written recommendations. The coating thickness shall be in accordance with the Manufacturer's printed instructions. All components of the coating system and the mixed paint shall comply with the Volatile Organic Compounds (VOC) Content Limits and Emission Standards stated in the Connecticut Department of Energy and Environmental Protection's Administration Regulation for the Abatement of Air Pollution, Sections 22a-174-41 through 41a and 22a-174-20(s), respectively.

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 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:

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.

Contractors and subcontractors are required to have at least one (1) **Coating Application Specialist (CAS) (SSPC ACS/NACE No. 13)**-certified (Level II-Interim Status-Minimal) craft-worker. CAS-certified (Level II-Interim Status-Minimal) craft-worker(s) are required for all crews/craft-workers up to four (4) crew members. For each crew larger than four (4), an additional CAS-certified (Level II-Interim Status-Minimal) craft-worker shall be present on each surface preparation/painting crew during surface preparation cleaning/removal and spray application (Atmospheric and Immersion Service) operations. A crew-member is a person who is on the job performing hand/power tool cleaning and/or spray application of protective coatings on a steel structure. The certification(s) must be kept current for the duration of the Project work. If a Contractor's, subcontractor's or any craft-worker's certification expires, the firm will not be allowed to do any work on this item until the certification is reissued.

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 the following:

- 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 or the underside of the bridge deck shall be sealed to prevent the escape of dust and debris.

The above specified containment must be used 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.

Blast cleaning will be required for any bottom flange repairs as shown on the plans. Blast cleaning shall be in accordance with SSPC-SP 6 or greater.

Note: Chemical stripping and abrasive blast cleaning will not be permitted.

Existing Steel Surfaces to be Painted: After the designated areas have been inspected and accepted according to the surface preparation specification, SSPC SP 15, the steel surfaces which are to receive the field touch-up paint shall be cleaned immediately prior to coating operations by wiping

or scrubbing the surface with rags or brushes wetted with solvent. Use clean solvent and clean rags for the final wiping.

- Solvent must be compatible with the specified coatings. Solvent cleaned surfaces shall be primed before any detrimental recontamination or corrosion occurs. Follow manufacturer's safety recommendations when using any solvent.
- All foreign materials such as dirt, dust, loose rust scale, sand, bird droppings, and all materials loosened or deposited on the steel surface by cleaning operations shall also be completely removed by vacuuming before any painting operations commence.
- Failure by the Contractor to properly prepare and clean surfaces to be painted in accordance with the specifications shall be cause for rejection by the Engineer. All surfaces that are rejected shall be cleaned and painted to the satisfaction of the Engineer in accordance with the specifications, at no additional cost to the State.

Application of Field Paint: The method for coating application shall be by brush and roller 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 manufacturers name, product designation, batch number and mixing/thinning instructions. Leaking containers shall not be used. Paint shall be furnished in the manufacturer's original sealed and undamaged containers. For multiple component paints, only complete kits shall be mixed and used. Partial mixing is not allowed. The paint shall be applied to produce a uniform smooth coat without runs, streaks sags, wrinkles, or other defects.

The Contractor shall provide a suitable facility for the storage of paint, which is in accordance with the latest Federal and State regulations. This facility must provide protection from the elements and insure that the paint is not subjected to temperatures outside the manufacturer's recommended extremes. Storage for paint must be located in reasonable proximity to the painting locations. The Engineer shall be provided access to the stored paint at any time, for inspection and to witness removal of the materials. The Contractor's facility for the storage of paint is subject to the approval of the Engineer.

Ambient Conditions: Solvent cleaning just prior to coating application or coating application work shall be performed when the conditions are as follows:

- The relative humidity is at or below 80% and when there is no falling rain or dew present, or anticipated, before a prepared surface can be coated.
- The substrate is not damp or covered by frost or ice.
- The surface temperature and air temperature are between 50°F and 100°F.
- The surface temperatures of the steel and air are more than 5°F above the dew point temperature, as determined by a surface temperature thermometer and electric or sling

psychrometer.

If the requirements of the coating manufacturer differ from the ranges provided above, comply with the most restrictive requirements unless directed otherwise by the Engineer in writing.

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 Contract 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, 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

Pay Unit

Localized Paint Removal and Field Painting of Existing Steel

s.f.

ITEM #0603801A – STRUCTURAL STEEL

Work under this item shall conform to the requirements of section 6.03 - Structural Steel of the Standard Specifications as amended and supplemented herein.

Description:

Work under this item shall consist of furnishing, fabricating, transporting, storing, handling and installing structural steel plates, shapes and other steel elements for the purpose of repairing deteriorated beam webs, flanges, and stiffeners of the type and size designated, as shown on the plans, and as directed by the Engineer and in accordance with these specifications.

Under this item, new structural steel plates and shapes shall be furnished and installed to repair existing structural steel members as indicated in the Contract documents and described herein:

The work shall include the following primary elements:

- Repair plates, fill plates, and stiffener angles at girder and floor beam web repairs. Painted.
- Repair plates and fill plates at girder and floor beam flange repair areas. Painted.
- Repair plates and fill plates at steel column repairs. Painted.
- Sidewalk strut angles and plates. Galvanized.
- Sidewalk bracket angles and plates. Galvanized.
- Sidewalk fascia channel. Galvanized.
- Approach span pedestrian rail posts and angles necessary to reconnect sidewalk brackets and fascia channel. Painted.
- Arch span pedestrian rail post extensions and plates necessary to extend the existing pedestrian rail post height. Painted.
- Jacking stiffeners. Painted.
- Miscellaneous steel shapes and hardware for supporting the relocated Incident Management System. Galvanized.

Work under this item will require coordination with other scheduled work on this Project.

Materials:

Materials shall conform to the requirements of Section M.06.

Materials for this work shall be stored off the ground before, during, and after fabrication. The plates shall be kept free from dirt, grease and other contaminants and shall be reasonably protected from corrosion.

Epoxy-Based Filler shall conform to ASTM C881, Grade 3. The epoxy based filler material shall be Flexolith Gel as manufactured by Tamms, Kop-Coat A-788 as manufactured by Carboline, Steel- Seam FT910 as manufactured by Sherwin - Williams, or Engineer approved equivalent product.

Construction Methods:

The work required shall be performed in accordance with the applicable requirements of Article 6.03.03 and as specified herein.

General Requirements

- a) Prior to the submittal of shop drawings, the Contractor, in conjunction with the Engineer, shall measure areas of deterioration to confirm the dimensions of repair plates and shall measure areas for all proposed repairs to confirm fit of the bolted repairs. Field measurements of deterioration limits and existing member dimensions shall be submitted with the shop drawings of the proposed repairs to the Engineer for approval. No repair work shall be performed prior to the approval of shop drawings.
- b) Extreme care shall be taken during removal to avoid damaging the existing structure to remain. Any portion of the existing structure damaged by the Contractor shall be repaired as directed by the Engineer at no additional cost to the State.
- c) Clean the faying surfaces of the new steel repair member and repair area under item “Localized Paint Removal and Field Painting of Existing Steel”. The new steel repair member and the area of repair shall not be painted prior to bolting the repair member to the repair area.
- d) Drill the holes in the existing steel to match new steel repair member
- e) Bolts to be used and hole size as designated on the plans
- f) A tight fit of no more than a 1/16-inch gap is allowed between new and existing steel, if not obtained, then the Epoxy Based Filler must be used.
- g) Bolt members in accordance with Article 6.03.03.4(f).
- h) Apply the two-coat paint system to the new steel repair member and portion of exposed repair area under item “Localized Paint Removal and Field Painting of Existing Steel”.

Any paint damaged as a result of steel repairs shall be cleaned and coated with field touch up paint in accordance with the item “Localized Paint Removal and Field Painting of Structural Steel”.

Method of Measurement:

This work will be measured for payment by the net weight basis per hundredweight (cwt) in accordance with Article 06.03.04.

Basis of Payment:

This work will be paid for at the contract unit price per hundredweight for “Structural Steel”. The unit price per hundredweight of steel shall include the cost of all materials, equipment, labor, and incidental expenses required to satisfactory complete the work in accordance with the Contract Documents. Payment shall be for structural steel, complete in place, which price shall include fabricating, furnishing, modifying, transporting, storing, erecting and installing the plates, angles, associated bolts, nuts, and washers, epoxy filler, fairing compound, epoxy mastic, caulking material, and all other materials, equipment, tools, labor and work incidental thereto.

This work shall also include structural steel shapes and miscellaneous hardware for relocated IMS support.

This work shall also include field drilling existing steel, temporary support and all necessary efforts to complete the work.

The cost of any required access, OSHA compliant work platforms, scaffolding, debris shield, needed for performance of structural steel repair shall be included in the item “Construction Access”.

The work to clean the existing and new structural steel, the painting of the structural steel and repair area shall only be measured for payment once under the item “Localized Paint Removal and Field Painting of Existing Steel”.

The work to install a new bolt into an existing bolt hole shall include the cleaning / reaming, etc. and all work incidental thereto. This work shall be paid under the item “Structural Steel”.

The work to tighten a loosed bolt shall not be measured for payment but included in the overall cost of “Structural Steel”. If the tightening of an existing bolt is unsuccessful, the bolt shall be removed and replaced with a new bolt and paid under the item “Structural Steel”. There will be no additional payment for the removal of the loose bolt.

When the replacement or tightening of bolts requires the area to be painted as directed by the Engineer, payment shall be in accordance with the item “Localized Paint Removal and Field Painting of Existing Steel” and shall be limited to a quantity of 0.20 SF per bolt.

ITEM #0653002A – CLEAN DRAINAGE SYSTEM

Description

The work under this item shall include the furnishing of all labor, supervision, equipment, appliances and materials, and performing all operations, in connection with the cleaning and removal of obstructions within the existing Arrigoni Bridge drainage system in order to assure unobstructed drainage of the bridge deck. Also included is the proper disposal of debris after the cleaning has been completed.

Under this item the Contractor is required to complete the bridge drainage cleaning as described herein within the first 6 months after Notice to Proceed. At the completion of contract work the Contractor shall provide assurance to the Engineer that the bridge drainage system is clean to the satisfaction of the Engineer.

Materials

No materials are required under this item.

Construction Methods

The Contractor shall perform a site inventory, under the direction of and to the satisfaction of the Engineer, to determine the extent of the cleaning out work required. The Contractor shall prepare and submit proposed cleaning procedures to the Engineer for review and approval prior to proceeding with the work. The submittal shall indicate the Contractor's proposed methods of cleaning, equipment to be used, equipment location and position.

The Contractor shall provide all equipment, tools, labor and materials necessary to satisfactorily clean and remove all visible obstructions, dirt, sand, sludge, roots, gravel, stones, oils, grease, etc. from the existing drainage system. Cleaning of the drainage system shall be initially accomplished by mechanical means with hydraulic methods being allowed only for the final cleaning to remove residual debris.

The Contractor shall furnish and use, subject to the approval of the Engineer, all labor, compressed air, power rodders, forced water and power equipment and all else as may be necessary or directed to perform the work. The approval of such methods shall be based on avoiding damage to the existing drainage system, affecting satisfactory clean out and providing environmental safeguards to prevent unnecessary sedimentation and air and water pollution.

Adequate precautions shall be taken to prevent debris from falling into the river below.

It is the Contractor's responsibility to supply any water necessary to perform the work. The Contractor shall be required to obtain formal authorization from the local water company when the supply of water is from fire hydrants. Water supplied from fire hydrants shall be at the expense of the Contractor. The Contractor shall be required to repair any damages resulting

from the use of the water supply system.

During all drainage cleaning operations, satisfactory precautions shall be taken to protect the drain lines from damage that might be inflicted by the improper use of the cleaning equipment. Whenever hydraulically propelled cleaning tools, which depend upon water pressure to provide their cleaning force or any tools which retard the flow of water in the drain line are used, precautions shall be taken to ensure that the water pressure created does not cause any damage or flooding to public or private property. Any damage occurring due to the Contractor's operations, as determined by the Engineer, shall be repaired to the satisfaction of the Engineer at the Contractor's expense. When water from fire hydrants is necessary, the water shall be conserved and not used unnecessarily. No fire hydrant shall be obstructed in case of a fire in the area served by the hydrant.

Waste water from the cleaning operation shall be contained and treated to remove oils and sediments prior to release. No untreated water will be allowed to be released into regulated areas. All materials removed from the bridge drainage system shall be properly disposed of off site.

After completion of the cleaning to the bridge drainage system, the Contractor shall maintain the bridge drainage system free of obstructions, to the satisfaction of the Engineer, throughout the entire construction period. The Contractor shall perform a final site inventory and cleaning out at the end of the construction, as directed by the Engineer.

The Contractor is made aware that the removal of the scupper's grating may be necessary to gain access to the scupper pan and down spout to fully clean it out. At no time shall traffic be allowed to run adjacent to the unprotected open scupper. Immediately after cleaning, the grate is to be reinstalled. Any hardware not reusable shall be replaced with the same type and size components as exists and of materials approved by the Engineer.

Due precaution shall be taken to avoid injury to the scupper, adjacent bridge and roadway components, public utility installations or abutting property.

If any excessive deterioration of the scuppers or pipes is identified, the Contractor shall cease work at this location and notify the Engineer of the condition.

Method of Measurement

This work will be measured for payment as follows: At completion of the initial bridge drainage cleaning, 90 percent of the lump sum bid price for this item shall be certified for payment. Upon completion of all work on the project, 100 percent of the lump sum price of this item minus any previous payments will be certified for payment.

Basis of Payment

This work will be paid for at the Contract lump sum price for “Clean Drainage System” which price shall include all equipment, tools, and labor incidental to the completion of this work.

Pay Item

Pay Unit

Clean Drainage System

l.s.

ITEM #0707009A – MEMBRANE WATERPROOFING (COLD LIQUID ELASTOMERIC)

Description

Work under this item consists of furnishing and installing a seamless elastomeric waterproofing membrane system applied to a concrete or steel surface as shown on the plans, in accordance with this specification and as directed by the Engineer. Work shall also include conditioning of the surface to be coated and all quality-control testing noted herein.

The completed membrane system shall be comprised of a primer coat followed by the membrane coating which is applied in one or two layers for a minimum total thickness of 80 mil, an additional 40 mil membrane layer with aggregate broadcast into the material while still wet, and a bond coat of bitumen-based adhesive material.

Materials

The Contractor shall select a waterproofing membrane system from the Department's current Qualified Product List (QPL) for Spray-Applied Membrane Waterproofing System. All materials incorporated in the works shall meet the Manufacturer's specification for the chosen system. The Engineer will reject any system that is not on the QPL.

Materials Certificate: The Contractor shall submit to the Engineer a Materials Certificate for the primer and membrane and bond coat material in accordance with the requirements of Article 1.06.07.

Construction Methods

At least ten days prior to installation of the membrane system, the Contractor shall submit to the Engineer, the manufacturer's recommended procedure for preparing the deck surface, pre-treatment or preparing at cracks and gaps, treatment at curbs, vertical surfaces or discontinuities, applying the primer and membrane, and placing of aggregated coat. Procedures shall also include recommended repairs of system non-compliant issues identified during application. The system shall be applied to the prepared area(s) as defined in the plans strictly in accordance with the Manufacturer's recommendations.

A technical representative, in the direct employ of the manufacturer, 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, and provide guidance on the handling, mixing and addition of components and observe application of the primer and membrane. The representative shall perform all required quality-control testing and remain on the Project site until the membrane has fully cured.

All quality-control testing, including verbal direction or observations on the day of the installation, shall be recorded and submitted to the Engineer for inclusion in the Project's records. A submittal of the quality-control testing data shall be received by project personnel

prior to any paving over the finished membrane or within 24 hours following completion of any staged portion of the work.

1. **Applicator Approval:** The Contractor's membrane Applicator shall be fully trained and licensed by the membrane manufacturer and shall have successfully completed at least three spray membrane projects in the past five years. The Contractor shall furnish references from those projects, including names of contact persons and the names, addresses and phone numbers of persons who supervised the 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.

2. **Job Conditions:**

(a) **Environmental Requirements:** Air and substrate temperatures shall be between 32°F and 104°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 membrane 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.

Personnel not involved in membrane application shall be kept out of the work area.

3. **Delivery, Storage and Handling:**

(a) **Packaging and Shipping:** All components of the membrane 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 shall be 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.

4. Surface 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: Sharp peaks and discontinuities shall be ground smooth. The surface profile of the 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 the surface patches require the approval of the Engineer before the membrane system is applied.

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 done by 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.

Voids, honeycombed areas, and blow holes on vertical surfaces shall be repaired in the same manner.

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. Inspection and Testing: Prior to priming of the surface, the Engineer, Applicator and Manufacturer's technical representative shall inspect and approve the prepared substrate.

(a) Random tests for deck moisture content shall be conducted on the substrate by the Applicator at the job site using a "Sovereign Portable Electronic Moisture Master Meter," a "Tramex CMEXpertII Concrete Moisture Meter" or approved equal. The minimum frequency shall be one test per 1000 s.f. but not less than three tests per day per bridge. Additional tests may be required if atmospheric conditions change and retest of the substrate moisture content is warranted.

The membrane system shall not be installed on substrate with a moisture content greater than that recommended by the system's manufacturer, but shall not be greater than 6%, whichever is less.

(b) Random tests for adequate tensile bond strength shall be conducted on the substrate using an adhesion tester in accordance with the requirements of ASTM D4541. The minimum frequency shall be one test per 5,000 s.f. but not 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 150 psi or failure in a concrete surface and greater than or equal to 300 psi for steel surfaces.

If the tensile bond strength is lower than the minimum specified, the Engineer may request additional substrate preparation. Any primer not adequately applied shall be removed and a new primer applied at the Contractor's expense, as directed by Engineer.

(c) Cracks and grouted joints shall be treated in accordance with the Manufacturer's recommendations, as approved or directed by the Engineer.

6. Application:

(a) The System shall be applied in four distinct steps as follows:

- 1) Substrate preparation and gap/joint bridging preparation
- 2) Priming
- 3) Membrane application
- 4) Membrane with aggregate

(b) Immediately prior to the application of any components of the System, the surface shall be dry (see Section 5a of this specification) and any remaining dust or loose particles shall be removed using clean, dry oil-free compressed air or industrial vacuum.

(c) Where the area to be treated is bound by a vertical surface (e.g. curb or wall), the membrane system may be continued up the vertical, as shown on the plans or as directed by the Engineer.

(d) 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.

(e) A neat finish with well defined boundaries and straight edges shall be provided by the Applicator.

(f) Primer: The primer shall consist of one coat with an overall coverage rate of 125 to 175 s.f./gal 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 and allowed by the manufacturer, brush or roller application will 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.

(g) Membrane: The waterproofing membrane shall consist of one or two coats for a total dry film thickness of 80 mils. If applied in two coats, the second coat shall be of a contrasting color to aid in quality assurance and inspection.

The membrane shall be comprised of 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.

Thickness checks: For each layer, checks for wet film thickness using a gauge pin or standard comb-type thickness gauge shall be carried out typically once every 100 s.f. Where rapid set time of the membrane does not allow for wet film thickness checks, ultrasonic testing (steel surfaces only), calibrated point-penetrating (destructive) testing, in-situ sampling (cutout of small sections for measuring thicknesses), or other methods approved by the Engineer shall be employed for determination of dry film thickness. The measured thickness of each and every individual test of the membrane shall be greater than or equal to the required thickness.

Bond Strength: Random tests for adequate tensile bond strength shall be conducted on the membrane in accordance with the requirements of ASTM D4541. The minimum test frequency shall be one test per 5,000 s.f. but no less than three adhesion tests per bridge. Adequate adhesion will be indicated by tensile bond strengths of the membrane to the substrate of greater than or equal to 150 psi or failure in a concrete surface and greater than or equal to 300 psi for steel surfaces.

Spark Testing: Following application of the membrane, test for pin holes in the cured membrane system over the entire application area in accordance with ASTM D4787-“Continuity Verification of Liquid or Sheet Linings Applied to Concrete Substrates.” Conduct the test at voltages recommended by the manufacturer to prevent damage to the membrane.

Repair the membrane system following destructive testing and correct any deficiencies in the membrane system or substrate noted during quality-control testing in accordance with the manufacturer's recommendations to the satisfaction of the Engineer at no additional cost to the State.

(h) 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 four 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 four inches overlap onto existing membrane.

Where the membrane is to be joined to existing cured material, the new application shall overlap the existing by at least four inches. Cleaning and surface preparation on areas to be lapped shall be as recommended in the manufacturer's written instructions.

(i) Aggregated Finish:

- 1) Apply an additional 40 mil thick layer of the membrane material immediately followed by an aggregate coating, before the membrane cures, at a rate to fully cover the exposed area. The membrane and aggregate shall be fully integrated after the aggregate has been applied and the membrane cured.
- 2) Localized areas not fully coated shall be touched-up with additional membrane and aggregate as needed.
- 3) Remove loose and excess aggregate from the surface to the satisfaction of the Engineer and dispose of properly after application prior to allowing traffic onto finished surface or application of tack coat.

(j) Bond Coat:

Prior to application of a bituminous concrete overlay, the aggregated finish shall be coated with a bonding material. The bonding material shall be per the membrane waterproofing manufacturer's recommendations.

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.

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.

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, storing and applying the system, technical representative and quality control tests, and any necessary repairs and remediation work as well as all materials, equipment, tools, labor incidental to this work.

Pay Item

Pay Unit

Membrane Waterproofing (Cold Liquid Elastomeric)

s.y.

ITEM #0813031A – 6” GRANITE CURVED STONE CURBING

08.13.04 - Method of Measurement:

Add the following after the only sentence in the first paragraph

This work will be measured for payment along the top arris line of the curb and will be actual number of linear feet of stone curbing installed and accepted.

ITEM #0813127A – 6” CURVED GRANITE STONE CURBING FOR STRUCTURES

8.17.01—Description: This curbing shall consist of approved granite stone, furnished in accordance with the dimensions and details shown on the plans, or as ordered, and installed to the lines and grades given and in conformity with these specifications.

8.17.02—Materials: The materials for this work shall conform to the requirements of Article M.12.08. Deformed steel anchor bars and support bars shall be galvanized in accordance with ASTM A767, Class 1 after fabrication.

8.17.03—Construction Methods: Granite stone curbing shall be constructed in the location and to the dimensions shown on the plans. The stone curbing shall be accurately set, straight and true to the line and grade as required. The stone curbing shall be set in a full mortar bed and full mortar end joints. As the stone curbing is being set, the anchors shall be grouted into the holes in the curbing a method as approved by the Engineer. The concrete backing shall not be placed until the curbing and anchors have been properly placed. Care must be taken to prevent any movements of the stone curbing already in place while and compacting concrete backing. When required by the Engineer, the stone curbing shall be supported by such bracing and formwork as may be necessary to prevent movement. Where vertical contraction joints or vertical expansion joints, or both, exist in the backing, the vertical joint of the curb shall coincide with the contraction or expansion joint.

All mortar joints shall be finished smooth and flush. These joints shall be carefully filled with cement mortar and shall be neatly pointed on the top and exposed front portions. After pointing, stone curbing shall be cleaned of all excess mortar to the satisfaction of the Engineer.

Where required and indicated on the plans, joint seal shall be placed in accordance with the provisions of Subarticle 4.01.03-F.6(f) insofar as it may apply.

Where indicated on the plans, or directed, drainage openings shall be made through the curbing at the elevations and of the size required.

All fines shall be cleaned from the face of stones after all work on the parapets and sidewalks has been completed.

8.17.04—Method of Measurement: This work will be measured for payment by the actual number of linear feet of granite stone curbing for bridges or curved granite stone curbing for bridges as the case may be, of the various sizes, installed and accepted. Measurement shall be made along the top arris line of the face of stone. Stone curbing set on a radius of 160 feet or less will be measured for payment as curved granite stone curbing for bridges.

8.17.02—Basis of Payment: Payment for this work will be made at the contract unit price per linear foot for “6” Curved Granite Stone Curbing for Structures”, complete in place, which price

shall include all materials including galvanized deformed steel anchor bars, galvanized deformed steel support bars, adhesive anchors, equipment, tools and labor incidental thereto.

There will be no direct payment for the cost of drillings in stone curbing for anchors, adhesive anchors, beveling or rounding the ends of the stone curbing and pointing the joints with mortar, and sealing the longitudinal joint, 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>
6" Curved Granite Stone Curbing for Structures	l.f.

ITEM #0814002A – RESET GRANITE STONE CURBING

Work under this item shall conform to the requirements of Form 817, Section 8.14 – Reset Stone Curbing, supplemented as follows:

Article 08.14.03 – Construction Methods: Add the Following:

Where existing curbing requires removal for the construction of a sidewalk bumpout, the affected section shall be removed, cut to length, and reset. The remaining unused piece shall remain property of the City of Middletown.

Article 08.14.05 – Basis of Payment: Add the Following:

There will be no direct payment for cutting of the granite curbing;, but the cost shall be included in the bid price for the reset granite stone curbing.

Pay Item	Pay Unit
Reset Granite Stone Curbing	l.f.

ITEM #0819002A – PENETRATING SEALER PROTECTIVE COMPOUND

Description: Work under this item shall consist of cleaning concrete surfaces of dirt, dust and debris, and furnishing and applying a clear, penetrating sealer where shown on the plans, to provide a hydrophobic barrier against the intrusion of moisture. This work also includes furnishing, installing and removing platforms, scaffolding, ladders and other means of access as well as shields, as required, to protect adjacent areas from overspray. Penetrating sealer shall not be applied to concrete surfaces that have been previously treated with coatings or curing compounds that would hinder penetration of the sealer into the concrete.

Materials: The penetrating sealer shall be a single component, 100% silane or silane siloxane from the list of materials below. The material shall be selected in anticipation of the expected ambient and surface temperature at the time of installation.

The following products may be used when ambient and surface temperatures are 40°F and above:

SIL-ACT ATS-100 (Silane)
Advanced Chemical Technologies, Inc.
9608 North Robinson Ave.
Oklahoma City, OK 73114
405-843-2585
www.advchemtech.com

Armor SX 5000 EXT-100 or SX 5000 WB (Silane Siloxane)
Foundation Armor, LLC.
472 Amherst St. STE 14
Nashua, NH 03063
866-306-0246
www.foundationarmor.com

Aquinil Plus 100 (Silane)
ChemMasters
300 Edwards Street
Madison, OH 44057
440-428-2105, 800-486-7866
www.chemmasters.net/Aquanil100.php

The following product may be used when ambient and surface temperatures are 20°F and above:

Certi-Vex Penseal 244 100% (Silane)
Vexcon Chemicals
7240 State Road
Philadelphia, PA 19135
888-839-2661
www.Vexcon.com

Construction Methods:

Submittals: The Contractor shall submit to the Engineer Safety Data Sheets (SDS) and product literature for the selected product. The literature shall include written instructions how to apply the product to vertical and horizontal surfaces, and where required, overhead surfaces.

The Contractor shall submit to the Engineer, in accordance with Article 1.05.02, written procedures for cleaning the concrete surfaces. The submittal shall include proposed equipment and materials and shall address how adjacent traffic and other areas shall be protected from dust, debris and overspray during the cleaning and application processes. Where the sealer is to be applied to parapets before pavement is placed, the submittal shall address protecting the deck and curb to which membrane waterproofing will be applied. Should the membrane already be present, the submittal shall address protecting the membrane. It shall also indicate how vegetation shall be protected from overspray. The submittal shall address the conditions under which work may proceed, including wind speed, temperature and precipitation. It shall also include procedures to be followed to protect the work should unfavorable weather conditions occur before the product has been absorbed.

The Contractor shall inspect the surfaces to be sealed to identify surface cleaning needs before submitting the procedures. The Contractor shall identify conditions that need repair or surfaces that may require special attention or cleaning procedures. Such observations shall be addressed in the written procedures.

Surface Preparation: Concrete surfaces to which penetrating sealer will be applied shall be dry, clean and free of grease, oil and other surface contaminants. New concrete and newly placed repair concrete shall be allowed to cure for at least 28 days before applying sealer. After rain or water cleaning, allow existing concrete surfaces to dry for at least 8 hours before applying sealer. Dry surfaces may be cleaned by sweeping with brushes or brooms, and blowing clean with oil-free, compressed air. The Contractor shall take care not to damage the concrete surface finish during cleaning operations. Care shall be taken so that cleaning methods do not damage joint sealant or other components of the structure.

Application: Application of the sealer can only begin after the Engineer evaluates the concrete surfaces for cleanliness and moisture, and determines that conditions are appropriate for application.

The sealer shall saturate the concrete surface with a rate of application of 200 square feet per gallon of sealer. The dispersion shall run six to eight inches down a vertical surface from the spray pattern. The maximum run-down is 12 inches. The Contractor shall monitor and record the number of square feet per gallon of sealer used to verify that the required application rate is being met. Additional sealer may be needed if surfaces are porous, rough or textured.

The Engineer will inspect the concrete surface during application and after the sealer has had adequate time to penetrate. As a test, water sprayed from a bottle on the sealed surface shall bead up and not be absorbed. Should water be absorbed into the concrete at a test area, additional areas shall be tested to determine which areas should receive additional application of sealer. The

Contractor shall apply additional sealer to the identified areas until absorption of water is prevented.

Method of Measurement: This work will be measured for payment by the actual number of square yards of concrete, coated completely and accepted, within the designated limits. The area will be measured once, regardless of the number of applications required.

Basis of Payment: This work will be paid for at the Contract unit price per square yard for “Penetrating Sealer Protective Compound,” complete, which price shall include all equipment tools, labor and materials, incidental thereto, including the preparation of the concrete surfaces and proper disposal of debris.

Pay Item	Pay Unit
Penetrating Sealer Protective Compound	s.y.

ITEM #0822005A – TEMPORARY PRECAST CONCRETE BARRIER CURB (STRUCTURE)

ITEM #0822006A – RELOCATED TEMPORARY PRECAST CONCRETE BARRIER CURB (STRUCTURE)

Description:

Work under this item shall consist of furnishing, installing and removing temporary precast concrete barrier curb as shown on the plans or as directed by the Engineer. This work shall also include the furnishing and installing of anchor bolts, and the later removal of anchor bolts at the specific locations shown on the plans.

Materials:

1. Concrete shall conform to the requirements of Article M.14.01 amended as follows:
 - (a) Concrete shall have a minimum 28 days strength (f 'c) of 4,000psi.
 - (b) Coarse Aggregate shall conform to the requirements of M.03.01-1 and to the grading requirements of Class "F".
 - (c) Cement for light concrete shall be Type III or Type IIIA Portland Cement or light colored cement approved by the Engineer.
 - (d) The entrained air content shall not be less than 5% nor more than 7%.
 - (e) Manufacturer identification and casting date of manufacture shall be permanently marked on the barrier curb by means of a non-corrosive metal or plastic tag as approved by the Engineer and 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 ASTM F3125 Grade A325 with washers conforming to ASTM A709 Grade 36. The anchor bolts, nuts and washers shall be mechanically galvanized in accordance with ASTM B695 Class 50.
5. The grout used in patching the remaining holes in the new concrete deck after the removal of the temporary barrier shall be non-shrink grout conforming to Article M.03.05.
6. Temporary precast concrete barrier curb shall be accepted on the basis of the manufacturer's certification, also called a PC-1, for precast concrete products as specified in M.08.02,

Construction Methods:

1. Fabrication: 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 (and Relocated 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.

Holes shall be drilled into the existing deck and prefabricated in the new deck at the locations and at the spacing required for the proper anchoring using the details as shown on the plans.

Details for temporarily fastening the precast concrete barrier units to the new grid deck shall be submitted with grid deck shop drawings and approved by the Engineer.

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.

Care shall be taken not to drill holes into or through structural steel.

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 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.

4. Alternate Anchorage Designs: For alternate anchorage designs of temporary precast concrete barrier curb (structure), two sets of complete design calculations along with shop drawings shall be submitted to the Engineer for review.

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 or relocated temporary concrete barrier furnished, installed and accepted.

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, drilling holes in the deck, initial installation, removal hole patching 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 (structure) will be paid for at the contract unit price per linear foot for “Relocated Temporary Precast Concrete Barrier Curb (Structure)”, which price shall include all transportation, materials, equipment, tools and labor incidental thereto.

<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 #0822042A – TEMPORARY GLARE SCREEN MODULAR UNITS
ITEM #0822043A – RELOCATED TEMPORARY GLARE SCREEN
MODULAR UNITS

Description:

This item shall consist of furnishing and installing a glare screen consisting of modular units with blades spaced as recommended by the manufacturer on Concrete Barrier Curb at locations as directed by the Engineer. This item shall also include relocating, removing and maintaining temporary glare screen. The glare screen shall be used during stages of construction as directed by the Engineer.

Materials:

The glare screen units shall be modular units consisting of vertical blades and a horizontal base rail. The modular units shall be manufactured and assembled in various lengths, so the cumulative nominal length of the modular units shall equal the length of the individual sections of concrete barrier curb, so that the joint between barrier sections will not be spanned by any one unit.

The glare screen system shall be manufactured from durable impact resistant, non-warping, non-metallic polymeric materials.

Glare screen blades shall be 6 inches to 9 inches in width, green in color and have a length of 30 inches.

Construction Methods:

Every 40 feet a modular blade shall have a 3 inch x 3 inch piece of Type V or Bright Wide-Angle reflective sheeting. (Yellow on the left side of the travelway and white on the right side of the travelway). The center of the marker shall be 48 inches above the base of the Concrete Barrier Curb. The attachment of the modular units to the concrete barrier curb sections shall be as specified by the manufacturer. The modular units shall be installed so that the joint between barrier sections will not be spanned by any one unit.

The temporary modular glare screen shall be maintained by the Contractor during all stages of construction. Any damaged material shall be removed and replaced by the Contractor at its expense.

The Contractor shall relocate the temporary modular glare screen and its appurtenances to the locations within the project limits as shown on the plans or as ordered by the Engineer. When the temporary modular glare screen is no longer required, it will be removed from the project and become the property of the Contractor.

Method of Measurement:

This item will be measured for payment by the actual number of linear feet of temporary modular glare screen in use at any one time of the size and color specified, furnished, installed, and accepted.

Relocated temporary modular glare screen will be measured by the actual number of linear feet relocated each time the screen has been satisfactorily relocated as directed by the Engineer, including to and from the storage area. Storage of temporary modular glare screen will not be measured for payment.

Basis of Payment:

This work will be paid for at the contract unit price per linear foot for “Temporary Glare Screen Modular Units” complete in place, which price shall include all furnishings, transportation, initial installation, final removal, storage, materials, disposal of the units and yellow or white reflective tape marker and all materials, equipment, tools, and labor incidental thereto.

The relocation of the temporary modular glare screen will be paid for at the contract unit price per linear foot for “Relocated Temporary Glare Screen Modular Units” which price shall include all transportation, temporary storage, relocation, materials, equipment, tools, and labor incidental thereto.

Pay Item

Pay Unit

Temporary Glare Screen Modular Units

l.f.

Relocated Temporary Glare Screen Modular Units

l.f.

ITEM #0904520A – PEDESTRIAN RAILING – APPROACH SPANS

Description:

The Contractor shall remove, store, re-assemble, and install a galvanized steel pedestrian railing mounted on the approach spans concrete barrier curbs, all as shown on the Plans, specified herein and as ordered by the Engineer.

Materials:

Anchor bolts and set screws shall be manufactured from stainless steel meeting the requirements of ASTM F593, Group 1 (AISI Type 304). Anchor bolts shall be chemically anchored.

Nuts shall be manufactured from stainless steel meeting the requirements of ASTM F594, Group 1.

Washers shall be manufactured from stainless steel plates meeting the requirements of ASTM A167, Type 302-305.

Adhesive material shall be listed on the Department's approved products list.

Construction Methods:

Area of railing where the galvanizing has been damaged shall be repaired in accordance with the requirements of ASTM A780.

Holes of the size and depth as shown on the Plans shall be drilled for each anchor bolt to match existing pedestrian railing anchor spacing.

Method of Measurement:

This work will be measured for payment by the number or linear feet of pedestrian railing actually removed, stored, re-assembled, installed and accepted by the Engineer.

Nearby work regarding the removal and re-installation of the existing 4' fascia fence and installation of new protective fence is covered under item #0913969A – Protective Fencing and item #0503274A – Remove, Store, and Re-assemble Handrail.

Basis of Payment:

This work will be paid for at the Contract unit price per linear foot for "Pedestrian Railing – Approach Spans", which price shall include all materials, labor, equipment, tools and incidentals necessary to complete the work.

Pay Item

Pay Unit

Pedestrian Railing – Approach Spans

l.f

ITEM #0913969A – PROTECTIVE FENCE

Description:

Work under this item shall consist of the design, fabrication and installation of a wire rope protective fencing system, complete, as shown on the plans and as directed by the Engineer.

All cable, ferrules, turnbuckles, eyelets, bracing and other fittings and components of the protective fencing system with the exception of rail posts and other structural steel components such as permanent bracing elements shall be furnished by one manufacturer.

Materials:

Structural steel shall conform to the requirements of Article 6.03.02 of the Standard Specifications.

Cable mesh shall consist of ASTM A 492 Type 316 stainless steel 7 X 7, minimum, wire rope with 316 stainless steel ferrules.

Cable mesh perimeter finish shall consist of closed loops with loose ferrules for “sewn-on” installation method.

Cable diameter and mesh aperture dimensions shall be as shown on the plans.

Cable mesh direction (grain) shall be as shown on the plans.

Border cable shall be 8mm diameter or larger ASTM A 492 Type 316 stainless steel 7 X 7, minimum wire rope.

Grommet, bushings, washers, swaging ferrules, studs, receivers, fittings and other components as required for installation shall be provided by the manufacturer.

All cable mesh material used in this project shall be diamond shaped X-TEND Type CXE manufactured by Carl Stahl DecorCable Innovations, Inc., 8080 South Madison Street, Burr Ridge, Ill 60527. Tel. (312) 474-1100

Construction Methods:

The flexible cable mesh system and components shall be capable of withstanding the effects of gravity loads and the following live load.

1. Concentrated load of 200 lbs applied horizontally on an area of one square foot anywhere on the vertical plane of the protective fencing.

Components and hardware of the mesh system shall be designed to withstand loads encountered without excessive deflection or distortion when cables are initially tensioned to required amounts.

Plans: Design calculations and detailed fabrication working drawings for the protective fencing shall be sealed by a Professional Engineer, licensed in the State of Connecticut and submitted to the Engineer for review, in accordance with the requirements of Article 1.05.02. The drawings shall include, but not be limited to, the following:

1. Plan view, elevations and detail section elevations
2. All ASTM and other material designations, finishes and all accessory items.
3. Actual field measurements recorded and shown on working drawings.
4. Manufacturers printed installation instructions.

The design calculations shall be complete; verifying conformance of the protective fence to provisions of this specification.

Provide two samples representing actual products and finishes as follows:

1. Wire rope with ferrules, minimum size 24 inches long.
2. Typical fittings.

Storage and Handling: Protective fencing manufacturers components shall be delivered to the site and stored in unopened packaging and under clean and dry storage conditions until ready for installation.

Exercise extreme care not to scratch, mark, dent or bend metal components during delivery, storage and installation.

The Contractor shall repair any damage to the protective fence finishes following installation at no cost to the State as directed by the Engineer.

Method of Measurement:

This work shall be measured for payment by the actual number of linear feet of “Protective Fencing” fabricated, installed and accepted. Required bracing members shall not be measured for payment. When the new Protective Fencing height doubles in the locations shown on the plans, payment shall be made at twice the unit price. The fence shall be measured once at the time of installation. No additional payment will be made for the reinstallation, repair or replacement of the fence. Measurement shall be made along the centerline of the fence.

Basis of Payment:

Payment for this work will be made at the contract unit price per linear foot for "Protective Fencing" complete in place, which price shall include all materials, equipment, tools, and labor incidental to the installation, maintenance, replacement, removal and disposal of fence.

Pay Item

Pay Unit

Protective Fence

l.f

ITEM #0917010A – REPAIR GUIDERAIL

Description: Work under this item shall consist of the repair of newly installed guiderail. It shall be repaired in the locations originally installed and fabricated in conformity with the lines, designations, dimensions, and details shown on the plans or as ordered by the Engineer.

Materials: The material for guiderail shall meet the requirements as specified within the original applicable contract items.

When repairing guiderail, the Contractor shall reuse any undamaged existing guiderail elements, timber rail, wire rope, appropriate posts, delineators, lap bolts, and other hardware within the project limits as approved by the Engineer to repair the guiderail. The Contractor shall use new materials when any components of the existing railing are damaged or missing and cannot be obtained from other guiderail systems being removed or converted within the Project limits.

Construction Methods: The repair of guiderail shall be in accordance with contraction methods as specified within the original applicable contract items.

Guiderail, including end anchors, which has been installed in final condition and accepted by the Engineer, shall be eligible for reimbursement for repairs subject to the conditions described below. If multiple runs are to be installed in a single stage as indicated in the contract documents, determination for reimbursement shall be made when all runs within the stage are complete and accepted as previously described. On projects without designated stages, guiderail installations must be complete and serving the intended function as determined by the Engineer.

When newly installed guiderail is damaged by public traffic, the following conditions must be satisfied prior to reimbursement for payment;

1. The damage must have been caused solely by the traveling public.
2. The contractor shall provide satisfactory evidence that such damage was caused by public traffic. Such as accident reports obtained from the Connecticut Department of Public Safety, police agencies or insurance companies; statements by reliable, unbiased eyewitnesses; or identification of the vehicle involved in the accident.
3. The contractor shall attempt to collect the costs from the person or persons responsible for the damage and provide documentation of those efforts to the satisfaction of the Engineer.
4. If such evidence cannot be obtained, the Engineer may determine that the damage was not caused by the Contractor and reimbursement for payment is warranted.

This repair provision does not relieve the Contractor of the requirements of Section 1.07, any other contractual requirements for maintenance and protection of traffic and final acceptance and relief of responsibility for the project.

The contractor shall remain responsible for the safety and integrity of the guiderail system for the duration of the project. In the event the guiderail is damaged, the Contractor shall provide sufficient cones, drums and other traffic control devices to provide safe passage by the public. When ordered by the Engineer, the Contractor shall furnish replacement parts and immediately repair the guiderail, but in no case more than 24 hours after notification from the Engineer. In non-emergency situations, the guiderail shall be repaired within 72 hours. The repaired guiderail or anchorages, when completed, shall conform to these specifications for a new system. The Contractor shall be responsible for the removal and the proper disposal of all damaged material and debris.

Method of Measurement: Guiderail damaged solely by the traveling public will be measured for payment. Damage caused by the Contractor's equipment or operations will not be measured for payment.

The sum of money shown on the estimate and in the itemized proposal as "Estimated Cost" for repair of guiderail will be considered the price bid even though payment will be made only for actual work performed. The estimated cost figure is not to be altered in any manner by the bidder. Should the bidder alter the amount shown, the altered figures will be disregarded and the original price will be used to determine the total amount bid for the contract.

Basis of Payment: Repair of guiderail will be paid for in accordance with Article 1.09.04 as required to restore the rail to its full working condition in conformance with these specifications for a new system. There will be no payment for maintenance and protection of traffic for work associated with this item unless, in the opinion of the Engineer, the sole purpose of the maintenance and protection of traffic is for repair of the guiderail.

<u>Pay Item</u>	<u>Pay Unit</u>
Repair Guiderail	est. (est.)

ITEM #0921005A – CONCRETE SIDEWALK RAMP

Work under this item shall conform to the requirements of Form 817, Section 9.21 – Concrete Sidewalks and Ramps, supplemented as follows:

Article 9.21.02 – Materials: Add the following:

Digital Level: The Contractor shall supply a minimum of one (1) new and unused handheld digital levels to the Engineer for use for the duration of the project. The digital level supplied shall meet the following requirements: The digital level shall be 24” (2 feet) long. The digital level must be able to provide inclinations in the following units of measurement: degree, percent, in/ft. (fractional), and in/ft. (decimal). The digital level shall have a minimum accuracy value of $\pm 1/10$ of a degree at level and 90 degrees, at all other angles ± 0.2 %. A carrying case shall be provided for each of the levels along with power source (batteries) the digital level requires for the duration of the project. If at any time the digital levels supplied are found to not be in compliance with the above criteria, the Contractor shall dispose of the digital level and provide the Engineer with a new unused digital level meeting the above requirements. Upon completion of the project the digital levels and cases shall become the property of the State of Connecticut and shall be transferred to the Engineer accompanied by a signed letter of transmission acknowledging the formal transfer.

Pay Item	Pay Unit
Concrete Sidewalk Ramp	s.f.

ITEM #0901030A – IMPRINTED CONCRETE SIDEWALK

Work under this item shall conform to the requirements of Form 817, Section 9.21 – Concrete Sidewalks and Ramps, supplemented as follows:

Article 9.21.01 - Description: Add the following:

Work under this item also includes the construction of imprinted concrete sidewalks using concrete pavement color, pattern, textural surface, color hardener, and application of sealant solution at the locations and to the dimensions and details shown on the plans or as ordered and in accordance with these specifications.

Article 9.21.02 – Materials: Add the following:

- **Dry Shake Color Hardener** – Shall meet ASTM C-979 for color stability and ASTM C-944 for abrasion resistance and match the color of Federal Standard 30109 after curing.
- **Stencil** – The stencil shall be 3-5/8” x 7-3/4” bricks with 1/2” mortar joints arranged in a basket weave pattern.
- **Sealer** – Curing and sealing compound shall be clear or semi-gloss and be applied according to manufacturer specifications.

The surface sealant shall meet the following standards:

ASTM C67 Section 7, Section 10 (water absorption & efflorescence)

ASTM C67 Section 9 (suction)

ASTM C666, 23-69 (freeze thaw resistance, artificial weathering, salt attack resistance)

- **Isolation Joint Material** – Joint material shall be one-half (1/2) inch in thickness, equal in height and width to the imprinted area and conform to AASHTO M33, Asphaltic Expansion Joint Materials.

Concrete from the same mill and raw materials of the same type and brand should be used for all the imprinted concrete surfaces on the project to minimize the potential for color variations. In addition, the temperature of the concrete must be kept between 65 and 85 degrees Fahrenheit unless otherwise specified by the manufacturer.

Article 9.21.03 – Construction Methods: Add the following:

8. Imprinting and Coloring: Finish the concrete to a uniform surface with a wood float. Lay the stencil atop the concrete. The stencil shall overlap the adjacent pattern to ensure alignment. Embed the stencil into the concrete with a roller and trim just inside the form. Once the stencil is flat so that there is no gap between it and the concrete, cast the dry shake color hardener onto the surface at the manufacturers recommended rate. Work the color hardener into the surface with a wood float and work the edges with hand tools. Remove the stencil and apply sealer per the manufactures recommendation.

Install isolation joints wherever concrete is placed against already installed concrete or stone structures such a curbing, building, or other, previously existing paving.

Prior to any placement of concrete, stake out all sign post locations within pour area in accordance with the requirements of the applicable provisions of Section 9.80 – Construction Staking. Install a PVC sleeve at each signpost location proposed within the imprinted concrete. The sleeve shall be large enough to permit the installation of the required signpost through the sleeve. In no case shall the imprinted concrete sidewalk be placed directly around a signpost already installed without the use of a sleeve or an alternate spacer approved by the Engineer.

When placing concrete adjacent to existing tree pits an additional haunch return shall be provided. The haunch shall be monolithically placed with the adjacent sidewalk and imprinted 6” from the vertical face where it intersects the form. The vertical face that is formed shall remain smooth. Prior to initial set a control joint shall be provided as shown on the plans.

Low Temperature Placements: No concrete is to be placed when air temperature is below 50°F unless additional precautions are taken and prior approval is given by the Engineer. The Engineer must approve all placements below 50°F. No concrete will be placed on frozen sub-grade or at temperatures below 20°F. Concrete exposed to temperatures below 40°F after placement must be protected with insulating blankets, a six (6) inch layer of straw that is maintained in a dry condition by a covering of plastic sheeting, or other appropriate methods. Any concrete placed during cold weather that is damaged because of freezing shall be replaced at the Contractor’s own expense.

The Contractor shall have on the job, at all times, sufficient waterproof paper to provide complete coverage in the event of rain. Protect the surface if rain occurs before final set. If rain falls on the newly coated sidewalk before the curing film has dried sufficiently to resist damage, or if the film is damaged in any other manner, the contractor shall replace and reapply the film. Protected treated surfaces from all foot or vehicular traffic for a sufficient period of time to prevent damage.

The Contractor shall protect newly poured concrete surfaces to prevent damage from falling objects, vandalism, etc. The Contractor shall repair or remove and replace any damaged or defaced concrete surface at his own expense. Determination to repair or remove and replace will be at the sole discretion of the Engineer.

Article 9.21.04 - Method of Measurement: Add the following:

7. Imprinted Concrete Sidewalk: This work will be measured by the actual number of square feet of completed and accepted imprinted concrete sidewalk. There will be no measurement for payment for excavation, gravel or reclaimed miscellaneous aggregate base, coloring agent, mat tools, dry shake color hardener, sealer, stencil, release agent, haunch return or isolation joint material, but the cost shall be included in the bid price for the imprinted concrete sidewalk.

Article 9.21.05 - Basis of Payment: Add the following:

This work will be paid for at the Contract unit price per square foot for “Imprinted Concrete Sidewalk” complete in place, which price shall include all excavation as specified

above, PVC sleeves, backfill, disposal of surplus material, gravel or reclaimed miscellaneous aggregate base, equipment, tools, materials and labor incidental thereto.

Pay Item	Pay Unit
Imprinted Concrete Sidewalk	s.f.

ITEM #0922050A – DECORATIVE CROSSWALK

Description: Work under this item shall consist of constructing aggregate reinforced preformed thermoplastic decorative crosswalks.

Materials: All materials and specialized application equipment for this work shall meet the requirements outlined in the manufacturer specification. Approved materials for this item are:

- 1) TrafficPatternsXD[®] Preformed Thermoplastic Decorative Crosswalks
- 2) ThermoPrintHT[®] Pre-Formed Imprinted Thermoplastic Decorative High Traffic Pavement Surfacing System
- 3) An approved equal

Panels:

- Pattern and size:
 - TrafficPatternsXD[®]: The pattern shall be “Offset Brick” with a brick size of 4-3/4” x 9-5/8”
 - ThermoPrintHT[®]: The pattern shall be “Running Bond” with a brick size of 4-3/4” x 8-3/4”
- Color: The color shall be “Colonial Brick”

Construction Methods: The methods used to complete this work shall meet the requirements outlined in the manufacturer specification, which can be located at:

- 1) TrafficPatternsXD[®]
http://www.ennisflintamericas.com/downloads/dl/file/id/140/product/942/specification_trafficpatternsxd_branded.pdf
- 2) ThermoPrintHT[®]
<http://www.patternpaving.com/catalog/thermoprintHT/ThermoPrintHT%20Sample-Spec2.pdf>
- 3) Upon approval of another product, the manufacturer specification for the installation shall be followed.

The Contractor shall supply a copy of a valid license agreement between the manufacturer and the accredited applicator (herein Applicator) for the construction calendar year. Written verification from the manufacturer that the Applicator is qualified to perform this Work will

suffice as well. This documentation shall be provided no later than one week (7 calendar days) prior to the award of the contract to:

Mr. Stephen D. Hall, P.E.
Project Engineer
Connecticut Department of Transportation
Bureau of Engineering and Construction
2800 Berlin Turnpike – P.O. Box 317546
Newington, CT 06131-7546
(860) 594-2591

Mr. Donald L. Ward, P.E.
Transportation District Engineer
Connecticut Department of Transportation
Bureau of Engineering and Construction
1107 Cromwell Avenue
Rocky Hill, CT 06067
(860) 258-4604

Alignment and sequencing:

Align the panels so that the long axis of the pattern is perpendicular to the direction of pedestrian traffic. Adjacent crosswalk pavement markings shall not be applied prior to the thermoplastic application.

Method of Measurement: This work will be measured by the actual number of square feet of completed and accepted Decorative Crosswalk.

Basis of Payment: This work will be paid for at the Contract unit price per square foot for “Decorative Crosswalk” complete in place, which price shall include all equipment, tools, materials, and labor incidental thereto.

Pay Item	Pay Unit
Decorative Crosswalk	s.f.

ITEM #0945060A – PINE BARK MULCH

Description: Shredded hardwood Bark Mulch shall be used as directed by the engineer and shall be of similar type and quality to existing mulch in adjacent tree planter areas.

Work under this item shall conform to Section 9.49 of the Standard Specifications, Form 817 amended as follows:

Materials:

The material for this work shall be shredded pine bark mulch. The shredded pine bark mulch shall be of similar type and quality to existing mulch in adjacent tree planter areas.

Construction Methods - Mulching: Article 9.49.03-13 add the following:
Wherever wood chip mulch is stated it shall be construed to mean shredded pine bark mulch. Shredded pine bark mulch shall be installed to a thickness of 3” around all plants.

Method of Measurement – Mulching: Article 9.49.04-2
Wherever wood chip mulch is stated it shall be construed to mean shredded pine bark mulch.

Basis of Payment – Mulching: Article 9.49.05-2
Wherever wood chip mulch is stated it shall be construed to mean shredded pine bark mulch.

<u>Pay Item</u>	<u>Pay Unit</u>
Pine Bark Mulch	S.Y.

ITEM #0949111A – PROTECTIVE FENCING

Description: This item shall consist of protecting and maintaining the existing trees and shrubs located within the limits indicated on the plans. Protection and maintenance work shall include furnishing and installing Protective Fencing.

Materials: Protective fencing shall consist of a 4’ high minimum orange safety delineator fence with 6’ minimum long posts of high carbon steel, drive type, with spade anchors.

Construction Methods:

1. General: All tree protection and maintenance work shall be performed in compliance with the National Arborist Association and the American National Standards Institute (ANSI) Publication: ANSI Z 133.1 "Safety Requirements for Pruning, Trimming, Repairing, Maintaining and Removing Trees, and for Cutting Brush."

The Contractor, the Department's representative, the Engineer, and the Landscape designer shall meet on the site to discuss all aspects of tree protection and maintenance prior to the commencement of any work, including clearing and grubbing operations. This meeting will include the field inspection of the staked limit of grading to review the existing vegetation and to identify any field modifications to the work.

No excavated material or construction materials are to be stockpiled within the drip line of any tree. Tree root systems shall be protected from smothering, flooding, erosion, and excessive wetting resulting from dewatering operations; and from run-off, spillage, and drainage of solutions containing materials which would be deleterious to tree roots. Parking and vehicular traffic will not be permitted within the tree's drip lines. Foot traffic over tree roots shall be restricted to prevent excessive compaction of soil over root systems.

2. Protective fencing: The Contractor shall install protective fencing along the edge of the trench line by driving posts 8 to 10 feet on centers into the ground to support the fence material firmly. The installations shall be maintained or replaced until they are no longer necessary for the purpose intended or as ordered by the Engineer. In areas where construction falls within the drip line of trees, fencing shall be removed and replaced as work near the trees is completed, to prevent excessive soil compaction.

Method of Measurement: This work shall be measured by the actual number of linear feet of “Protective Fencing” installed and accepted. The fence shall be measured once, throughout the duration of the project at the time of installation. No additional payment will be made for the reinstallation, repair or replacement of the fence. Measurement shall be made along the centerline of the fence.

Method of Payment: Payment for this work will be made at the contract unit price per linear foot for "Protective Fencing" complete in place, which price shall include all materials, equipment, tools, labor incidental to the installation, maintenance, replacement, removal and disposal of fence.

<u>Payment Item</u>	<u>Pay Unit</u>
Protective Fencing	L. F.

ITEM #0949432A – ROOT PRUNING

Description: This item shall consist of protecting and maintaining the existing trees and shrubs located within the limits indicated on the plans. Protection and maintenance work shall include Root Pruning.

Construction Methods:

1. General: All tree protection and maintenance work shall be performed in compliance with the National Arborist Association and the American National Standards Institute (ANSI) Publication: ANSI Z 133.1 "Safety Requirements for Pruning, Trimming, Repairing, Maintaining and Removing Trees, and for Cutting Brush."

The Contractor, the Department's representative, the Engineer, and the Landscape Designer shall meet on the site to discuss all aspects of tree protection and maintenance prior to the commencement of any work, including clearing and grubbing operations. This meeting will include the field inspection of the staked limit of grading to review the existing vegetation and to identify any field modifications to the work.

No excavated material or construction materials are to be stockpiled within the drip line of any tree. Tree root systems shall be protected from smothering, flooding, erosion, and excessive wetting resulting from dewatering operations; and from run-off, spillage, and drainage of solutions containing materials which would be deleterious to tree roots. Parking and vehicular traffic will not be permitted within the tree's drip lines. Foot traffic over tree roots shall be restricted to prevent excessive compaction of soil over root systems.

2. Root Pruning: The Contractor shall operate an air spade, hand pruners, hand saw, or rock saw along the outside limits of grading prior to clearing and grubbing operations. The activity involves clean cutting tree roots to minimize the construction activity shock to the affected trees. Unless otherwise instructed by the Engineer, root pruning shall be performed to a depth of 2.5 feet only in the vicinity of existing trees. The trench shall be immediately backfilled with soil removed or organic soil. This root pruning operation shall occur prior to protective fencing and clearing and grubbing.

Measurement: This work shall be measured by the actual number of linear feet of "Root Pruning" completed and accepted.

Payment: Payment for this work will be made at the contract unit price per linear foot for "Root Pruning" complete in place, which price shall include all materials, equipment, tools, and labor incidental thereto.

Pay Item
Root Pruning

Pay Unit
L.F.

ITEM #0950019A – TURF ESTABLISHMENT - LAWN

Description: The work included in this item shall consist of providing an accepted stand of grass by furnishing and placing seed as shown on the plans or as directed by the Engineer.

Materials: The materials for this work shall conform to the requirements of Section 9.50 of Standard Specification Form 817. The following mix shall be used for this item:

Turf Seed Mix:

In order to preserve and enhance the diversity, the source for seed mixtures shall be locally obtained within the Northeast USA including New England, New York, Pennsylvania, New Jersey, Delaware, or Maryland. One approved seed mixture is detailed below. Other proposed mixtures must be approved by the ConnDOT Landscape Design office.

<u>Proportion (Percent)</u>	<u>Species Common name</u>	<u>Scientific name</u>
20	Kentucky Bluegrass Improved varieties	Poa pratensis
45	Red Fescue Improved varieties	Festuca rubra
35	Perennial Ryegrass Improved varieties	Lolium perenne

Construction Methods: Construction Methods shall be those established as agronomically acceptable and feasible and that are approved by the Engineer. Rate of application shall be field determined in Pure Live Seed (PLS) based on the minimum purity and minimum germination of the seed obtained. Calculate the PLS for each seed species in the mix. Adjust the seeding rate for the above composite mix, based on 250 lbs. per acre. The seed shall be mulched in accordance with Article 9.50.03.

Method of Measurement: This work will be measured for payment by the number of square yards of surface area of accepted established grasses as specified or by the number of square yards of surface area of seeding actually covered and as specified.

Basis of Payment: This work will be paid for at the contract unit price per square yard for “Turf Establishment - Lawn” which price shall include all materials maintenance, equipment, tools, labor, and work incidental thereto. Partial payment of up to 60% may be made for work completed, but not accepted.

Pay Item

Turf Establishment - Lawn

Pay Unit

S.Y.

ITEM #0950106A – TREE BARRIER

Description: This item shall consist of applying wood framing around the trunk or trunks of the tree from the ground level to the height of 6 feet as indicated on the plans or as directed by the Engineer, all in accordance with these Specifications.

Materials: Tree Barrier: Wood framing shall consist of nominal lumber 6 feet in length; the width and thickness shall vary from 2" x 2" to 2" x 6", depending on trunk diameter. Binding material shall consist of single strand 9-gauge wire or 1/2-inch strapping.

Construction Methods:

1-General: All tree protection and maintenance work shall be preformed in compliance with the National Arborist Association and the American National Standards Institute (ANSI) Publication. ANSI Z 133.1 "Safety Requirements for Pruning, Trimming, Repairing, Maintaining and Removing Trees, and for Cutting Brush."

The Contractor, the Department's representative, the Engineer, and the Landscape designer shall meet on the site to discuss all aspects of tree protection and maintenance prior to the commencement of any work, including clearing and grubbing operations. This meeting will include the field inspection of the staked limit of grading to review the existing vegetation and to identify any field modifications to the work.

No excavated material or construction materials are to be stockpiled within the drip line of any tree. Tree root systems shall be protected from smothering, flooding, erosion, and excessive wetting resulting from dewatering operations; and from run-off, spillage, and drainage of solutions containing materials which would be deleterious to tree roots. Parking and vehicular traffic shall not be permitted within the tree's drip lines

2-Tree Barrier: The wood framing shall be placed around the trunk in sufficient quantity to protect the trunk from mechanical damage, wood framing members shall not be spaced greater than 4 inches apart. The binding material shall be tight to prevent the wood from moving. The binding material shall not come in contact with the trunk or any portion of the tree. Under no circumstance shall nails or any other type of fastener enter the tree. The wood framing shall be removed and legally disposed of when all mechanical work within the surrounding area has been completed.

Measurement: This work shall be measured by the number of feet of "Tree Barrier" installed and accepted. The barrier shall be measured once, throughout the duration of the project at the time of installation. No additional payment will be made for the reinstallation, repair or replacement of the barrier. Measurement shall be made along the centerline of the barrier.

Payment: Payment for this work will be made at the contract unit price per foot for "Tree Barrier" complete in place, which price shall include all materials, equipment, tools, labor incidental to the installation, maintenance, replacement, removal and disposal of barrier.

Pay Item
Tree Barrier

Pay Unit
L.F.

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 a sheet aluminum sign to less than 250 feet. The entire sign shall be visible for 250 feet measured from the center of the right-travel lane approaching the sign, as viewed from a 3.5 ft height above the roadway.

All trees scheduled to be removed shall be visibly marked or flagged by the Contractor at least seven days prior to the cutting of such trees.

The Engineer will inspect the identified trees and verify the limits of clearing and thinning prior to the Contractor proceeding with his cutting operation.

ITEM #0952049A – SELECTIVE CLEARING AND THINNING

Description: This work shall consist of cutting, trimming and the removal of trees, limbs, brush, rubbish and objectionable material as shown on the plans or as directed by the Engineer. Stumps shall only be removed if directed by the Engineer. No work shall disrupt and surrounding features. The purpose of this item is to remove any hazardous and damaging limbs and vegetative growth from the areas specified on the plans, and to provide a neat, easily maintained perimeter along the facility.

Materials: The contractor responsible for furnishing the service has complete responsibility for the tools, equipment and labor being used and will furnish all fuel, maintenance and repair for that equipment. Hook and blade pruning tools shall be used rather than anvil-type pruning tools. Climbing spurs shall not be used for climbing trees unless tree is being fully removed.

Construction Methods:

The identification of vegetation to be removed must be verified in the field prior to any work being performed. Trees and brush to be removed shall be cut flush with the ground surface, or pulled if directed. All work pertaining to the cutting, trimming, and removal of trees, understory vegetation, vines and other objectionable material shall be done in a neat and orderly manner so as not to damage native vegetation, soils, or other surrounding features and shall be performed as described below.

1 - Quality Assurance: Contractors required to perform tree trimming shall be licensed arborists qualified to perform arboriculture within the state of Connecticut under Connecticut General Statutes – Section 23-61b, Licensing for Arboriculture; examination; fees, renewal, suspension and revocation.

Tree trimming shall be performed to meet the latest definitions and standards identified in the American National Standards Institute (ANSI) A300 Standards described in the section of Tree Care Operations – Tree, Shrub and other Woody Plant Maintenance - Standard Practices (Pruning).

Contractor shall have crews available that are Qualified Line-Clearance Arborists as described in the (ANSI) Z.133 Standards for Arboricultural Operations. Operations shall comply with applicable Occupational Safety and Health Administration (OSHA) Standards, ANSI 2133.1, as well as state and location regulations.

2 - Coordination and Scheduling: Coordinate tree pruning and trimming with other construction and other functions as directed by the Engineer.

Method of Measurement: This item will be paid for on a Square Yard (S.Y.) basis which will include the inspection of approximate measured areas shown on the plans, and of tree pruning and trimming completed along the trail corridor and other disturbed areas.

Basis of Payment: This work will be paid for at the contract Square Yard (S.Y.) price for 'Selective Clearing and Thinning,' complete in place, which price shall include all materials, tools, equipment and labor incidental thereto, also all cleaning up of the site upon completion of the work.

<u>Pay Item</u>	<u>Pay Unit</u>
Selective Clearing and Thinning	S.Y.

ITEM #0969030A – PROJECT COORDINATOR (MINIMUM BID)

Article 1.05.08 – Schedules and Reports of the Standard Specifications is hereby amended by the following:

Add 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's resume shall be submitted for approval by name, in writing, within seven (7) calendar days of the award of the Contract, 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 they 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 they propose 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.

When the Contract is administered under Section 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.

Software – Minimum Specification: The Contractor shall provide the Engineer with a licensed copy of the latest version of the Oracle 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.

Printer: An addition printer shall be provided that meets the printer specifications noted under contract item for "Construction Field Office" and is compatible with the software.

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.

Please delete any reference to Bar Chart under 1.05.08 – Schedule and Reports and replace with the following:

Critical Path Method (CPM)

Please add the following:

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.

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 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:

1. ES - Earliest Start Time: the earliest time at which the activity can start given that its precedent activities must be completed first.
2. EF - Earliest Finish Time: equal to the earliest start time for the activity plus the time required to complete the activity.
3. LF - Latest Finish Time: the latest time at which the activity can be completed without delaying the project.
4. 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 Department or the Contractor. During the course of Contract, 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 Department 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 may be requested printed out by the Department and shall be on 22" x 34" sheets. Additional, more detailed diagrams for important aspects or phases of the work may 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.

1. 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.

2. 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.

The following shall also apply to Contracts administered under Section 1.20:

3. 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 and Narrative; 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 narrative and 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, narratives, 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:
 - a. The monthly payment for the Project Coordinator item will 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 will 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 Contract payments.
2. In the event the Contract time 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 for at the per month cost for the services of the Project Coordinator.
3. If the Contractor is not in compliance with this specification or has failed to submit a "Baseline" schedule, monthly update, or a Recovery Schedule for any portion of the work, the Engineer will withhold all Contract payments until the schedule is submitted to, and approved by, the Engineer.

Pay Item

Pay Unit

Project Coordinator(Minimum Bid)

l.s

ITEM #0969053A – CONTRACTOR QUALITY CONTROL PROGRAM **LEVEL 2**

Description:

The Contractor shall establish, maintain, and implement a written Project-specific Quality Control (QC) Program tailored to the complexity and scope of the work. This Program shall detail the programmatic documentation of the Contractor's processes for delivering the level of construction quality required by the Contract.

The written QC Program shall provide a comprehensive description of the planning, monitoring and reporting program the Contractor shall implement to ensure and document the quality of the work as it progresses.

The QC Program shall address, as a minimum, the following elements: Organization; Document Control; Design Control; Procurement Control; Control of Subcontractors, Fabricators and Suppliers; Inspection; Special Process Control; Non-Conformance Resolution; Records; and Reporting.

The QC Program shall identify and list critical and routine work categories, which shall be used to differentiate the level of reporting, inspection and attention throughout the process.

The QC Program shall include a method to identify and resolve any deviations from the Contract while maintaining the Project schedule. The QC Program shall include a method to prevent recurring deviations once identified and resolved.

The Contractor shall modify the QC Program as needed to meet the requirements of this specification. The QC Program shall be recognized as a dynamic document, subject to revisions and amendments, as required, in response to actual Site conditions, work methods, and to address deviations encountered and corrected throughout the Project.

The Contractor shall furnish the services of a dedicated (sole responsibility), full-time, on-Site Quality Control Manager (QCM) for the Project. The QCM shall report directly to upper management and shall have the authority to issue stop work orders.

When the Contractor's schedule dictates simultaneous work operations, the Contractor is responsible for supplementing the QCM with additional QC personnel (independent of trade staff) to meet the requirements of this specification.

The additional Contractor Quality Control requirements described herein shall be used in conjunction with the Department's Standard Specifications Form 817. The QC Program is neither intended to relieve the Contractor from its responsibility under the Contract, nor to replace the external inspections of the work carried out by the Engineer.

The minimum lump sum bid for this item shall be **\$600,000** Failure of the Contractor to bid at least the minimum amount will result in the Department adjusting the Contractor's bid to the minimum bid amount for this item.

Construction Methods:

Submittals

(1) QCM: Within thirty (30) days of Contract award, the Contractor shall submit, in writing, the name of their proposed QCM with a resume of their qualifications, submitted in accordance with the requirements listed below, for concurrence by the Department. The QCM shall not be changed without prior written notification to the Department.

The submittal shall outline the credentials of the proposed QCM, who shall be an individual with a bachelor's degree in Engineering and demonstrated construction experience. This shall include at least 10 years of experience in any combination of the following areas:

- Field inspection experience
- Construction experience relevant to the type of work and the scope of the Project
- Previous experience as a Quality Control professional

The submittal shall also include documented certification or training in quality control principles (NETTCP Quality Assurance Technologist or approved equal) and two (2) letters of recommendation from previous clients.

(2) QC Program: Within forty-five (45) days of Contract award, the Contractor, with direct input from the QCM, shall prepare and submit to the Department, for review and approval, a written QC Program, including the Elements listed below, and in accordance with all requirements of this specification.

Sample forms and reports intended to be used to assure compliance with this specification shall be included in the initial submittal of the QC Program. Sample forms and reports shall include, but are not limited to:

- Sample document control tracking form
- Sample design control tracking form (for Contractor design-build items)
- Sample shop drawing/working drawing review
- Sample material receiving inspection report
- Sample inspection forms for critical work categories
- Sample special process control forms
- Sample non-conformance report
- Sample daily and monthly reports

The Contractor's QCM, Project Manager and a representative of their upper management shall sign the final QC Program submission and any revisions or amendments thereto. Any revisions or amendments made to the QC Program shall be submitted in writing to the Engineer for acceptance.

Subcontractors, fabricators and suppliers involved in critical work categories, as defined in the QC Program, shall have their own work-item specific QC Plan which shall be included as an addendum to the Contractor's QC Program, and shall comply with all conditions of this item.

(3) Additional QC Personnel: When additional QC personnel are required due to simultaneous work operations, the Contractor shall provide resume(s) of qualifications of the proposed personnel at least thirty (30) days in advance of the work. All additional QC personnel utilized for inspecting, sampling, and testing of materials shall be certified by NETTCP (or another entity acceptable to the Department) in the appropriate designation for the work or materials being inspected, sampled, or tested. These individual(s) shall also have demonstrated construction experience of at least 5 years in any combination of the following areas:

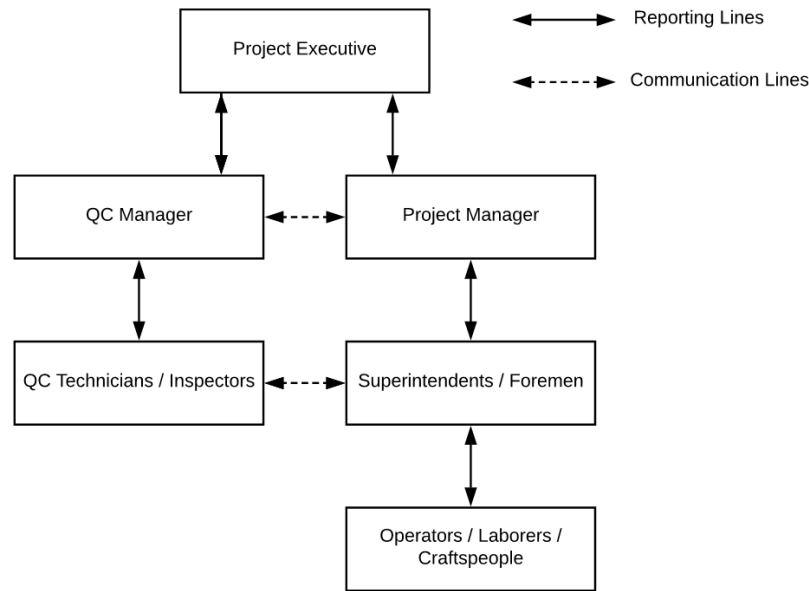
- Field inspection experience
- Construction experience relevant to the type of work and the scope of the Project
- Previous experience as a Quality Control professional

(4) Laboratories: All laboratories performing QC testing of Project Produced Materials shall be qualified through either the AASHTO Accreditation Program (AAP) or the NETTCP Laboratory Qualification Program. The Contractor shall provide laboratory proof of qualification at least thirty (30) days in advance of the work.

(5) Reports: The Contractor shall be required to produce and submit to the Engineer daily and monthly inspection reports as described in the Reporting Element of this specification.

Elements of the Contractor Quality Control Program:

1. Organization: This Element shall describe the Contractor's organization, including reporting relationships within and external to the Contractor's organization. The name of the QCM shall be clearly stated and this individual shall be responsible to upper management and have the authority to stop work. An organizational chart shall be included to graphically depict the Contractor's organizational structure and major reporting lines and relationships. The organizational chart shall clearly show the hierarchy between the QCM, upper management and additional QC personnel; and a narrative shall follow which shall define the roles, duties and responsibilities of each person in the implementation of the QC Program and in the resolution of QC issues. This Element shall also include the resumes of all QC personnel.



2. Document Control: This Element shall describe the methods used by the Contractor and the QCM to control the use of the various design documents, shop drawings, procedures, etc. to assure that only the most current, accepted documents are used and are distributed to the individuals performing the work. The process to recall documents which have been superseded or revised shall be addressed. This Element shall identify the submittals that are required by the Contract, the system used to track these submittals and their current status.

A submittal status update spreadsheet shall be submitted with each monthly report, in accordance with the Reporting Element.

3. Design Control: This Element shall describe how the Contractor and the QCM control any design process (i.e. working and shop drawings) for which it is responsible. This shall include the selection of design input data, checking for correctness, completeness, compatibility and format, and reviewing and approving design output documents prior to submission to the Department. This Element shall provide guidance as to how the QCM or other personnel shall indicate that documents have been reviewed by the Contractor prior to submission, and that Department comments have been adequately addressed prior to any required resubmissions.

4. Procurement Control: This Element shall describe the methods used by the Contractor and the QCM to assure that all materials and specialized equipment provided for the work are as specified. Included shall be guidelines for documenting that purchase documents have been reviewed to assure that correct details have been ordered, including specification, grade, type, color, Buy America or other aspects as required by the Contract.

This Element shall describe receiving inspection activities to be performed, and documentation required to confirm that the correct material or equipment has been delivered. A list of items requiring Materials Certificates and/or Certified Test Reports shall be developed by the

Contractor and included in this Element. The Contractor shall prepare a “Material Receiving Inspection Report” which shall include records of inspections performed and reviews of material test reports or other documentation required by the Contract. It shall also include copies of Materials Certificates and/or Certified Test Reports for all these items.

As a minimum, receiving inspections shall be performed on the following materials:

- Materials requiring a Materials Certificate or Certified Test Report
- Source-Controlled Materials (not inspected at the manufacturing plant)
- Job-Controlled Materials (other than concrete, bituminous and soils)

Following a receiving inspection, a copy of the “Material Receiving Inspection Report,” along with associated documents, shall be submitted to the Engineer.

5. Control of Subcontractors, Fabricators and Suppliers: Subcontractors, fabricators and suppliers involved in critical work categories, as defined in 6(a) herein, shall develop their own QC Plan to be added as an addendum to the Contractor’s QC Program, which shall comply with all conditions of this item. The Contractor shall be responsible for reporting on QC activities performed by or for subcontractors, fabricators and suppliers.

It is the Contractor’s responsibility to notify all subcontractors, fabricators, and suppliers of the requirements of the Contract. This Element shall describe the methods used by the Contractor and the QCM to assure that all the applicable requirements of the Contract are passed on to the subcontractors, fabricators and suppliers. This Element shall include the methods used by the Contractor and the QCM to monitor and control the quality of the work performed by subcontractors, fabricators and suppliers, and to obtain the required quality records.

This Element shall also describe how the Contractor will ensure that:

- The Engineer receives advance notice of:
 - The source of supply
 - The location of fabrication, including component parts
 - The schedule of fabrication, including the date of beginning of fabrication and the date the material is to be delivered to the Project
- Material fabricated specifically for the Project will be inspected and approved prior to being shipped or incorporated into the work
- Properly documented mill test reports are furnished by suppliers
- Subcontractors are approved prior to performing any work for or on the Project

6. Inspection: This Element shall describe how the Contractor and the QCM will assure that the specified quality of materials and workmanship will be achieved. The Contractor’s QC Program is not related to any inspection carried out by the Engineer. Inspection will include the identification and tracking of the quality characteristics (metrics) used to verify that the level of quality of materials and workmanship conforms to the requirements of the Contract.

The QC Program shall identify the reporting requirements for each item based on its work category, and these reporting requirements will be approved by the Engineer. The work categories will be identified as **critical** or **routine**.

(a) Critical Work Categories: For this Project, critical work categories shall include, but are not limited to the following:

- Construction Staking
- Maintenance & Protection of Traffic
- Subbase and Base Material
- Hot Mix Asphalt
- Drainage
- Bridge Demolition
- Reinforcing Steel
- Structural Steel
- Structural Concrete
- Precast Concrete Deck Panels
- Electrical
- Landscaping
- Sign Support Foundation
- Environmental Compliance
- Permit Compliance

The QCM shall be familiar with all aspects of work related to critical work categories and no work shall be performed on these categories without the prior knowledge of the QCM. The QC Program shall define specific means and methods that shall be employed to minimize, identify, resolve and prevent recurrence of deviations from the Contract in regards to materials or workmanship for each of the critical work categories listed.

The QC Program shall identify hold points in the critical work categories beyond which work operations cannot proceed until the QCM and the Engineer have inspected the work in place and releases the hold.

When simultaneous critical work categories are required by the Contractor's schedule, additional QC personnel shall be required.

This Element shall describe the system(s) used to assure that all materials and workmanship for critical work categories are in conformance with the Contract, including but not limited to:

- Visual inspection of the work, including frequency and hold points
- Materials to be tested
- Tests to be conducted
- Frequency of testing
- Locations of sampling
- Checks
- Intermittent or continuous inspections

- Inspections of completed work
- Or a combination of above methods

Quality control reporting forms shall be developed to document the work performed by the QCM and QC personnel, on each of these critical work categories. The forms shall be signed by Contractor supervisory field personnel, the QCM and QC personnel (if applicable), to document conformance of the work being performed. All work performed by the QCM and QC personnel on these critical work categories shall be documented and included in the QCM's daily and monthly reports.

(b) Routine Work Categories: All other work categories not covered by 6(a) will be defined as routine work categories and the general provisions of this specification shall apply.

7. Special Process Control: This Element shall describe the measures to be used to assure that any special processes (such as, but not limited to, welding, high-strength bolting, nondestructive examination, critical coatings, surveys, and control of critical tolerances) shall be controlled by procedures that are described in and comply with the Contractor's approved QC Program. The recording of results shall properly document that processes are in conformance with the Contract. In addition, this Element shall describe the methods used to verify, document and track any pre-qualification of the processes, personnel and equipment where required by the Contract.

8. Non-Conformance Resolution: This Element shall describe the protocol(s) for correcting any material or workmanship found not to be in compliance with the Contract, the reporting requirements for documenting any non-compliance, subsequent corrective measures and issue resolution.

(a) Contractor-Issued Non-Conformance Reports: This Element shall outline the Contractor's use of self-issued non-conformance reports to document actions taken to identify, resolve and prevent recurring deviations. The non-conformance reports shall include signatures of the responsible persons for each process of the corrective action taken. Upon resolution of a non-conformance issue, the QC Program shall be revised to identify preventive measures that shall be taken to prevent similar deviations. Contractor supervisory field personnel involved in the work shall be informed of any changes implemented to avoid recurrence of deviations.

(b) Engineer-Issued Non-Compliance Notices (NCN): Non-compliance notices (NCNs) issued by the Engineer shall also be an indication of non-conformance and shall be addressed according to 1.05.11 and resolved to the satisfaction of the Engineer. Upon resolution, the QC Program shall be revised to identify preventive measures that shall be taken to prevent similar deviations. Contractor supervisory field personnel involved in the work shall be informed of any changes implemented to avoid recurrence of deviations.

9. Records: This Element shall describe how various records generated by the Contractor are originated, maintained, received, filed, protected and authenticated. Quality Control records required for submittal to the Engineer shall be described. This Element shall outline the

Contractor's procedure for retaining records for a period of 3 years after acceptance of the Contract.

10. Reporting: QC Inspection Reports: The Contractor shall be required to produce and submit to the Engineer daily and monthly inspection reports in accordance with all requirements of this specification. The QC Program shall clearly define the information that shall be provided as part of the daily and monthly reports.

(a) Daily Reports: Daily reports shall include documentation of all activities, including inspection, material testing, and any work associated with the Elements of this specification, performed by the QCM and other QC personnel. The location of any forms relative to this specification shall be referenced in the daily reports.

For any week that a non-conformance report is issued, either by the Contractor or the Engineer, actions taken to resolve the non-conformance report shall be summarized and included with the submission of the daily reports. Updates on the status of the non-conformance shall continue in each submission of daily reports until the non-conformance issue is resolved. Once resolved, the next submission of daily reports shall document that supervisory field personnel involved in the work have been informed of any changes to be implemented to avoid recurrence of deviations. Any revisions or amendments made to the QC Program, once submitted and accepted by the Engineer, shall be documented in the next submission of daily reports.

Daily reports shall be submitted (as a package) to the Engineer by 12 PM on the Tuesday following the week of the inspection reports, or as agreed to by the Engineer. Except as otherwise authorized by the Engineer, submissions after that time will be considered late.

(b) Monthly Reports: Monthly reports shall include a summary of the work performed, including QC activities, in the previous month and also a one (1) month "look ahead" schedule with expected QC efforts and procedures for critical and routine work categories. Monthly reports shall also include a submittal status update spreadsheet.

Monthly reports shall be submitted to the Engineer by the fifth (5th) business day each month. Except as otherwise authorized by the Engineer, monthly submissions after that time will be considered late.

(c) Quality Assurance/Quality Control (QA/QC) Meetings: Meetings shall be held specific to the QC Program. The Contractor shall, at minimum, be represented by the QCM and shall meet with the Engineer every other week, or more frequently at the Engineer's request, to review reporting and all work related to this specification.

Method of Measurement:

Within forty-five (45) calendar days of the award of the Contract, the Contractor shall submit to the Engineer for approval a schedule of values of its lump sum bid price for this item detailing the following:

1. The development costs to prepare the written QC Program. Development costs shall be ten percent (10%) of the total cost of the item.
2. The cost per-month to provide the services of the QC Program, including the QCM, QC activities, necessary QC personnel, preparing and submitting daily and monthly reports, and all other requirements of this specification. A per-month cost will be derived by taking the lump sum bid price, subtracting the development cost to prepare the written QC Program, and dividing the remainder by the number of Contract months remaining from the date of submission of the written QC Program.

Basis of Payment:

This item will be paid for at the Contract lump sum price for “Contractor Quality Control Program Level 2” complete, which price shall include all submittals, QC Program revisions and amendments, inspections, monitoring, daily logs, reports, meetings, records, and all materials, equipment, labor and work incidental thereto.

Upon approval of the schedule of values by the Engineer, payments for work performed will be made as follows:

1. Upon acceptance of the written QC Program, the lump sum development cost from the payment schedule will be approved for payment.
2. Upon acceptable completion of the services of the QC Program for the month, the per-month cost will be approved for payment.

The Engineer reserves the right to apply the following reductions to the monthly payment portion, which cannot be recovered and will result in a reduction in the lump sum amount, should the Contractor fail to meet the requirements of this specification:

1. QC staff: A five percent (5%) reduction to the monthly payment will be applied for each day that acceptable QC services are not provided. The total reduction for any calendar month will not exceed the monthly payment for the item.
2. Reports: A five percent (5%) reduction to the monthly payment will be applied for each day that the required reports have been submitted late, up to a maximum of fifty percent (50%) of the monthly payment per report. This five percent (5%) reduction will apply to each independent report (each package of daily reports, described in 9(a) above, submitted on a weekly basis is considered one independent report). The total reduction for any calendar month will not exceed the monthly payment for the item.
3. QA/QC Meetings: A twenty-five percent (25%) reduction to the monthly payment will be applied for each bi-weekly QA/QC meeting not attended by the QCM. The total reduction for any calendar month will not exceed the monthly payment for the item.

Should the Contractor fail to continuously provide an acceptable QC Program, as required by this specification, the Engineer may withhold the entire monthly estimate until such time as all requirements are met.

Should the Contractor fail to comply with the QCM requirements of this specification, the QCM shall be replaced at the Engineer’s request.

Only one monthly payment will be made for each calendar month regardless of the number of personnel required to complete the specified work.

Pay Item

Pay Unit

Contractor Quality Control Program Level 2

l.s.

ITEM #0969066A – CONSTRUCTION FIELD OFFICE, EXTRA LARGE

Description: Under the item included in the bid document, adequate weatherproof office quarters with related furnishings, materials, equipment and other services, shall be provided by the Contractor for the duration of the work, and if necessary, for a close-out period determined by the Engineer. The office, furnishings, materials, equipment, and services are for the exclusive use of CTDOT forces and others who may be engaged to augment CTDOT 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.

Furnishings/Materials/Supplies/Equipment: All furnishings, materials, equipment and supplies shall be in like new condition for the purpose intended and require approval of the Engineer.

Office Requirements: The Contractor shall furnish the office quarters and equipment as described below:

Description \ Office Size	Small	Med.	Large	Extra Large
Minimum Sq. Ft. of floor space with a minimum ceiling height of 7 ft.	400	400	1000	2000
Minimum number of exterior entrances.	2	2	2	2
Minimum number of parking spaces.	7	7	10	15

Office Layout: The office shall have a minimum square footage as indicated in the table above, and shall be partitioned as shown on the building floor plan as provided by the Engineer.

Tie-downs and Skirting: Modular offices shall be tied-down and fully skirted to ground level.

Lavatory Facilities: For field offices sizes Small and Medium the Contractor shall furnish a toilet facility at a location convenient to the field office for use by CTDOT personnel and such assistants as they may engage; and for field offices sizes Large and Extra Large the Contractor shall furnish two (2) separate lavatories with toilet (men and women), in separately enclosed rooms that are properly ventilated and comply with applicable sanitary codes. Each lavatory shall have hot and cold running water and flush-type toilets. For all facilities the Contractor shall 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 CTDOT 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, with appropriate handrails. Stairways shall be ADA/ABA compliant and have non-skid tread surfaces. An ADA/ABA compliant ramp with non-skid surface shall be provided with the Extra-Large field office.

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.

Parking Facility: The Contractor shall provide a parking area, adjacent to the field office, of sufficient size to accommodate the number of vehicles indicated in the table above. If a paved parking area is not readily available, the Contractor shall construct a parking area and driveway consisting 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, wiring, outlets, etc., 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 desk and personal computer table (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 CTDOT electrical inspector, must be contacted at 860-594-2240. (Do Not Call Local Town Officials)
- I. Prior to field office removal, the CTDOT Office of Information Systems (CTDOT OIS) 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.

Telephone Service: The Contractor shall provide telephone service with unlimited nation-wide calling plan. For a Small, Medium and Large field office this shall consist of the installation of two (2) telephone lines: one (1) line for phone/voice service and one (1) line dedicated for the facsimile machine. For an Extra-Large field office this shall consist of four (4) telephone lines: three (3) lines for phone/voice service and one (1) line dedicated for facsimile machine. The Contractor shall pay all charges.

Data Communications Facility Wiring: Contractor shall install a Category 6 568B patch panel in a central wiring location and Cat 6 cable from the patch panel to each PC station, Smart Board location, Multifunction Laser Printer/Copier/Scanner/Fax, terminating in a (Category 6 568B) 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 CTDOT OIS staff in coordination with the designated field office personnel as soon as the facility is in place.

For Small, Medium and Large field offices the Contractor shall run a CAT 6 LAN cable a minimum length of 25 feet for each CTDOT networked device (including but not limited to: smartboards and Multi-Function Laser Printer/Copier/Scanner/Fax) to LAN switch area leaving an additional 10 feet of cable length on each side with terminated RJ45 connectors. For an Extra-Large field office the Contractor shall run CAT 6 LAN cables from workstations, install patch panel in data circuit demark area and terminate runs with RJ45 jacks at each device location. Terminate runs to patch panel in LAN switch area. Each run / jack shall be clearly labeled with an identifying Jack Number.

The Contractor shall supply cables to connect the Wi-Fi printer to the Contractor supplied internet router and to workstations/devices as needed. These cables shall be separate from the LAN cables and data Jacks detailed above for the CTDOT network.

The number of networked devices anticipated shall be at least equal to the number of personal computer tables, Multi-Function Laser Printer/Copier/Scanner/Fax, and smartboards listed below.

The installation of a data communication circuit between the field office and the CTDOT OIS in Newington will be coordinated between the CTDOT District staff, CTDOT OIS staff and the local utility company once the Contractor supplies the field office phone numbers and anticipated installation date. The Contractor shall provide the field office telephone number(s) to the CTDOT Project Engineer within 10 calendar days after the signing of the Contract as required by Article 1.08.02. This is required to facilitate data line and computer installations.

Additional Equipment, Facilities and Services: The Contractor shall provide at the field Office at least the following to the satisfaction of the Engineer:

Furnishing Description	Office Size			
	Small	Med.	Large	Extra Large
	Quantity			
Office desk (2.5 ft. x 5 ft.) with drawers, locks, and matching desk chair that have pneumatic seat height adjustment and dual wheel casters on the base.	1	3	5	8
Standard secretarial type desk and matching desk chair that has pneumatic seat height adjustment and dual wheel casters on the base.	-	-	-	1
Personal computer tables (4 ft. x 2.5 ft.).	2	3	5	8
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	1	1	2
Conference table, 3 ft. x 12 ft.	-	-	-	1
Table – 3 ft. x 6 ft.	-	-	-	1
Office Chairs.	2	4	8	20
Mail slot bin – legal size.	-	-	1	1
Non-fire resistant cabinet.	-	-	2	4
Fire resistant cabinet (legal size/4 drawer), locking.	1	1	2	3
Storage racks to hold 3 ft. x 5 ft. display charts.	-	-	1	2
Vertical plan racks for 2 sets of 2 ft. x 3 ft. plans for each rack.	1	1	2	2
Double door supply cabinet with 4 shelves and a lock – 6 ft. x 4 ft.	-	-	1	2
Case of cardboard banker boxes (Min 10 boxes/case)	1	1	2	3
Open bookcase – 3 shelves – 3 ft. long.	-	-	2	2
White Dry-Erase Board, 36" x 48" min. with markers and eraser.	1	1	1	1
Interior partitions – 6 ft. x 6 ft., soundproof type, portable and freestanding.	-	-	6	6
Coat rack with 20 coat capacity.	-	-	-	1
Wastebaskets - 30 gal., including plastic waste bags.	1	1	1	2
Wastebaskets - 5 gal., including plastic waste bags.	1	3	6	10
Electric wall clock.	-	-	-	2
Telephone.	1	1	1	-
Full size stapler 20 (sheet capacity, with staples)	1	2	5	8
Desktop tape dispensers (with Tape)	1	2	5	8
8 Outlet Power Strip with Surge Protection	3	4	6	9

Rain Gauge	1	1	1	1
Business telephone system for three lines with ten handsets, intercom capability, and one speaker phone for conference table.	-	-	-	1
Mini refrigerator - 3.2 c.f. min.	1	1	1	1
Hot and cold water dispensing unit. Disposable cups and bottled water shall be supplied by the Contractor for the duration of the project.	1	1	1	1
Microwave, 1.2 c.f. , 1000W min.	1	1	1	1
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.	*	*	*	*
Electric pencil sharpeners.	1	2	2	2
Electronic office type printing calculators capable of addition, subtraction, multiplication and division with memory and a supply of printing paper.	1	1	2	4
Small Multi-Function Laser Printer/Copier/Scanner/Fax combination unit, network capable, as specified below under <u>Computer Related Hardware and Software</u> .	1	1		
Large Multi-Function Laser Printer/Copier/Scanner/Fax combination unit, network capable, as specified below under <u>Computer Related Hardware and Software</u> .			1	1
Field Office Wi-Fi Connection as specified below under <u>Computer Related Hardware and Software</u>	1	1	1	1
Wi-Fi Printer as specified below under <u>Computer Related Hardware and Software</u> .	1	1	1	1
Digital Camera as specified below under <u>Computer Related Hardware and Software</u> .	1	1	3	3
Video Projector as specified below under <u>Computer Related Hardware and Software</u> .	-	-	-	1
Smart Board as specified below under <u>Computer Related Hardware and Software</u> .	-	-	-	1
Infrared Thermometer, including annual third party certified calibration, case, and cleaning wipes.	1	1	1	2
Concrete Curing Box as specified below under Concrete Testing Equipment.	1	1	1	1
Concrete Air Meter and accessories as specified below under Concrete Testing Equipment as specified below. Contractor shall provide third party calibration on a quarterly basis.	1	1	1	1
Concrete Slump Cone and accessories as specified below under Concrete Testing Equipment.	1	1	1	1

First Aid Kit	1	1	1	1
Portable Turbidity Meter – Hanna Instruments HI 98703, with Fast Tracker Technology, EPA Compliant	-	-	-	1
Flip Phones as specified under <u>Computer Related Hardware and Software</u> .	-	-	-	-
Smart Phones as specified under <u>Computer Related Hardware and Software</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.

Computer Related Hardware and Software: The CTDOT will supply by its own means the actual Personal Computers for the CTDOT representatives. The Contractor shall supply the Field Office Wi-Fi Connection, Wi-Fi Printer, Digital Camera(s), Flip Phones, Smart Phones, Multifunction Laser Printer/Copier/Scanner/Fax, Video Projectors, and Smart Board(s) as well as associated hardware and software, must meet the requirements of this specification as well as the latest minimum specifications posted, as of the project advertising date, at CTDOTs web site <http://www.ct.gov/dot/cwp/view.asp?a=1410&q=563904>

Within 10 calendar days after the signing of the Contract but before ordering/purchasing the Wi-Fi Printer (separate from the Multifunction Laser Printer/Copier/Scanner/Fax), Field Office Wi-Fi, Digital Camera(s), Flip Phones, Smart Phones, Multifunction Laser Printer/Copier/Scanner/Fax, Video Projector(s) and Smart Board(s) as well as associated hardware, the Contractor must submit a copy of their proposed order(s) with catalog cuts and specifications to the Administering CTDOT District for review and approval. The Wi-Fi Printer, Wi-Fi Router, Flip Phones, Smart Phones, digital cameras, Projector(s) and Smart Board(s) will be reviewed by CTDOT District personnel. The Multifunction Laser Printer/Copier/Scanner/Fax will be reviewed by the CTDOT OIS. The Contractor shall not purchase the hardware, software, or services until the Administering CTDOT District informs them that the proposed equipment, software, and services are approved. The Contractor will be solely responsible for the costs of any hardware, software, or services purchased without approval.

The Contractor and/or their internet service provider shall be responsible for the installation and setup of the field office Wi-Fi, Wi-Fi printer, and the configuration of the wireless router as directed by the CTDOT. Installation will be coordinated with CTDOT District and Project personnel.

After the approval of the hardware and software, the Contractor shall contact the designated representatives of the CTDOT administering District, a minimum of 2 working days in advance of the proposed delivery or installation of the Field Office Wi-Fi Connection, Wi-Fi Printer, Digital Camera(s), Flip Phones, Smart Phones, Multifunction Laser Printer/Copier/Scanner/Fax, Video Projectors and Smart Board(s), as well as associated hardware, software, supplies, and support documentation.

The Contractor shall provide all supplies, paper, maintenance, service and repairs (including labor and parts) for the Wi-Fi printers, copiers, field office Wi-Fi, fax machines and other equipment and facilities required by this specification for the duration of the Contract. All repairs must be performed with-in 48 hours. If the repairs require more than a 48 hours then an equal or better replacement must be provided.

Once the Contract has been completed, the hardware and software will remain the property of the Contractor.

First Aid Kit: The Contractor shall supply a first aid kit adequate for the number of personnel expected based on the size of the field office specified and shall keep the first aid kit stocked for the duration that the field office is in service.

Rain Gauge: The Contractor shall supply install and maintain a rain gauge for the duration of the project, meeting these minimum requirements. The rain gauge shall be installed on the top of a post such that the opening of the rain gauge is above the top of the post an adequate distance to avoid splashing of rain water from the top of the post into the rain gauge. The Location of the rain gauge and post shall be approved by the Engineer. The rain gauge shall be made of a durable material and have graduations of 0.1 inches or less with a minimum total column height of 5 inches. If the rain gauge is damaged the Contractor shall replace it prior to the next forecasted storm event at no additional cost.

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 equipment.

- 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 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.

All testing equipment will remain the property of the Contractor at the completion of the project.

Insurance Policy: The Contractor shall provide a separate insurance policy, with no deductible, in the minimum amount of five thousand dollars (\$5,000) 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 CTDOT shall be an additional named insured on the policy. These losses shall include, but not be limited to: theft, fire, and physical damage. The CTDOT will be responsible for all maintenance costs of CTDOT owned computer hardware. In the event of loss,

the Contractor shall provide replacement equipment in accordance with current CTDOT 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 CTDOT 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 CTDOT will reimburse the Contractor for replacement costs exceeding the amount of the required coverage.

Maintenance: During the occupancy by the CTDOT, 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, rounded up to the nearest month.

There will not be any price adjustment due to any change in the minimum computer related hardware and software requirements.

Basis of Payment: The furnishing and maintenance of the Construction Field Office will be paid for at the Contract unit price per month for "Construction Field Office, (Type)," which price shall include all material, equipment, labor, service contracts, licenses, software, repair or replacement of hardware and software, related supplies, utility services, parking area, external illumination, trash removal, snow and ice removal, and work incidental thereto, as well as any other costs to provide requirements of this specified this specification.

<u>Pay Item</u>	<u>Pay Unit</u>
Construction Field Office, (Type)	Month

ITEM #0971001A – MAINTENANCE AND PROTECTION OF TRAFFIC

Article 9.71.01 – Description is supplemented by the following:

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

Route 66 (Main Street)

The Contractor shall maintain and protect the existing number of lanes of traffic and turning lanes in each direction on a paved travel path not less than 11 feet in width per lane.

Excepted therefrom will be those periods, during the allowable periods, when the Contractor is actively working, at which time 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.

Where turn lanes exist, the Contractor shall provide an additional 10 feet of paved travel path to be used for turning vehicles only. The additional 10 feet of travel path shall be a minimum length of 150 feet. It shall be implemented so that sufficient storage, taper length, and turning radius are provided.

Route 66 (Washington Street)

The Contractor shall maintain and protect the existing number of lanes of traffic and turning lanes in each direction on a paved travel path not less than 11 feet in width per lane.

Excepted therefrom will be those periods, during the allowable periods, when the Contractor is actively working, at which time 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.

Where turn lanes exist, the Contractor shall provide an additional 10 feet of paved travel path to be used for turning vehicles only. The additional 10 feet of travel path shall be a minimum length of 150 feet. It shall be implemented so that sufficient storage, taper length, and turning radius are provided.

Route 17 (Hartford Avenue)

The Contractor shall maintain and protect the existing number of lanes of traffic and turning lanes in each direction on a paved travel path not less than 11 feet in width per lane.

Excepted therefrom will be those periods, during the allowable periods, when the Contractor is actively working, at which time 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.

Where turn lanes exist, the Contractor shall provide an additional 10 feet of paved travel path to be used for turning vehicles only. The additional 10 feet of travel path shall be a minimum length of 150 feet. It shall be implemented so that sufficient storage, taper length, and turning radius are provided.

Route 17 & Route 66

The Contractor shall maintain and protect the existing number of lanes of traffic and turning lanes in each direction on a paved travel path not less than 11 feet in width per lane.

Excepted therefrom will be those periods, during the allowable periods, when the Contractor is actively working, at which time 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.

Where turn lanes exist, the Contractor shall provide an additional 10 feet of paved travel path to be used for turning vehicles only. The additional 10 feet of travel path shall be a minimum length of 150 feet. It shall be implemented so that sufficient storage, taper length, and turning radius are provided.

Main Street (South of the intersection with Washington Street)

The Contractor shall maintain and protect the existing number of lanes of traffic and turning lanes in each direction on a paved travel path not less than 11 feet in width per lane.

Excepted therefrom will be those periods, during the allowable periods, when the Contractor is actively working, at which time 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.

SR 545 (Washington Street)

The Contractor shall maintain and protect the existing number of lanes of traffic and turning lanes in each direction on a paved travel path not less than 11 feet in width per lane.

Excepted therefrom will be those periods, during the allowable periods, when the Contractor is actively working, at which time 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.

All Other Roadways

The Contractor shall maintain and protect the existing number of lanes of traffic and turning lanes in each direction on a paved travel path not less than 11 feet in width per lane.

Excepted therefrom will be those periods, during the allowable periods, when the Contractor 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. Driveway construction shall be coordinated with the property owners. At a minimum, temporary graded surfaces shall consist of subbase, processed aggregate base, granular fill, or other suitable materials approved by the Engineer. The Contractor will be allowed to close said driveways to perform the required work during those periods when the businesses are closed, unless permission is granted from the business owner to close the driveway during business hours. If a temporary closure of a residential driveway is necessary, the Contractor shall coordinate with the owner to determine the time period of the closure.

Article 9.71.03 - Construction Method is supplemented as follows:

General

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

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

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

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

The Contractor, during the course of active construction work on overhead signs and structures, shall close the lanes directly below the work area for the entire length of time overhead work is being undertaken. At no time shall an overhead sign be left partially removed or installed.

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

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

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

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

Existing Signing

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

Requirements for Winter

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

Signing Patterns

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

Pavement Markings

The Contractor will be responsible for the furnishing of and installation of all pavement markings, either temporary or permanent. The Contractor shall install pavement markings on the roadway as directed by the Engineer. This work will be paid for under the appropriate pavement marking items.

The Contractor is alerted that all pavement markings must be in place by the end of the work day for any roadway to be opened that day.

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 advance 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 advance 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) Temporary road closures using Rolling Road Blocks (RRB) may be allowed on limited access highways for operations associated with the installation and removal of temporary lane closures. RRB may be allowed for the installation and removal of lead signs and lane tapers only and shall meet the following requirements:
- RRB may not start prior to the time allowed in the contract Limitations of Operation for sign pattern installation. Sign pattern removal must be complete prior to the time indicated in the Limitations of Operation for restoring the lanes to traffic.
 - On limited access highways with 4 lanes or more, a RRB may not start until the Limitations of Operation Chart allows a 2 lane closure. In areas with good sight lines and full shoulders, opposite side lead signs should be installed in a separate operation.
 - Truck-Mounted Impact Attenuators (TMAs) equipped with arrow boards shall be used to slow traffic to implement the RRB. State Police Officers in marked vehicles may be used to support the implementation of the RRB. The RRB shall start by having all vehicles, including Truck-Mounted Impact Attenuators TMAs and police vehicles leave the shoulder or on-ramp and accelerate to a normal roadway speeds in each lane, then the vehicles will position themselves side by side and decelerate to the RRB speed on the highway.
 - An additional Truck-Mounted Impact Attenuator TMAs equipped with a Portable Changeable Message Sign shall be utilized to advise the motorists that sign pattern installation / removal is underway. The Pre-Warning Vehicle (PWV) should be initially positioned in the right shoulder ½ mile prior to the RRB operation. If a traffic queue reaches the PWV's initial location, the contractor shall slowly reverse the PWV along the shoulder to position itself prior to the new back of queue. A Pre-Warning Vehicle, as specified elsewhere in the contract, shall be utilized to advise the motorists that sign pattern installation / removal is underway.
 - The RRB duration shall not exceed 15 minutes from start of the traffic block until all lanes are opened as designated in the Limitation of Operation chart. If the RRB duration exceeds 15 minutes on 2 successive shifts, no further RRB will be allowed

- until the Contractor obtains approval for a revised installation procedure from the respective construction District.
- RRB should not be utilized to expand a lane closure pattern to an additional lane during the shift. The workers and equipment required to implement the additional lane closure should be staged from within the closed lane. Attenuator trucks (and State Police if available) should be used to protect the workers installing the taper in the additional lane.
 - Exceptions to these work procedures may be submitted to the District Office for consideration. A minimum of 2 business days should be allowed for review and approval by the District.
 - The RRB procedures (including any approved exceptions) will be reviewed and discussed by the inspection team and the Contractor in advance of the work. The implementation of the agreed upon plan will be reviewed with the State Police during the Work Zone Safety meeting held before each shift involving temporary lane closures. If the State Police determine that alternative procedures should be implemented for traffic control during the work shift, the Department and Contractor will attempt to resolve any discrepancies with the duty sergeant at the Troop. If the discrepancies are unable to be resolved prior to the start of the shift, the work will proceed as recommended by the Department Trooper. Any unresolved issues will be addressed the following day.
- 3.e) The Contractor must adhere to using the proper signs, placing the signs correctly, and ensuring the proper spacing of signs.
- 3.f) Additional devices are required on entrance ramps, exit ramps, and intersecting roads to warn and/or move traffic into the proper travel path prior to merging/exiting with/from the main line traffic. This shall be completed before installing the mainline pattern past the ramp or intersecting roadway.
- 3.g) Prior to installing a pattern, any conflicting existing signs shall be covered with an opaque material. Once the pattern is removed, the existing signs shall be uncovered.
- 3.h) On limited access roadways, workers are prohibited from crossing the travel lanes to install and remove signs or other devices on the opposite side of the roadway. Any signs or devices on the opposite side of the roadway shall be installed and removed separately.

SECTION 4. USE OF HIGH MOUNTED INTERNALLY ILLUMINATED FLASHING ARROW

- 4.a) On limited access roadways, one Flashing Arrow shall be used for each lane that is closed. The Flashing Arrow shall be installed concurrently with the installation of the traffic control pattern and its placement shall be as shown on the traffic control plan. For multiple lane closures, one Flashing Arrow is required for each lane closed. If conditions warrant, additional Flashing Arrows should be employed (i.e.: curves, major ramps, etc.).

- 4.b) On non-limited access roadways, the use of a Flashing Arrow for lane closures is optional. The roadway geometry, sight line distance, and traffic volume should be considered in the decision to use the Flashing Arrow.
- 4.c) The Flashing Arrow shall not be used on two lane, two-way roadways for temporary alternating one-way traffic operations.
- 4.d) The Flashing Arrow board display shall be in the “arrow” mode for lane closure tapers and in the “caution” mode (four corners) for shoulder work, blocking the shoulder, or roadside work near the shoulder. The Flashing Arrow shall be in the “caution” mode when it is positioned in the closed lane.
- 4.e) The Flashing Arrow shall not be used on a multi-lane roadway to laterally shift all lanes of traffic, because unnecessary lane changing may result.

SECTION 5. USE OF TRUCK MOUNTED OR TRAILER 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 “Truck-Mounted or Trailer-Mounted Impact Attenuator”. 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. If it is used as a TMA and is in the proper location as specified, then it should be paid at the specified hourly rate for “Truck-Mounted or Trailer-Mounted Impact Attenuator”. 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 is also used as a Flashing Arrow in the same day, then the unit should be paid as a “Truck-Mounted or Trailer-Mounted Impact Attenuator” for the hours used to install and remove the pattern, typically 2 hours (1 hour to install and 1 hour to remove). If the TMA is also used as a Flashing Arrow during the same day, then the unit should be paid at the daily rate as a “High Mounted Internally Illuminated Flashing Arrow”.

SECTION 6. USE OF TRAFFIC DRUMS AND TRAFFIC CONES

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

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

7.a) For lane closures on limited access roadways, one CMS shall be used in advance of the traffic control pattern. Prior to installing the pattern, the CMS shall be installed and in operation, displaying the appropriate lane closure information (i.e.: Left Lane Closed - Merge Right). The CMS shall be positioned ½ - 1 mile ahead of the lane closure taper. If the nearest Exit ramp is greater than the specified ½ - 1 mile distance, than an additional CMS shall be positioned a sufficient distance ahead of the Exit ramp to alert motorists to the work and therefore offer them an opportunity to take the exit.

7.b) CMS should not be installed within 1000 feet of an existing CMS.

7.c) On non-limited access roadways, the use of CMS for lane closures is optional. The roadway geometry, sight line distance, and traffic volume should be considered in the decision to use the CMS.

7.d) The advance CMS is typically placed off the right shoulder, 5 feet from the edge of pavement. In areas where the CMS cannot be placed beyond the edge of pavement, it may be placed on the paved shoulder with a minimum of five (5) traffic drums placed in a taper in front of it to delineate its position. The advance CMS shall be adequately protected if it is used for a continuous duration of 36 hours or more.

7.e) When the CMS are no longer required, they should be removed from the clear zone and have the display screen cleared and turned 90° away from the roadway.

7.f) The CMS generally should not be used for generic messages (ex: Road Work Ahead, Bump Ahead, Gravel Road, etc.).

7.g) The CMS should be used for specific situations that need to command the motorist's attention which cannot be conveyed with standard construction signs (Examples include: Exit 34 Closed Sat/Sun - Use Exit 35, All Lanes Closed - Use Shoulder, Workers on Road - Slow Down).

7.h) Messages that need to be displayed for long periods of time, such as during stage construction, should be displayed with construction signs. For special signs, please coordinate with the Office of Construction and the Division of Traffic Engineering for the proper layout/dimensions required.

7.i) The messages that are allowed on the CMS are as follows:

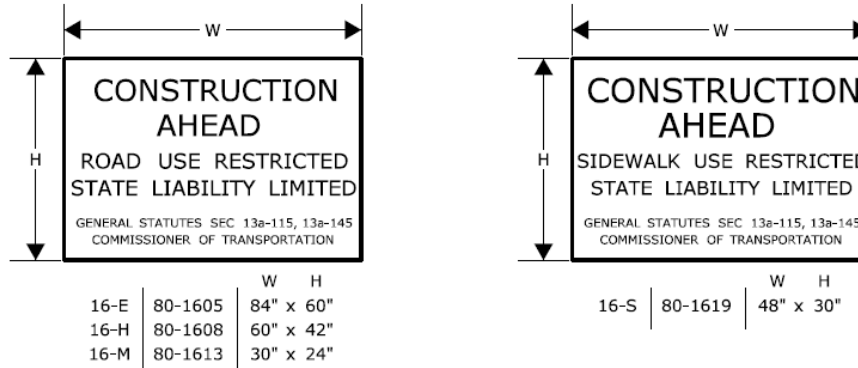
<u>Message No.</u>	<u>Frame 1</u>	<u>Frame 2</u>	<u>Message No.</u>	<u>Frame 1</u>	<u>Frame 2</u>
1	LEFT LANE CLOSED	MERGE RIGHT	9	LANES CLOSED AHEAD	REDUCE SPEED
2	2 LEFT LANES CLOSED	MERGE RIGHT	10	LANES CLOSED AHEAD	USE CAUTION
3	LEFT LANE CLOSED	REDUCE SPEED	11	WORKERS ON ROAD	REDUCE SPEED
4	2 LEFT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

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

SECTION 8. USE OF STATE POLICE OFFICERS

- 8.a) State Police may be utilized only on limited access highways and secondary roadways under their primary jurisdiction. One Officer may be used per critical sign pattern. Shoulder closures and right lane closures can generally be implemented without the presence of a State Police Officer. Likewise in areas with moderate traffic and wide, unobstructed medians, left lane closures can be implemented without State Police presence. Under some situations it may be desirable to have State Police presence, when one is available. Examples of this include: nighttime lane closures; left lane closures with minimal width for setting up advance signs and staging; lane and shoulder closures on turning roadways/ramps or mainline where sight distance is minimal; and closures where extensive turning movements or traffic congestion regularly occur, however they are not required.
- 8.b) Once the pattern is in place, the State Police Officer should be positioned in a non-hazardous location in advance of the pattern. If traffic backs up beyond the beginning of the pattern, then the State Police Officer shall be repositioned prior to the backup to give warning to the oncoming motorists. The State Police Officer and TMA should not be in proximity to each other.
- 8.c) Other functions of the State Police Officer(s) may include:
- Assisting entering/exiting construction vehicles within the work area.
 - Enforcement of speed and other motor vehicle laws within the work area, if specifically requested by the project.
- 8.d) State Police Officers assigned to a work site are to only take direction from the Engineer.

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.

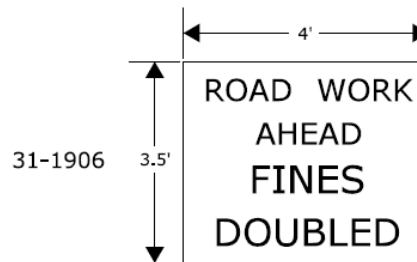
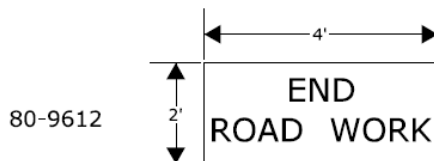
REGULATORY SIGN "ROAD WORK AHEAD, FINES DOUBLED"

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

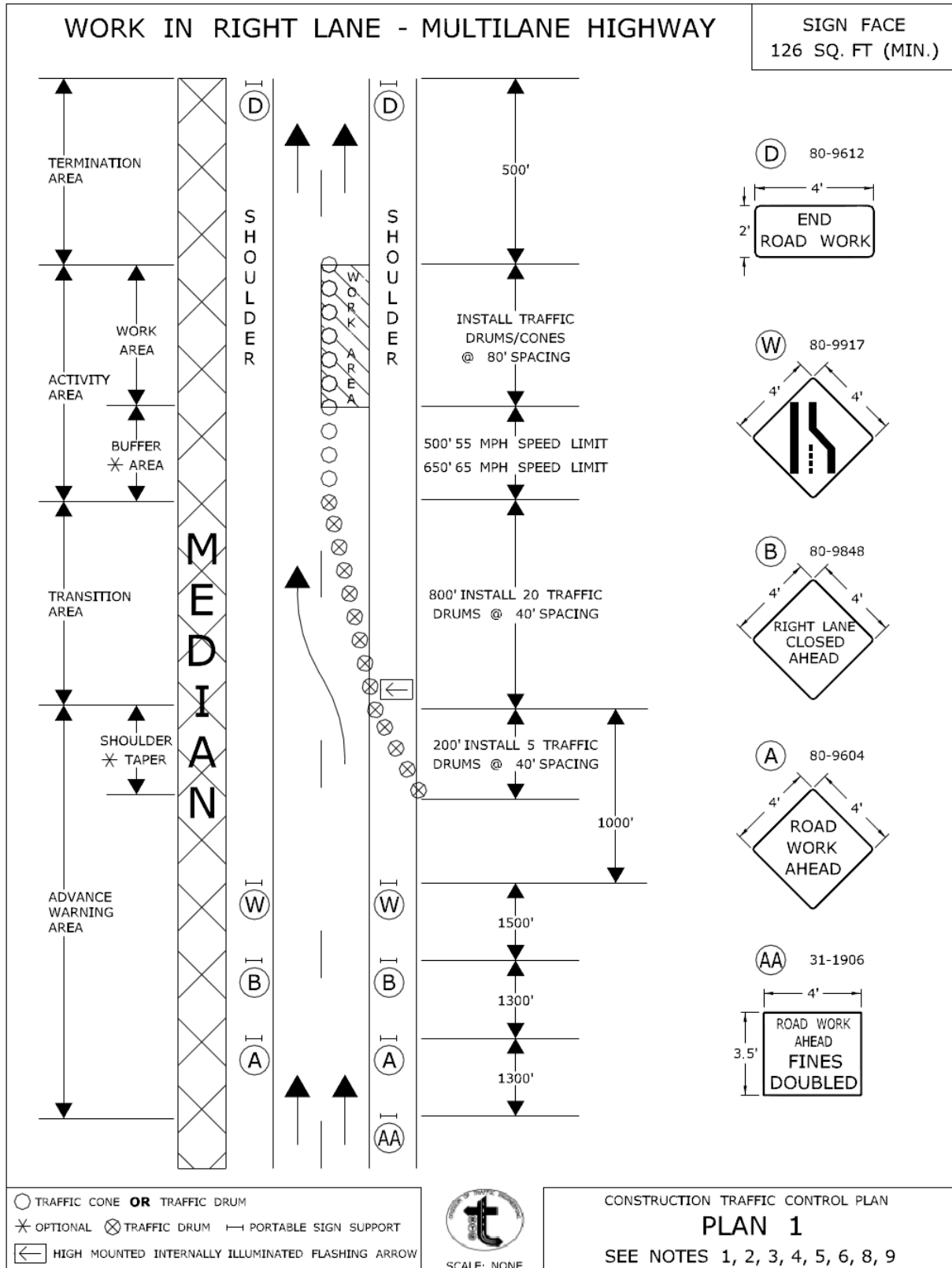
CONSTRUCTION TRAFFIC CONTROL PLAN NOTES

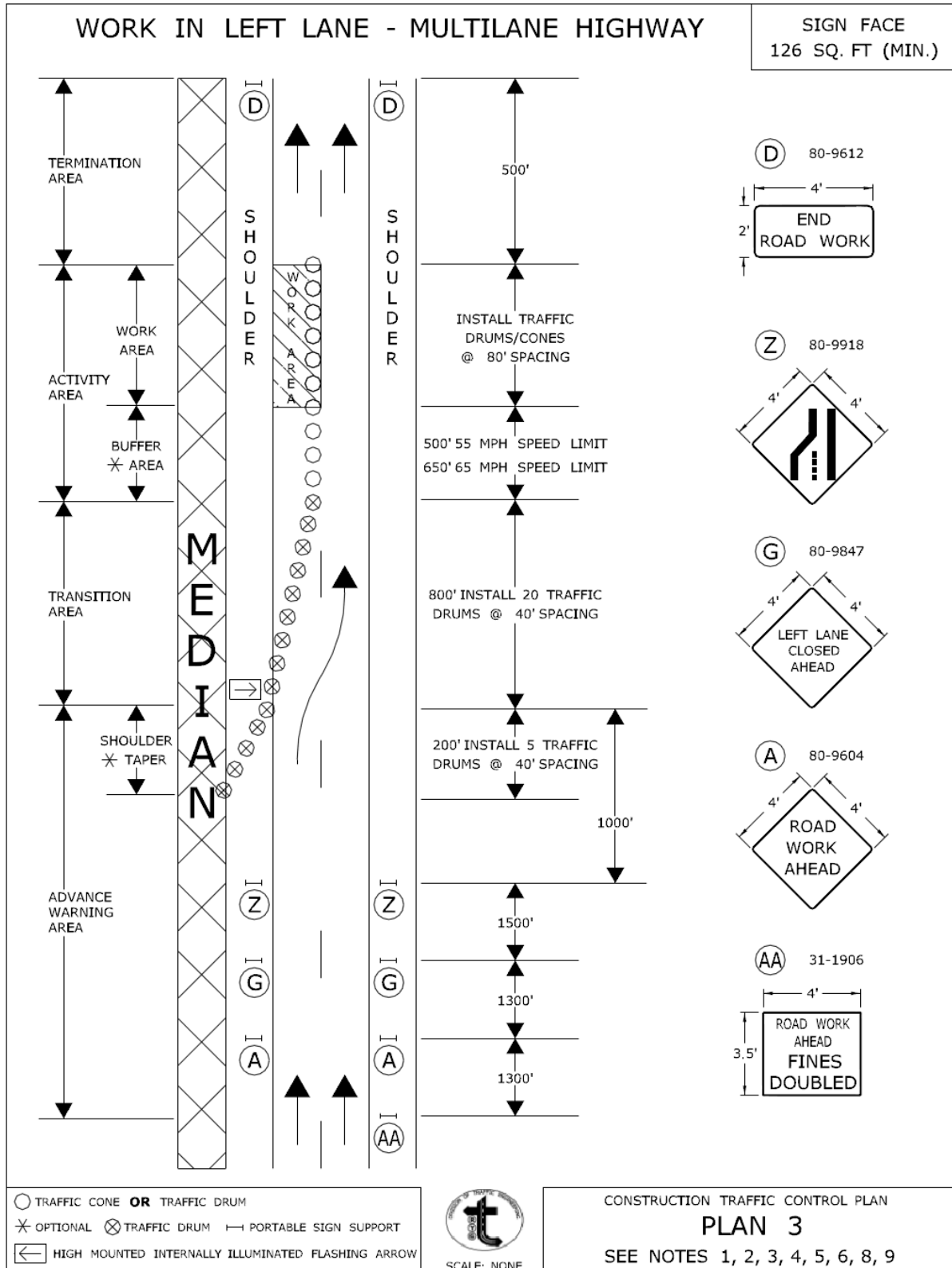
CONNECTICUT DEPARTMENT OF TRANSPORTATION
BUREAU OF ENGINEERING & CONSTRUCTION

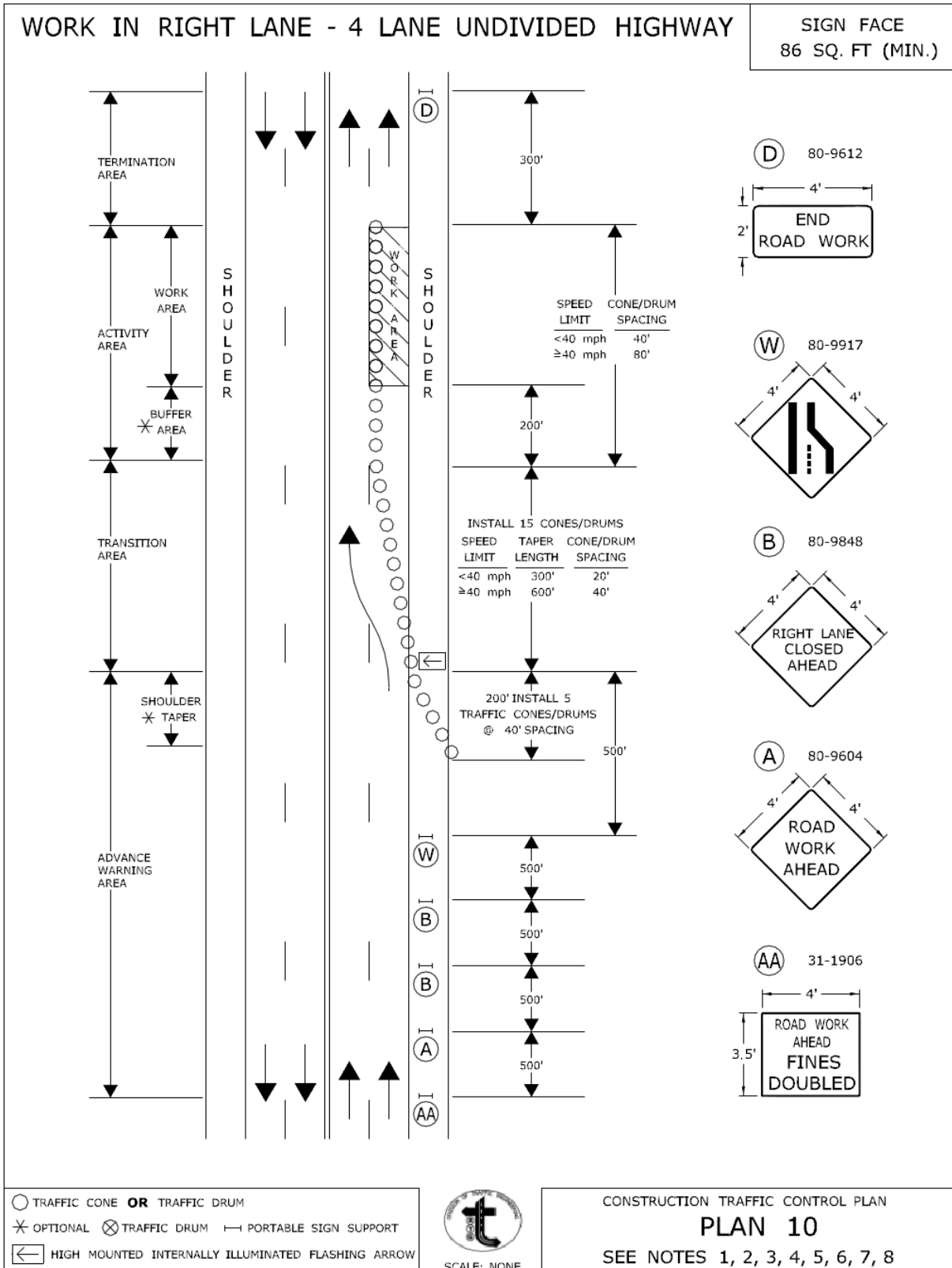
APPROVED

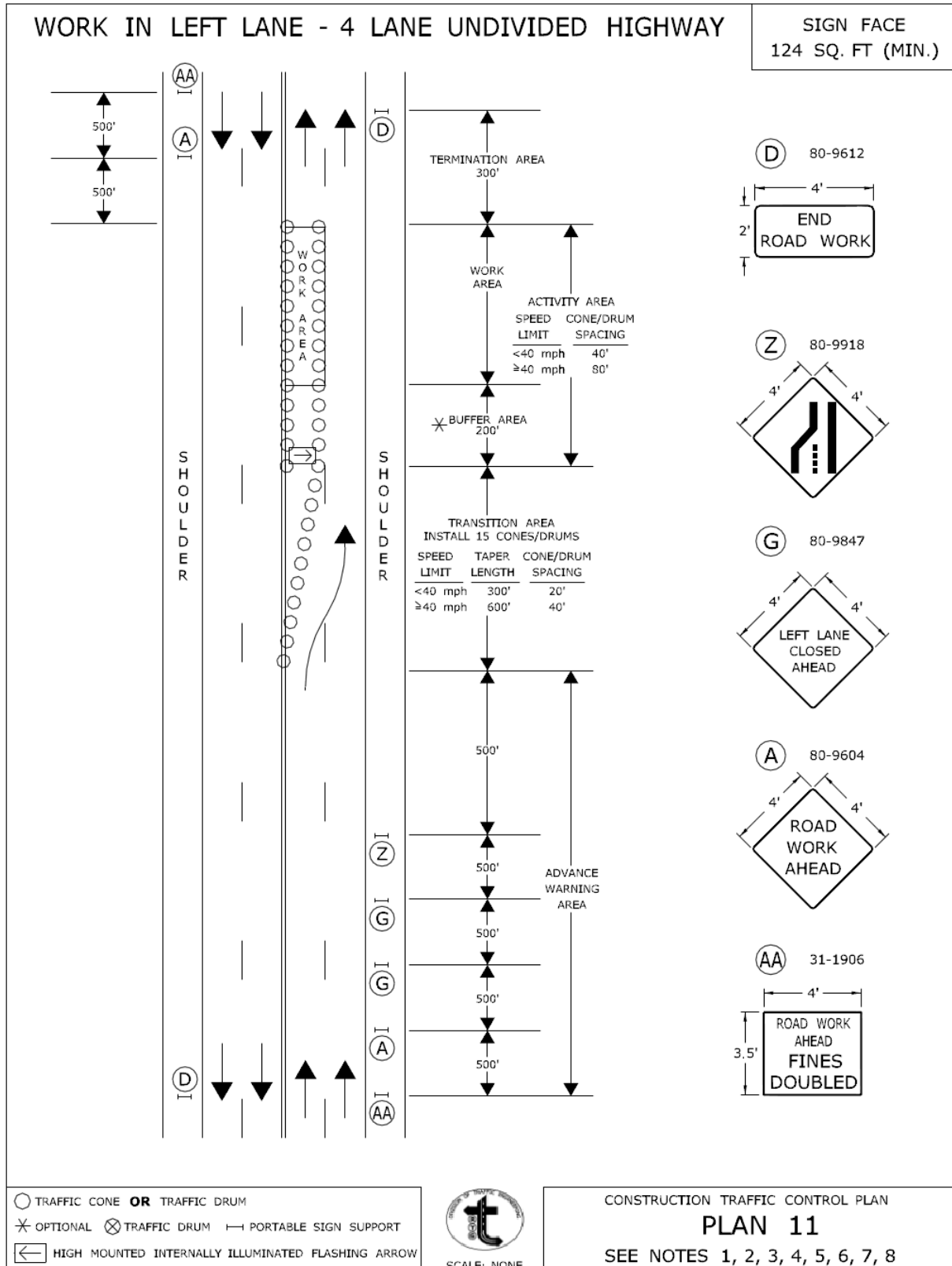
Charles S. Harlow
PRINCIPAL ENGINEER

Charles S. Harlow
2012.06.05 15:50:35-0400









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



SCALE: NONE

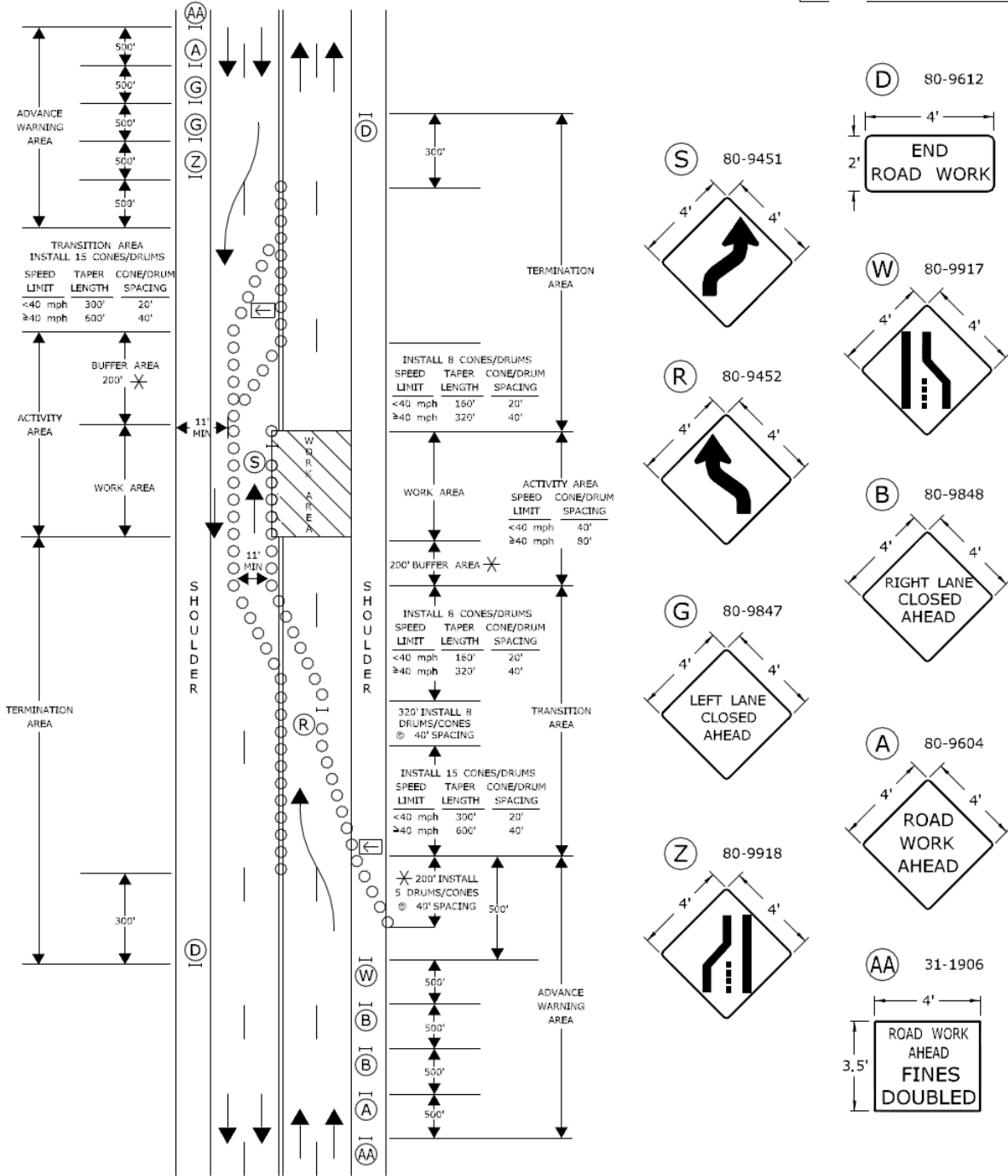
CONSTRUCTION TRAFFIC CONTROL PLAN
PLAN 11
SEE NOTES 1, 2, 3, 4, 5, 6, 7, 8

CONNECTICUT DEPARTMENT OF TRANSPORTATION
BUREAU OF ENGINEERING & CONSTRUCTION

APPROVED *Charles S. Harlow*
PRINCIPAL ENGINEER
Charles S. Harlow
2012.08.05 15:54:36-0400'

WORK IN BOTH LANES - 4 LANE UNDIVIDED HIGHWAY

SIGN FACE
204 SQ. FT. (MIN.)



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

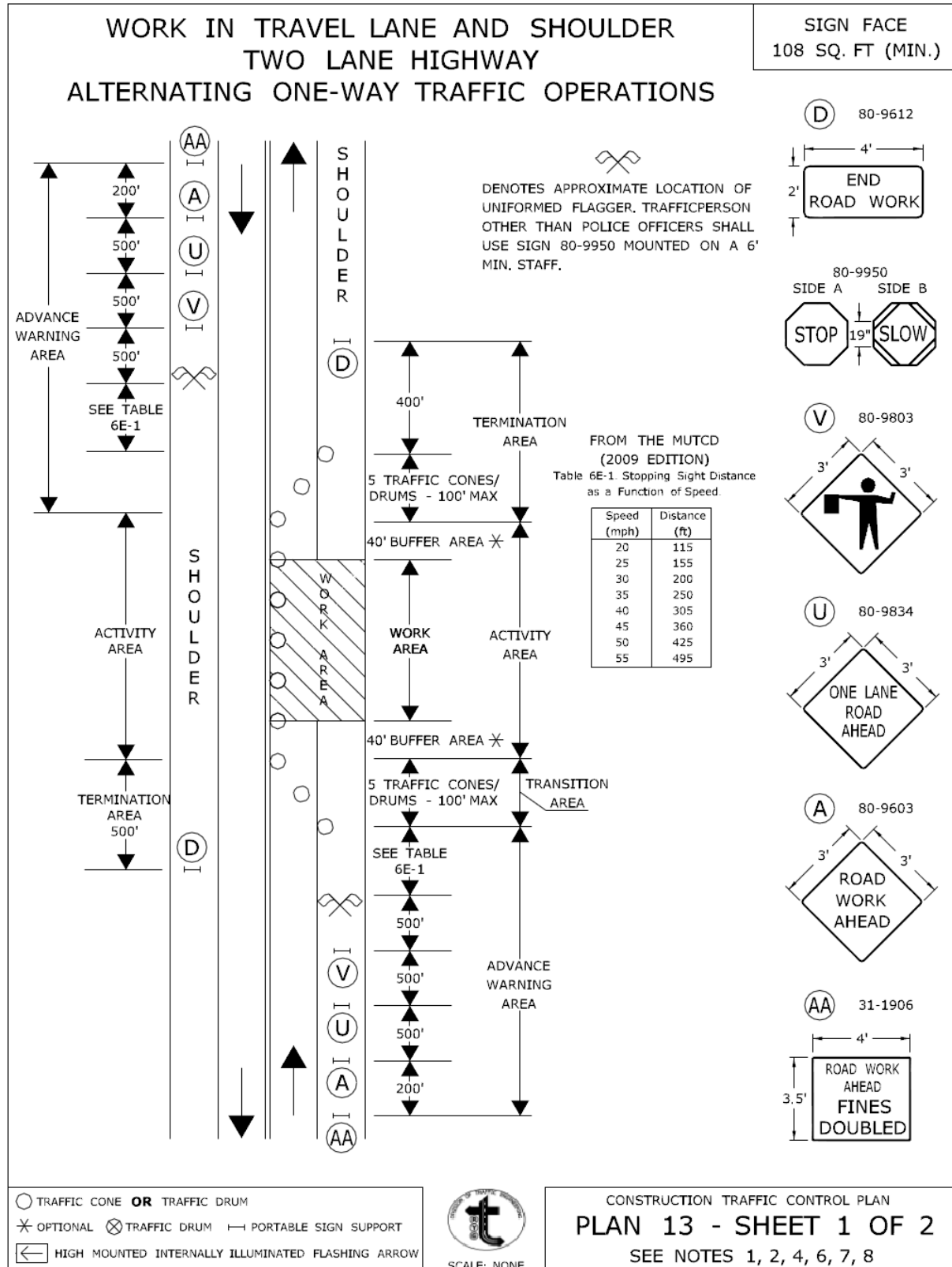


CONSTRUCTION TRAFFIC CONTROL PLAN
PLAN 12
SEE NOTES 1, 2, 3, 4, 5, 6, 7, 8

SCALE: NONE

CONNECTICUT DEPARTMENT OF TRANSPORTATION
BUREAU OF ENGINEERING & CONSTRUCTION

APPROVED *Charles S. Harlow*
PRINCIPAL ENGINEER
Charles S. Harlow
2012.06.05 15:55:01-0400'



CONNECTICUT DEPARTMENT OF TRANSPORTATION
BUREAU OF ENGINEERING & CONSTRUCTION

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

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

SIGN FACE
108 SQ. FT (MIN.)

HAND SIGNAL METHODS TO BE USED BY UNIFORMED FLAGGERS

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

A. TO STOP TRAFFIC

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



B. TO DIRECT TRAFFIC TO PROCEED

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



C. TO ALERT OR SLOW TRAFFIC

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



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

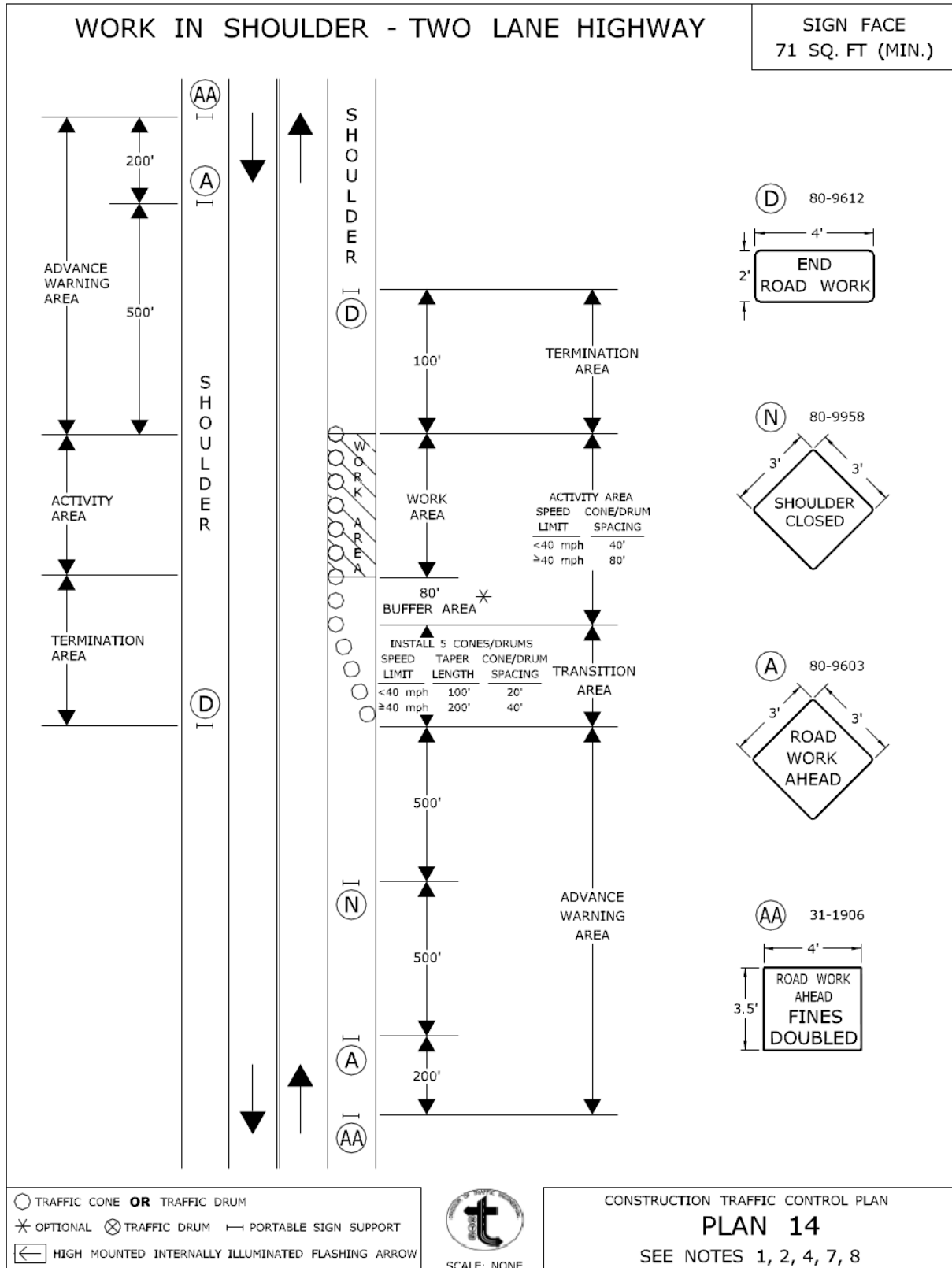


SCALE: NONE

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

CONNECTICUT DEPARTMENT OF TRANSPORTATION
BUREAU OF ENGINEERING & CONSTRUCTION

APPROVED *Charles S. Harlow*
PRINCIPAL ENGINEER
Charles S. Harlow
2012.06.05 15:55:45-04'00'



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

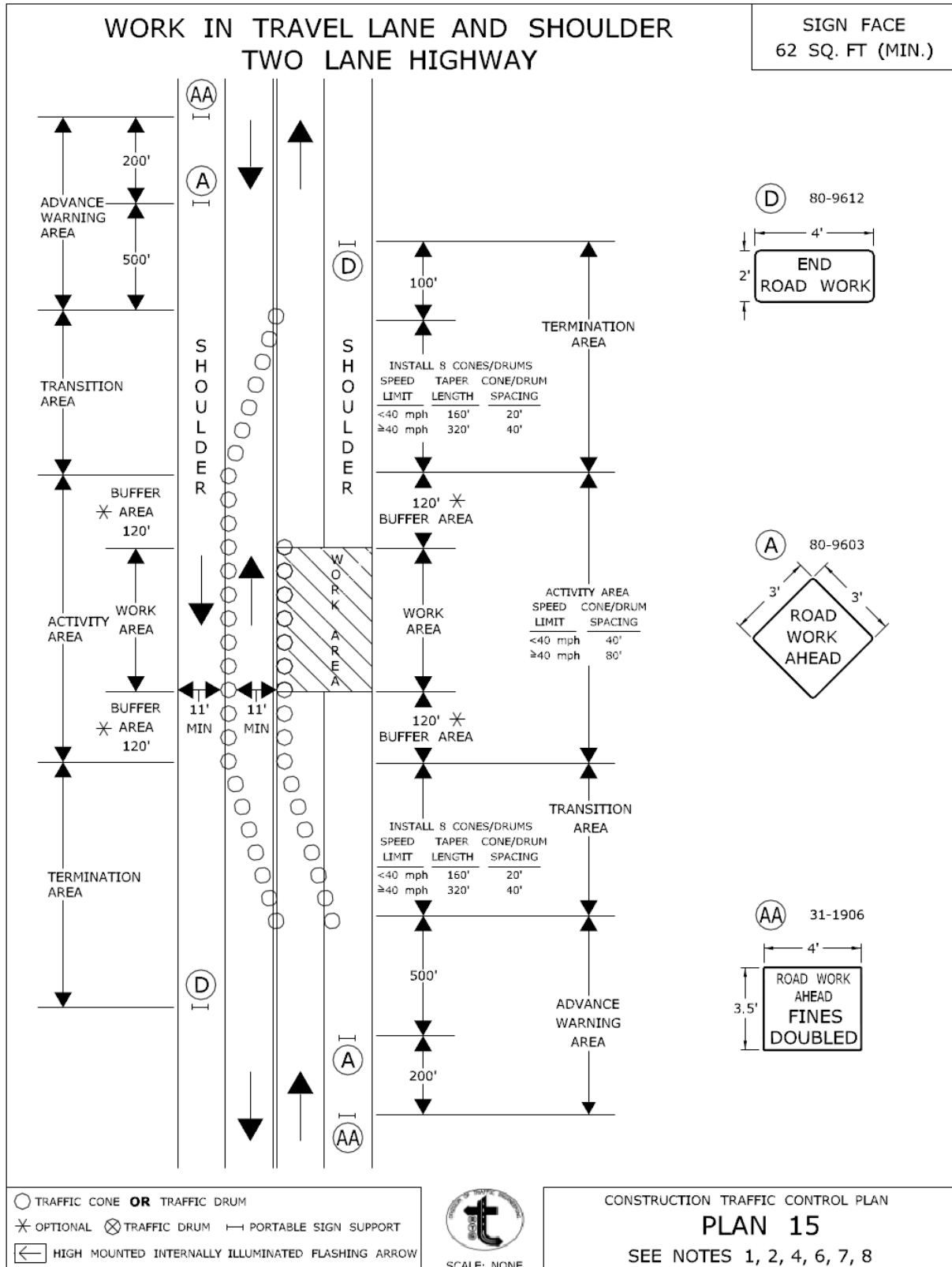


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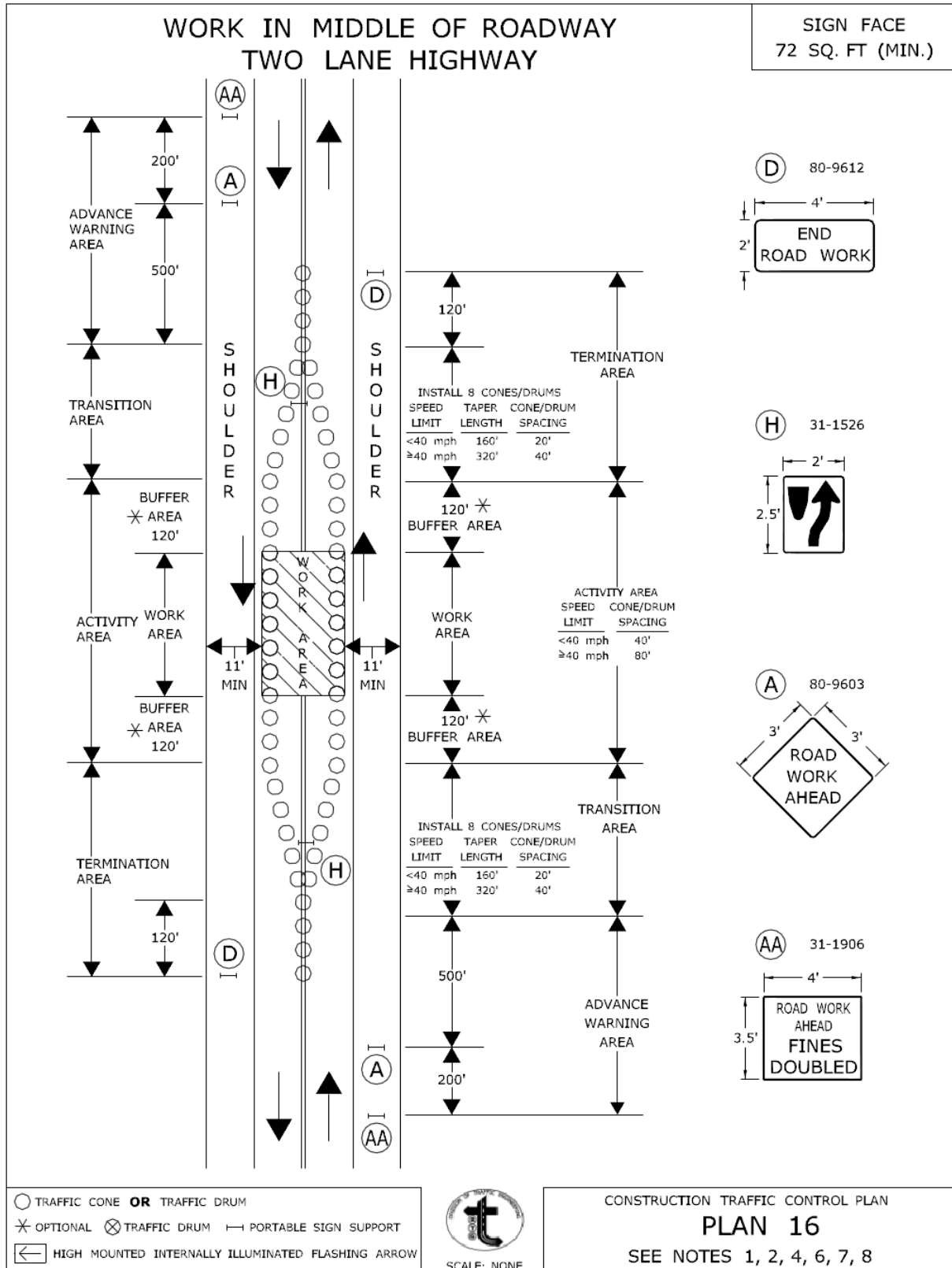
CONSTRUCTION TRAFFIC CONTROL PLAN
PLAN 14
 SEE NOTES 1, 2, 4, 7, 8

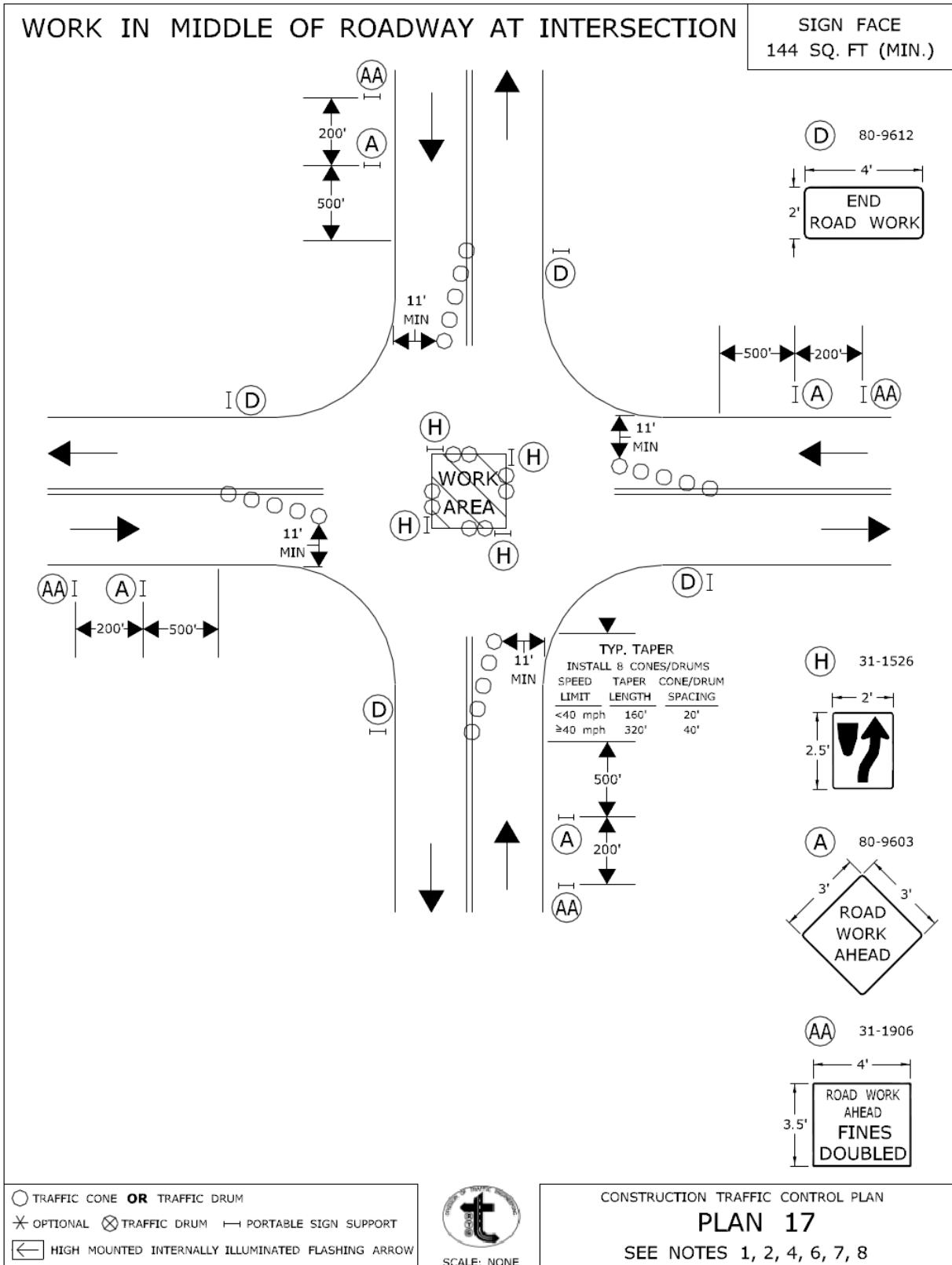
CONNECTICUT DEPARTMENT OF TRANSPORTATION
 BUREAU OF ENGINEERING & CONSTRUCTION

APPROVED *Charles S. Harlow*
 PRINCIPAL ENGINEER
 Charles S. Harlow
 2012.08.05 15:56:09-04'00"



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





○ 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* 2012.08.05 15:57:16-04'00"
 PRINCIPAL ENGINEER

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

The temporary relocation of signs and supports, and the furnishing, installation and removal of any temporary supports shall be paid for under the item “Maintenance and Protection of Traffic”. Temporary overhead sign supports and foundations shall be paid for under the appropriate item(s).

The cost of furnishing, installing, and removing the material for the 4H:1V traversable slope shall be paid for under the item “Maintenance and Protection of Traffic.”

ITEM #0971999A – WRECKER SERVICE

Description:

Wrecker service for the purpose of towing disabled vehicles from the project area and approaches, as directed by the Engineer or the Municipal Police, will be provided during the period of construction activities as follows:

From the hours of 6:00 AM – 9:00 AM and 3:00 PM – 7:00 PM, two wreckers will be stationed within the project limits, unless otherwise directed by the Engineer and/or Municipal Police.

Materials:

The wrecker equipment shall be of sufficient size to remove passenger cars and light trucks. It shall be in good condition and well maintained at all times. It shall be equipped with dispatch radio/car phone equipment. The wrecker shall have wheel lift capacity.

The wrecker equipment must be contracted for from a dealer or repairer company licensed by the Connecticut Motor Vehicle Department for Wrecker Service. The dealer or repairer company must also be on a Municipal Police “Wrecker Rotation List”.

Construction Methods:

The wrecker(s) shall tow the disabled vehicle(s) from the project limits and the transition areas preceding and following the project limits to a designed location established by the Contractor for each construction stage and approved by the Engineer.

Upon arrival at the towing scene, the wrecker operator shall transmit the vehicle’s registration information to the Municipal Police.

Upon delivery of the disabled vehicle to the approved location, the wrecker shall be required to immediately return to its assigned duty station, thus providing maximum wrecker coverage during the specified duty hours.

In the event of an accident, no vehicle(s) is (are) to be moved until clearance is given by the investigating Municipal Police Officer. Once clearance is received, the above procedure is to be utilized.

If it is determined that the vehicle to be towed is stolen, the wrecker company will make arrangements to have the vehicle immediately removed to the wrecker company’s yard, unless otherwise directed by the Municipal Police.

During the period when the wrecker service is required, the Contractor will maintain a towing log. At the end of each period of wrecker service, a copy of the towing log will be submitted to the Engineer and the Municipal Police. The towing log will indicate the vehicles towed, time

and disposition at the end of each day. The wrecker company will be responsible for the vehicles that are towed until they are removed from the designated towing location by the Owner, or wrecker company from the Municipal Police “Wrecker Rotation List”.

Method of Measurement:

Wrecker services provided will be measured for payment by the number of hours for each wrecker that is made available for coverage and authorized by the Engineer.

Basis of Payment:

This work will be paid for at the contract unit price per hour for “Wrecker Service”, which price shall include cost of furnishing, operating and maintaining the vehicles, as well as insurance costs or liabilities incidental to wrecker service.

No additional billing to the recipient of the wrecker service will be allowed for under this item of work.

Pay Item

Pay Unit

Wrecker Service

hr.

ITEM #0973723A – WORKSITE TRAFFIC SUPERVISOR

Description:

The Contractor shall furnish the services of a certified person(s) to act as a Worksite Traffic Supervisor(s) on Site for each workday that traffic control devices are being used. This individual(s) must be certified through the American Traffic Safety Services Association (ATSSA) as a Traffic Control Supervisor or a similar training course acceptable to CTDOT. The individual(s) must have taken the course, passed the exam and have certification or have applied for certification to be accepted or conditionally accepted for this position by the Department. If not already certified, certification must be obtained within 2 months of conditional acceptance by the Department. Certification must be maintained throughout the duration of the Project. The certified Worksite Traffic Supervisor(s) may be employee(s) of the Contractor or a subcontractor however, the Worksite Traffic Supervisor must be dedicated to this role with no other Project responsibilities.

The Worksite Traffic Supervisor(s) shall be designated by name, in writing, with a resume of their qualifications within fourteen (14) calendar days after award and shall not be changed without prior written notice to the Department.

Construction Methods:

Worksite Traffic Supervisor(s) shall be present, on Site throughout each work shift where temporary traffic control signing is employed. During periods when no temporary traffic control signing is employed Worksite Traffic Supervisor(s) shall inspect the permanent traffic control signing a minimum of once each weekday (i.e. Monday through Friday).

The Worksite Traffic Supervisor's duties shall include, but are not limited to, the following:

Monitor installation, relocation, removal, cleaning and aligning of construction signing patterns, signs and sign supports, existing signs or signs required on the Project.

Assure all signing and pavement marking installation (both temporary and permanent) deficiencies caused by construction or vehicular traffic are corrected by the Contractor's forces.

Inspect all traffic control devices and pavement markings in use on a daily basis for proper installation in accordance with the Contract traffic control plans, CTDOT standards, and MUTCD requirements.

Monitor and enforce compliance by workers in the wearing of high visibility protective clothing and other safety related clothing.

Inspect and notify the Engineer of any deficiencies to traffic related mechanical devices located on the Project and the corrective actions to be taken.

Perform a monthly inventory of all construction signing, cones, drums and traffic control devices to assure compliance with the "Quality Standards for Work Zone Traffic Control Devices" as published by ATSSA. Assure removal from service of all "marginal" or "unacceptable" devices.

Monitor work zone signing and safety practices of all subcontractors on the Project to ensure their compliance with work zone safety requirements.

Recommend and implement enhancements to the Traffic Control Plan to meet Site conditions.

Monitor installed traffic control patterns and devices a minimum of four (4) times per shift and assure implementation of any necessary corrections.

Maintain a weekly log of all Worksite Traffic activities and provide to the Engineer by noon on Monday of the following week.

Conduct weekly inspections with the Engineer of all worksite traffic control signs, drums, pavement markings, Changeable Message Signs, arrow boards and other traffic control devices. Document all discussions in the Weekly Log.

Prior to the installation of any signing pattern on the Project, the Worksite Traffic Supervisor shall submit to the Engineer a copy of the proposed Weekly Worksite Traffic Safety Log to be used throughout the duration of the Project. The Weekly Log shall include at a minimum the following information:

- Date, weather conditions, temperature
- Worksite Traffic Safety Supervisor's name
- Contractor's name
- Sign pattern information including type of sign patterns installed, time of installation, modifications to standard patterns, time of removal, and time of periodic reviews of patterns
- Status of all work zone traffic control signs, devices and systems
- Condition of pavement markings with deficiencies noted and corrective action taken
- Operational problems which may include traffic flow delays, accidents, incidents within Project
- Status report on Portable Work Zone Management System with deficiencies noted and corrective action taken

In addition, prior to installing any construction signing on the Project, the Worksite Traffic Supervisor shall develop and submit to the Engineer Site-specific installation and removal plans for all temporary signing patterns and construction sign installations to be used. Worksite Traffic Supervisor(s) shall conduct safety meetings with the sign installation crew prior to installing any signing patterns on the Project, and minimum of once a month thereafter, or more frequently if required due to staffing changes or installation and removal problems.

Worksite Traffic Supervisor(s) shall conduct monthly Traffic Safety "tailgate" sessions with all workers on the Project. A report of the safety "tailgate" sessions held along with a record of attendees shall be submitted to the Engineer by the tenth (10th) day of the following month. If Worksite Traffic Supervisor(s) will not be available as required due to circumstances beyond the

control of the Contractor (i.e. Illness, etc.) the Contractor shall notify the Engineer of the absence within one (1) hour of the start of the workday (work shift).

Method of Measurement:

This work will be measured on a monthly basis. Upon receipt of the monthly report, the per month cost for the services of the "Worksite Traffic Supervisor" will be certified for payment.

Basis of Payment:

This service will be paid for at the Contract unit price per month for "Worksite Traffic Supervisor" complete, which price shall include all inspections, reports, meetings and handling of all traffic appurtenances, and all materials, equipment, labor and work incidental of this service. Only one monthly payment will be made for each calendar month regardless of the number of certified personnel required due to multiple shift operations.

Failure of the Contractor to provide Worksite Traffic Supervisor(s) as required by this specification will result in the following adjustment being applied:

A deduction of four hundred dollars (\$400.00) for each work shift that is not covered as required by this specification. A work shift is defined as any eight (8) hour period, or portion thereof. The total deduction for any calendar month may exceed the monthly bid price for the item if the Contractor fails to provide the Worksite Traffic Supervisor (except where absence is beyond the Contractor's control).

Pay Item

Pay Unit

Worksite Traffic Supervisor

mo.

ITEM #1002151A – LIGHT STANDARD FOUNDATION - CITY

DESCRIPTION: This item shall consist of furnishing and installing a pre-cast concrete light pole foundation at the location and to the dimensions and details shown on the plans, or as directed by the Engineer, and in accordance with this specification.

MATERIALS: The materials for this work shall conform to Section 10.02.02. The foundation shall be pre-cast and shall be dimensioned as indicated in the details. The foundation shall be constructed with appropriate reinforcing as indicated in the details and as recommended by the manufacturer.

CONSTRUCTION METHODS: The light pole foundation shall be installed at the location as indicated on the plans, and in accordance with Section 10.02.03. The foundation shall be installed as indicated in the details with the top 1” of the foundation extending above finished grade. The foundation shall be installed plumb, with the anchor bolts located parallel to the edge of pavement. The area around the installed foundation shall be graded and finished to match the surrounding grade.

METHOD OF MEASUREMENT: This work shall be measured for payment by the number of light pole foundations installed, complete and accepted.

BASIS OF PAYMENT: This work will be paid for at the contract unit price each for "Light Standard Foundation - City " complete and accepted in place, which price shall include the foundation, concrete, reinforcing bars, ties, conduit, anchor bolts, ground rod, excavating, backfilling, grading, replacement of surrounding surface material, and all equipment, tools, labor, and work incidental thereto.

<u>Pay Item</u>	<u>Pay Unit</u>
Light Standard Foundation – City	ea.

ITEM #1002201A – TRAFFIC CONTROL FOUNDATION – SPAN POLE

Description: Work under this item shall consist of designing and constructing drilled shaft foundations for steel span poles, in accordance with the details shown on the plans and as ordered by the Engineer.

Materials: The reinforcing steel shall be uncoated, ASTM A615, Grade 60 reinforcement conforming to the requirements of Article M.06.01.

The concrete for the drilled shaft shall conform to Article M.03 for Class PCC04460. The compressive strength of the concrete in the constructed foundation shall conform to the requirements of 6.01- Concrete for Structures and M.03 – Portland Cement Concrete. 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 0.625 in. diameter by 10.0 ft. long copper clad steel. The copper cladding shall be a minimum thickness of 0.128 in. The ground clamp shall be a square-head bolt type, approved for direct burial.

Bare copper wire shall conform to Article M.15.13.

Topsoil shall conform to Article M.13.01.

Fertilizer shall conform to Article M.13.03.

Seed mixture shall conform to Article M.13.04.

Mulch shall conform to Article M.13.05.

Erosion control matting shall conform to Article M.13.09.

Construction Methods: For the purpose of bidding this item, the Contractor shall assume that the subsurface conditions for each drilled shaft foundation location consists of cohesionless, medium dense, granular soil (AASHTO A-1 or A-2) with cobbles present and a high groundwater table which requires the use of wet construction/concreting methods. During excavation and construction of each foundation, should the Contractor encounter subsurface conditions that differ materially from those assumed at the time of bid, the Contractor shall

notify the Engineer. All matters regarding increased cost relating to an agreed upon change in subsurface conditions will be handled per Section 1.04.04 – Differing Site Conditions.

The design of drilled shaft foundations shall conform to the requirements of AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaries and Traffic Signals – latest edition, including the latest interim specifications, available prior to the advertising date of the contract, amended as follows:

1. The foundation shall be designed for the soils and rock properties and parameters based on the subsurface conditions (character of the soil and rock, presence of ground water, etc.) in the location of, adjacent to and below the drilled shaft foundation excavation. The need and extent of all subsurface explorations and investigations shall be determined by the Contractor.
2. The compressive strength, f'_c , of the concrete used in the design shall be 4,000 psi.
3. The reinforcement shall be uncoated and conform to ASTM A615, Grade 60.
4. The foundation shall be designed for the span pole reactions of all group loads and load combinations. The reactions shall include axial, shear, flexural and torsional load effects. No reduction of the reactions or increase in the allowable stresses of the materials is permitted.
5. The diameter of the drilled shaft foundation shall be 3.0 ft., unless otherwise allowed by the Engineer.
6. 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.
7. The design of the drilled shaft embedment depth shall account for the slope of the finished grade.
8. The minimum embedment for a drilled shaft foundation, constructed entirely in soil, shall be no less than 12.0 ft. below the finished grade at the low side of a sloping grade. The minimum embedment for a drilled shaft foundation, constructed entirely in rock shall be no less than 8.0 ft. below the finished grade at the low side of a sloping grade.
9. 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.

10. 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.
11. The structural design of the drilled shaft shall be based on stress and strain compatibility in the circular drilled shaft cross section.
12. 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.
13. 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 in., 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.
14. 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 in. The minimum spacing/pitch of the transverse reinforcement shall be no more than 4 in. 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.
15. The design of the foundation shall be coordinated with the traffic structure to avoid conflicts between the embedded support anchorage and the foundation reinforcement.

Prior to excavating for the foundation, the Contractor shall submit working drawings and design calculations, with all details and documents necessary for fabrication and construction, for each span pole foundation in a **span wire structure configuration** for review in accordance with Article 1.05.02.

The working drawings and design calculations for the span pole foundations shall conform to working drawing requirements for permanent construction. **A single set of working drawings with tabulated data for multiple span pole foundations in span wire structure configuration is allowed.** Each span pole foundation shall be referenced with an alpha-numeric identifier noted on the Contract documents. The working drawings and calculations shall be prepared in Customary U.S. units.

The span pole foundation working drawing and calculation submittal shall include the following:

1. title sheet
2. table of contents
3. contact information for designer – contact information shall include name and address of design firm, name of contact person with phone number and email address
4. copy of the certificate of insurance
5. foundation working drawings
6. foundation design calculations

The working drawings shall include complete details of all foundation components. The drawings shall include, but not be limited to the following:

1. the Project number, town and support identification number
2. reference to the design specifications, including interim specifications
3. material specifications for all components
4. embedment depths for foundation in soil, rock and a combination of soil and rock
5. anchor bolt details, including dimensions, embedment and projection

The design calculations shall include, but not be limited to the following:

1. the Project number, town and support identification number
2. references to design specifications, including interim specifications, and the applicable code section and articles
3. description/documentation for all computer programs used in the design
4. 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
5. traffic structure reactions of all group loads and load combinations
6. soil and rock design parameters
7. computations demonstrating the geotechnical and structural capacity of the drilled shaft is adequate for all group load combinations

Prior to excavating for the foundation, the Contractor shall submit the following:

Reinforcing Steel Shop Drawings: Based on the reviewed foundation design, the Contractor shall prepare reinforcing steel shop drawings for each foundation. The drawings shall be reviewed and stamped by the foundation designer. Four copies of each reviewed 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 “Engineer of Record”.

Concrete and Slurry Mix Designs: The Contractor shall submit to the District Engineer the concrete mix design and the slurry mix design, including admixtures, for review.

Foundation Construction Procedure: The Contractor shall submit to the District Engineer a written foundation construction procedure outlining the equipment; drilling procedure for soil and rock, including removal of obstructions and removal of excavated spoils; temporary casing placement and removal; slurry placement; reinforcement, anchor bolt and conduit placement; and concrete placement required for the drilled shaft foundation construction for review. The procedure should include contingencies for the various soil, rock and subsurface water conditions that may be encountered during the foundation construction.

The Engineer will evaluate the foundation construction procedure for conformance with the contract documents and will then notify the Contractor of any additional information required and/or changes necessary to meet the contract requirements. All procedural approvals given by the Engineer shall be subject to trial in the field and shall not relieve the Contractor of the responsibility to

satisfactorily complete the work as detailed in the plans and specifications. The Contractor shall not commence construction of the drilled shafts until the Engineer has accepted the foundation construction procedure.

Excavations required for shafts shall be performed through whatever materials are encountered, to the dimensions and elevations in the working drawings or as ordered by the Engineer. The methods and equipment used shall be suitable for the intended purpose and materials encountered. Shaft excavation may be performed by combinations of augering, rotary drilling, down-the-hole hammer, reverse circulation drilling, clamming, scraping, or other means approved by the Engineer. Generally, either the dry method, wet method, or temporary casing method may be used, as necessary, to produce sound, durable concrete foundation shafts free of defects. The Contractor shall select and use the method that is needed to properly accomplish the work, as determined by site conditions and subject to the approval of the Engineer. The Contractor is responsible for maintaining the stability of the shaft excavation during all phases of construction.

The dry method consists of drilling the shaft excavation, removing accumulated water and loose material from the excavation, and placing the shaft concrete in a relatively dry excavation. The dry construction method shall be used only at sites where the groundwater table and site conditions are suitable to permit construction of the shaft in a relatively dry excavation, and where the sides and bottom of the shaft are stable and may be visually inspected prior to placing the concrete. The use of the dry construction method is permitted if less than one foot of water accumulates in the bottom of a hole without pumping over a one hour period, the excavation remains stable and any loose material and water can be removed prior to placement of concrete.

The wet construction method shall be used at sites where a dry excavation cannot be maintained for placement of the shaft concrete. Wet construction methods consist of using a mineral slurry to maintain stability of the hole perimeter while advancing the excavation to final depth, placing the reinforcing cage and shaft concrete. This procedure may require desanding and cleaning the slurry; final cleaning of the excavation by means of a bailing bucket, air lift, submersible pump or other devices; and placing the shaft concrete with a tremie. Unless it is demonstrated to the satisfaction of the Engineer that the surface casing is not required, temporary surface casings shall be provided to aid shaft alignment and position, and to prevent sloughing of the top of the shaft excavation. Surface casing is defined as the amount of casing required from the ground surface to a point in the shaft excavation where sloughing of the surrounding soil does not occur.

The temporary casing construction method shall be used at all sites where the dry or wet construction methods are inappropriate. Temporary casing construction method consists of advancing the excavation through caving material by the wet method. Temporary casing may be installed by driving or vibratory procedures in advance of excavation to the lower limits of the caving material. When a nearly impervious formation is reached, a casing is placed in the hole and sealed in the nearly impervious formation. After the drilling fluid is removed from the casing, drilling may proceed as with the dry method except that the casing is withdrawn when the shaft concrete is placed. If seepage conditions prevent use of the dry method, excavation is completed using the wet method. Temporary casing may be installed by driving or vibratory

procedures in advance of excavation to the lower limits of the caving material. Slurry may be omitted if the casing can be installed with only minor caving of the hole.

If the Engineer determines that the foundation material encountered during excavation is unsuitable or differs from that anticipated in the design of the shaft, or if rock is encountered at an unanticipated elevation, the Contractor's foundation designer shall determine if the foundation embedment should be revised from that shown on the working drawings. If rock is encountered, the Engineer shall be notified to inspect and determine the elevation of the top of competent rock. Any revisions to the foundation embedment during construction shall be reviewed by the Engineer.

Excavated materials which are removed from the shaft excavation and any drilled fluids used shall be disposed of by the Contractor as directed by the Engineer and in accordance with Section 1.10.

Casings shall be metal, smooth, clean, watertight, and of ample strength to withstand both handling and driving stresses and the pressure of both concrete and the surrounding earth materials. The outside diameter of casing shall not be less than the specified size of the shaft. Temporary casings shall be removed while the concrete remains workable (i.e., a slump of 4 in. or greater). Before the casing is withdrawn and while the casing is being withdrawn, a 5.0 ft. 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 in. of the top casing and at least 48 in. above the existing water level during drilling and until the concrete placement is essentially complete. The slurry properties shall be maintained at all times, including non-working periods and stoppages. The slurry shall be circulated and agitated, continuously if necessary, to maintain the slurry properties and to prevent it from setting up in the shaft.

The Contractor, in the presence of the Engineer, shall perform control tests on the slurry to ensure that the density, viscosity, and pH fall within the acceptable limits tabulated below. The

Contractor shall provide all equipment required to perform the tests. If desanding is required, sand content shall not exceed 4% (by volume) at any point in the shaft excavation as determined by the American Petroleum Institute sand content test.

Range of Values (at 68°F)

Property (Units)	Time of Slurry Introduction	Time of Concreting (in Hole)	Test Method
Density (pcf)	64.3 to 69.1	64.3 to 75.0	Density Balance
Viscosity (seconds per quart)	28 to 45	28 to 45	Marsh Cone
pH	8 to 11	8 to 11	pH paper or meter

The control tests to determine unit weight (density), viscosity, and pH values of the slurry shall be done during the shaft excavation to establish a consistent working pattern.

Prior to placing shaft concrete, slurry samples shall be taken from the bottom and at intervals not exceeding 10.0 ft. 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 0.25 in. 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 ft. 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 ft. After placement of the reinforcing cage, the Engineer shall inspect the shaft to ensure that it has remained clean. If the inspection indicates that loose material has accumulated at the bottom of shaft excavation, the Contractor shall remove the reinforcing cage and reclean the shaft.

If directed by the Engineer, the top of the shaft shall be formed square with the length of the sides matching the diameter of the shaft.

Concrete construction shall conform to Subarticle 6.01.03-2,3,4,5 and 6 as amended herein.

Concrete shall be placed in the shaft excavation as soon as possible, but no more than 4 hours after completion of excavation and cleaning of the bottom of the excavation, and no more than 2 hours after placement of the reinforcing steel cage. Concrete shall be placed in a continuous operation to the top of the shaft. The concrete level shall be horizontal during the pouring operations. Concrete placement shall continue after the shaft is full and 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 in. of water may exist at the bottom of the excavation and loose sediment no more than 0.5 in. over one-half the base is acceptable.

In wet (slurry) construction, concrete is 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 ft. below the ground surface except where soft uncased soil or slurry remaining in the excavation will possibly mix with the concrete.

Exposed concrete shall be cured and finished in accordance with Subarticle 6.01.03-7, 9 and 10.

Anchor bolt assemblies shall be embedded in the concrete as shown on the working drawings. A template plate shall be used to hold the anchor bolt assemblies, conduits and ground rod sleeve in the correct position. The anchor bolts shall be installed plumb.

All conduit ends terminating below grade shall be capped with a malleable iron caps. All above-grade conduit ends shall be terminated with an insulated bonding bushing with tinned insert.

Ground rod and ground wire shall be installed as shown on the plans.

No construction operations that would cause soil movement adjacent to the shaft, other than mild vibration, shall be conducted for at least 48 hours after shaft concrete has been placed.

The top of the foundations shall be backfilled and the adjacent disturbed ground surfaces restored to match the surrounding area after the concrete has cured and the forms are removed. Placement of topsoil shall conform to Articles 9.44.01 and 9.44.03. Turf establishment shall conform to Article 9.50.03.

The span poles shall not be erected on the foundation until the concrete in the shaft has attained a compressive strength, f'_c , greater than or equal to 4,000 psi.

Method of Measurement: This work will be measured for payment by the number of foundation units, each completely installed and accepted.

The work to remove rock from the foundation excavation will be measured from the top of rock to the bottom of rock excavation.

Basis of Payment: The work will be paid for at the contract unit price each for "Traffic Control Foundation – Span Pole," completed and accepted in place, which price shall include all equipment, materials, tools and labor incidental to the subsurface exploration, design, fabrication, construction and disposal of drilling spoils, of the foundations at the locations specified on the plans.

Backfilling and restoration of adjacent ground surfaces (pavement, slope protection, topsoil and seed, etc.) in all areas disturbed by the work will not be paid for separately, but will be included as part of the work. The Engineer will determine the type, thickness and horizontal limits of the surfaces to be restored.

When rock is encountered within the limits of excavation, its removal will be paid for at the contract unit price per vertical foot for "Rock in Foundation Excavation," which price shall

include any additional excavation to remove the rock and any additional concrete required to fill the excavation beyond the designed foundation hole dimensions. Rock, in so far as it applies to "Rock in Foundation Excavation," shall be defined as rock in definite ledge formation, boulders, or portions of boulders, cement masonry structures, concrete structures or Portland cement concrete pavement which has a cross-sectional area that exceeds 50% of the cross-sectional area of the designed foundation hole.

ITEM #1002202A – TRAFFIC CONTROL FOUNDATION – MAST ARM

Description: Work under this item shall consist of designing and constructing drilled shaft foundations for mast arm assemblies, in accordance with the details shown on the plans and as ordered by the Engineer.

Materials: The reinforcing steel shall be uncoated, ASTM A615, Grade 60 reinforcement conforming to the requirements of Article M.06.01.

The concrete for the drilled shaft shall conform to Article M.03 for Class PCC04460. The compressive strength of the concrete in the constructed foundation shall conform to the requirements of 6.01- Concrete for Structures and M.03 – Portland Cement Concrete. 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 0.625 in. diameter by 10.0 ft. long copper clad steel. The copper cladding shall be a minimum thickness of 0.128 in. The ground clamp shall be a square-head bolt type, approved for direct burial.

Bare copper wire shall conform to Article M.15.13.

Topsoil shall conform to Article M.13.01.

Fertilizer shall conform to Article M.13.03.

Seed mixture shall conform to Article M.13.04.

Mulch shall conform to Article M.13.05.

Erosion control matting shall conform to Article M.13.09.

Construction Methods: For the purpose of bidding this item, the Contractor shall assume that the subsurface conditions for each drilled shaft foundation location consists of cohesionless, medium dense, granular soil (AASHTO A-1 or A-2) with cobbles present and a high groundwater table which requires the use of wet construction/concreting methods. During excavation and construction of each foundation, should the Contractor encounter subsurface conditions that differ materially from those assumed at the time of bid, the Contractor shall

notify the Engineer. All matters regarding increased cost relating to an agreed upon change in subsurface conditions will be handled per Section 1.04.04 – Differing Site Conditions.

The design of drilled shaft foundations shall conform to the requirements of AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaries and Traffic Signals – latest edition, including the latest interim specifications, available prior to the advertising date of the contract, amended as follows:

1. The foundation shall be designed for the soils and rock properties and parameters based on the subsurface conditions (character of the soil and rock, presence of ground water, etc.) in the location of, adjacent to and below the drilled shaft foundation excavation. The need and extent of all subsurface explorations and investigations shall be determined by the Contractor.
2. The compressive strength, f'_c , of the concrete used in the design shall be 4,000 psi.
3. The reinforcement shall be uncoated and conform to ASTM A615, Grade 60.
4. The foundation shall be designed for the mast arm assembly reactions of all group loads and load combinations. The reactions shall include axial, shear, flexural and torsional load effects. No reduction of the reactions or increase in the allowable stresses of the materials is permitted.
5. The diameter of the drilled shaft foundation shall be 3.0 ft., unless otherwise allowed by the Engineer.
6. 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.
7. The design of the drilled shaft embedment depth shall account for the slope of the finished grade.
8. The minimum embedment for a drilled shaft foundation, constructed entirely in soil, shall be no less than 12.0 ft. below the finished grade at the low side of a sloping grade. The minimum embedment for a drilled shaft foundation, constructed entirely in rock shall be no less than 8.0 ft. below the finished grade at the low side of a sloping grade.
9. 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.

10. 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.
11. The structural design of the drilled shaft shall be based on stress and strain compatibility in the circular drilled shaft cross section.
12. 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.
13. 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 in., 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.
14. 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 in.. The minimum spacing/pitch of the transverse reinforcement shall be no more than 4 in.. 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.
15. The design of the foundation shall be coordinated with the traffic structure to avoid conflicts between the embedded support anchorage and the foundation reinforcement.

Prior to excavating for the foundation, the Contractor shall submit working drawings and design calculations, with all details and documents necessary for fabrication and construction, for each mast arm assembly foundation for review in accordance with Article 1.05.02.

The working drawings and design calculations for the mast arm assembly foundation shall conform to working drawing requirements for permanent construction. **A single set of drawings with tabulated data for multiple mast arm foundations is not permitted.** Each mast arm foundation shall be referenced with an alpha-numeric identifier noted on the Contract documents. The working drawings and calculations shall be prepared in Customary U.S. units.

The mast arm foundation working drawing and calculation submittal shall include the following:

1. title sheet
2. table of contents
3. contact information for designer – contact information shall include name and address of design firm, name of contact person with phone number and email address
4. copy of the certificate of insurance
5. foundation working drawings
6. foundation design calculations

The working drawings shall include complete details of all foundation components. The drawings shall include, but not be limited to the following:

1. the Project number, town and support identification number
2. reference to the design specifications, including interim specifications
3. material specifications for all components
4. embedment depths for foundation in soil, rock and a combination of soil and rock
5. anchor bolt details, including dimensions, embedment and projection

The design calculations shall include, but not be limited to the following:

1. the Project number, town and support identification number

2. references to design specifications, including interim specifications, and the applicable code section and articles
3. description/documentation for all computer programs used in the design
4. 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
5. traffic structure reactions of all group loads and load combinations
6. soil and rock design parameters
7. calculations demonstrating the geotechnical and structural capacity of the drilled shaft is adequate for all group load combinations

Prior to excavating for the foundation, the Contractor shall submit the following:

Reinforcing Steel Shop Drawings: Based on the reviewed foundation design, the Contractor shall prepare reinforcing steel shop drawings for each foundation. The drawings shall be reviewed and stamped by the foundation designer. Four copies of each reviewed 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 “Engineer of Record”.

Concrete and Slurry Mix Designs: The Contractor shall submit to the Engineer at the District Construction office the concrete mix design and the slurry mix design, including admixtures, for review.

Foundation Construction Procedure: The Contractor shall submit to the Engineer at the District Construction office a written foundation construction procedure outlining the equipment; drilling procedure for soil and rock, including removal of obstructions and removal of excavated spoils; temporary casing placement and removal; slurry placement; reinforcement, anchor bolt and conduit placement; and concrete placement required for the drilled shaft foundation construction for review. The procedure should include contingencies for the various soil, rock and subsurface water conditions that may be encountered during the foundation construction. Also required in this submission are the following;

The Engineer will evaluate the foundation construction procedure for conformance with the Contract documents and will then notify the Contractor of any additional information required and/or changes necessary to meet the Contract requirements. All procedural approvals given by the Engineer shall be subject to trial in the field and shall not relieve the Contractor of the responsibility to satisfactorily complete the work as detailed in the plans and specifications. The

Contractor shall not commence construction of the drilled shafts until the Engineer has accepted the foundation construction procedure.

Excavations required for shafts shall be performed through whatever materials are encountered, to the dimensions and elevations in the working drawings or as ordered by the Engineer. The methods and equipment used shall be suitable for the intended purpose and materials encountered. Shaft excavation may be performed by combinations of augering, rotary drilling, down-the-hole hammer, reverse circulation drilling, clamming, scraping, or other means approved by the Engineer. Generally, either the dry method, wet method, or temporary casing method may be used, as necessary, to produce sound, durable concrete foundation shafts free of defects. The Contractor shall select and use the method that is needed to properly accomplish the work, as determined by site conditions and subject to the approval of the Engineer. The Contractor is responsible for maintaining the stability of the shaft excavation during all phases of construction.

The dry method consists of drilling the shaft excavation, removing accumulated water and loose material from the excavation, and placing the shaft concrete in a relatively dry excavation. The dry construction method shall be used only at sites where the groundwater table and site conditions are suitable to permit construction of the shaft in a relatively dry excavation, and where the sides and bottom of the shaft are stable and may be visually inspected prior to placing the concrete. The use of the dry construction method is permitted if less than one foot of water accumulates in the bottom of a hole without pumping over a one hour period, the excavation remains stable and any loose material and water can be removed prior to placement of concrete.

The wet construction method shall be used at sites where a dry excavation cannot be maintained for placement of the shaft concrete. Wet construction methods consist of using a mineral slurry to maintain stability of the hole perimeter while advancing the excavation to final depth, placing the reinforcing cage and shaft concrete. This procedure may require desanding and cleaning the slurry; final cleaning of the excavation by means of a bailing bucket, air lift, submersible pump or other devices; and placing the shaft concrete with a tremie. Unless it is demonstrated to the satisfaction of the Engineer that the surface casing is not required, temporary surface casings shall be provided to aid shaft alignment and position, and to prevent sloughing of the top of the shaft excavation. Surface casing is defined as the amount of casing required from the ground surface to a point in the shaft excavation where sloughing of the surrounding soil does not occur.

The temporary casing construction method shall be used at all sites where the dry or wet construction methods are inappropriate. Temporary casing construction method consists of advancing the excavation through caving material by the wet method. Temporary casing may be installed by driving or vibratory procedures in advance of excavation to the lower limits of the caving material. When a nearly impervious formation is reached, a casing is placed in the hole and sealed in the nearly impervious formation. After the drilling fluid is removed from the casing, drilling may proceed as with the dry method except that the casing is withdrawn when the shaft concrete is placed. If seepage conditions prevent use of the dry method, excavation is completed using the wet method. Temporary casing may be installed by driving or vibratory

procedures in advance of excavation to the lower limits of the caving material. Slurry may be omitted if the casing can be installed with only minor caving of the hole.

If the Engineer determines that the foundation material encountered during excavation is unsuitable or differs from that anticipated in the design of the shaft, or if rock is encountered at an unanticipated elevation, the Contractor's foundation designer shall determine if the foundation embedment should be revised from that shown on the working drawings. If rock is encountered, the Engineer shall be notified to inspect and determine the elevation of the top of competent rock. Any revisions to the foundation embedment during construction shall be reviewed by the Engineer.

Excavated materials which are removed from the shaft excavation and any drilled fluids used shall be disposed of by the Contractor as directed by the Engineer and in accordance with Section 1.10.

Casings shall be metal, smooth, clean, watertight, and of ample strength to withstand both handling and driving stresses and the pressure of both concrete and the surrounding earth materials. The outside diameter of casing shall not be less than the specified size of the shaft. Temporary casings shall be removed while the concrete remains workable (i.e., a slump of 4 in. or greater). Before the casing is withdrawn and while the casing is being withdrawn, a 5.0 ft. 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 in. of the top casing and at least 48 in. above the existing water level during drilling and until the concrete placement is essentially complete. The slurry properties shall be maintained at all times, including non-working periods and stoppages. The slurry shall be circulated and agitated, continuously if necessary, to maintain the slurry properties and to prevent it from setting up in the shaft.

The Contractor, in the presence of the Engineer, shall perform control tests on the slurry to ensure that the density, viscosity, and pH fall within the acceptable limits tabulated below. The

Contractor shall provide all equipment required to perform the tests. If desanding is required, sand content shall not exceed 4% (by volume) at any point in the shaft excavation as determined by the American Petroleum Institute sand content test.

Range of Values (at 68°F)

Property (Units)	Time of Slurry Introduction	Time of Concreting (in Hole)	Test Method
Density (pcf)	64.3 to 69.1	64.3 to 75.0	Density Balance
Viscosity (seconds per quart)	28 to 45	28 to 45	Marsh Cone
pH	8 to 11	8 to 11	pH paper or meter

The control tests to determine unit weight (density), viscosity, and pH values of the slurry shall be done during the shaft excavation to establish a consistent working pattern.

Prior to placing shaft concrete, slurry samples shall be taken from the bottom and at intervals not exceeding 10.0 ft. 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 0.25 in. 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 ft. 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 ft. After placement of the reinforcing cage, the Engineer shall inspect the shaft to ensure that it has remained clean. If the inspection indicates that loose material has accumulated at the bottom of shaft excavation, the Contractor shall remove the reinforcing cage and reclean the shaft.

If directed by the Engineer, the top of the shaft shall be formed square with the length of the sides matching the diameter of the shaft.

Concrete construction shall conform to Subarticle 6.01.03-2,3,4,5 and 6 as amended herein.

Concrete shall be placed in the shaft excavation as soon as possible, but no more than 4 hours after completion of excavation and cleaning of the bottom of the excavation, and no more than 2 hours after placement of the reinforcing steel cage. Concrete shall be placed in a continuous operation to the top of the shaft. The concrete level shall be horizontal during the pouring operations. Concrete placement shall continue after the shaft is full until good quality concrete is evident at the top of the shaft. The elapsed time from the beginning of concrete placement in the shaft to the completion of placement shall not exceed 2 hours.

In dry construction, concrete shall be placed in a single continuous operation with the flow of concrete down the center of the shaft excavation so as to consolidate the concrete on impact. During placement operations, the concrete is not permitted to hit the reinforcing steel. A dropchute, consisting of a hopper and flexible hose, may be used to direct the concrete down the center of the foundation and prevent the concrete from hitting the reinforcing steel. Accumulated water shall be removed before placing the concrete. At the time of concrete placement, no more than 2 in. of water may exist at the bottom of the excavation and loose sediment no more than 0.5 in. 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 ft. below the ground surface except where soft uncased soil or slurry remaining in the excavation will possibly mix with the concrete.

Exposed concrete shall be cured and finished in accordance with Subarticle 6.01.03-7, 9 and 10.

Anchor bolt assemblies shall be embedded in the concrete as shown on the working drawings. A template plate shall be used to hold the anchor bolt assemblies, conduits and ground rod sleeve in the correct position. The anchor bolts shall be installed plumb.

All conduit ends terminating below grade shall be capped with a malleable iron caps. All above-grade conduit ends shall be terminated with an insulated bonding bushing with tinned insert.

Ground rod and ground wire shall be installed as shown on the plans.

No construction operations that would cause soil movement adjacent to the shaft, other than mild vibration, shall be conducted for at least 48 hours after shaft concrete has been placed.

The top of the foundations shall be backfilled and the adjacent disturbed ground surfaces restored to match the surrounding area after the concrete has cured and the forms are removed. Placement of topsoil shall conform to Articles 9.44.01 and 9.44.03. Turf establishment shall conform to Article 9.50.03.

The mast arm assemblies shall not be erected on the foundation until the concrete in the shaft has attained a compressive strength, f'_c , greater than or equal to 4,000 psi.

Method of Measurement: This work will be measured for payment by the number of foundation units, each completely installed and accepted.

The work to remove rock from the foundation excavation will be measured from the top of rock to the bottom of rock excavation.

Basis of Payment: The work will be paid for at the Contract unit price each for "Traffic Control Structure – Mast Arm," completed and accepted in place, which price shall include all equipment, materials, tools and labor incidental to the subsurface exploration, design, fabrication, construction and disposal of drilling spoils, of the foundations at the locations specified on the plans.

Backfilling and restoration of adjacent ground surfaces (pavement, slope protection, topsoil & seed, etc.) in all areas disturbed by the work will not be paid for separately, but will be included as part of the work. The Engineer will determine the type, thickness and horizontal limits of the surfaces to be restored.

When rock is encountered within the limits of excavation, its removal will be paid for at the Contract unit price per vertical foot for "Rock in Foundation Excavation," which price shall include any additional excavation to remove the rock and any additional concrete required to fill the excavation beyond the designed foundation hole dimensions. Rock, in so far as it applies to "Rock in Foundation Excavation," shall be defined as rock in definite ledge formation, boulders,

or portions of boulders, cement masonry structures, concrete structures or portland cement concrete pavement which has a cross-sectional area that exceeds 50% of the cross-sectional area of the designed foundation hole.

**ITEM #1002223A – TRAFFIC CONTROL FOUNDATION – PEDESTAL
(SPECIAL)**

All work associated with this item shall be in accordance with Section 10.02 of the Form 817 and amended as follows:

10.02.01 – Description:

Replace the first sentence with the following: This item shall consist of furnishing and installing an ornamental aluminum pedestal foundation of the type called for at the location as shown on the plans and to the dimensions and details included within this special provision or as directed by the Engineer and in conformity with these specifications.

10.02.03 – Construction Methods:

Add the following: Prior to ordering the foundation, the Contractor shall verify that the bolt circle, size and reveal are adequate to accommodate the ornamental aluminum pedestal supplied under this contract.

Replace the first 2 sentences with the following: The Traffic Control Foundation shall be constructed in accordance with the pertinent provisions of Article 6.01.03. The Traffic Control Foundation may be precast.

Delete the 5th sentence.

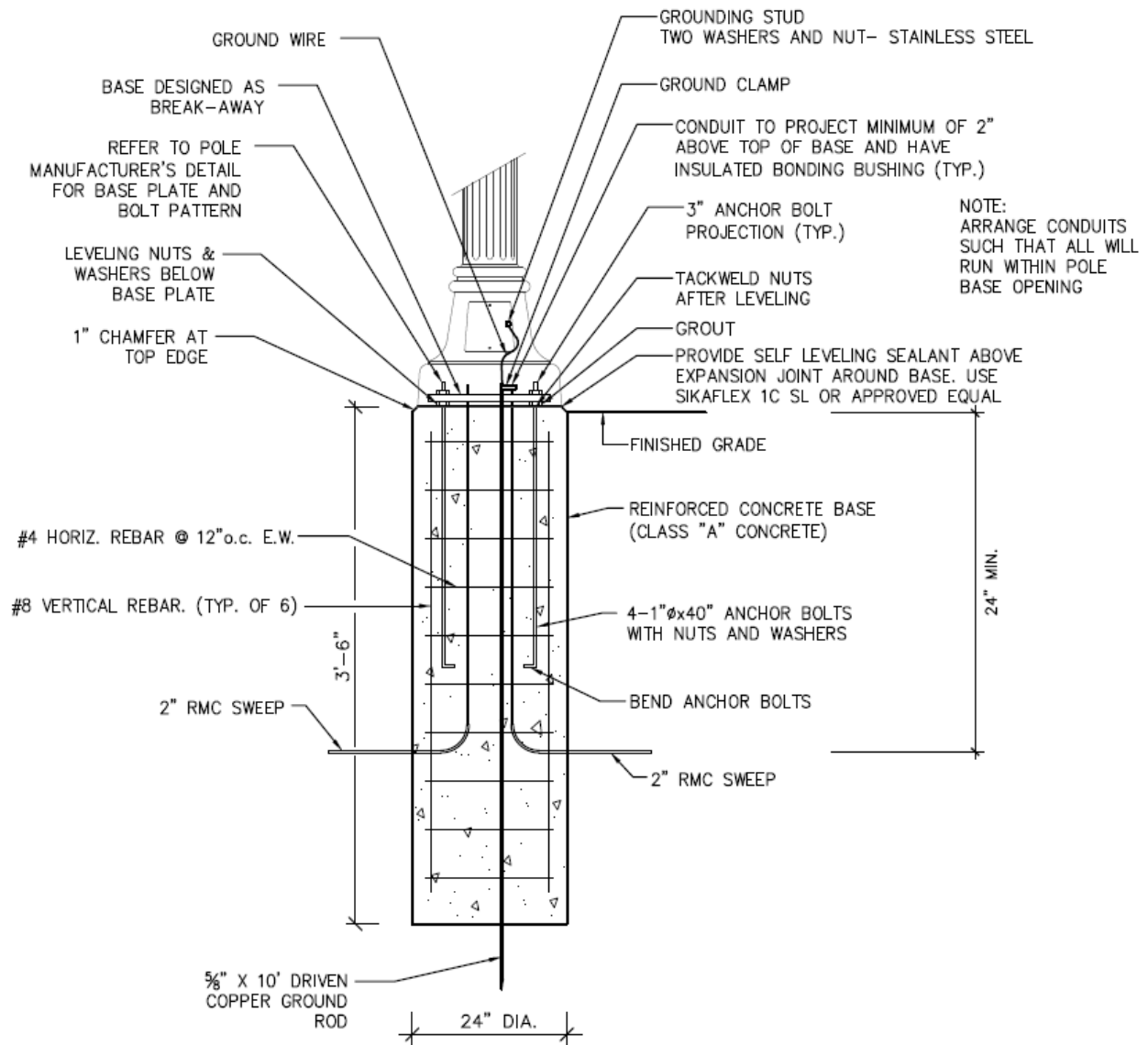
10.02.04 – Method of Measurement:

Replace the 1st sentence with the following: Traffic Control Foundation – Pedestal (Special) shall be measured for payment by the number of units installed and accepted.

11.02.05 – Basis of Payment:

Replace the 1st paragraph with the following: This work will be paid for at the Contract unit price each for “Traffic Control Foundation – Pedestal (Special)”: which price shall include all materials, equipment, forms, excavation, disposal of surplus material. Class “A” concrete, electrical conduit sweeps, conduit caps, ground rod, sleeves, bonding bushings, anchor bolts, backfill, topsoil, grading. Seeding. Fertilizing, mulching, riprap, restoration of bituminous concrete sidewalk and pavement surfaces. All Concrete sidewalk replaced due to foundation installation shall be paid for at the Contract unit price for “Concrete Sidewalk”.

Pay Item	Pay Unit
Traffic Control Foundation – Pedestal (Special)	ea.



TRAFFIC CONTROL FOUNDATION PEDESTAL (SPECIAL)

NOT TO SCALE

ITEM #1003621A – DECORATIVE LIGHT STANDARD

Description:

Under this item the Contractor shall furnish and install a decorative vertical light standard shaft, structure mounted, to replicate the existing light standards mounted on Bridge No. 00524 (Arrigoni Bridge). Work under this item shall also include any work required to integrate the Pedestrian railing into the new light standard and attachment to the steel works of the bridge as identified on the plans.

This item shall also consist of furnishing a bracket arm and installing the arm on the new steel light standard shaft. The bracket arm shall replicate the existing bracket arm.

Materials:

The light standard shall conform to section M.15.04 of Form 817 as applicable and supplemented as follows:

Each Decorative Light Standard and appurtenances attached thereto shall be fabricated of steel conforming to ASTM A572 Grade 50.

Poles shall be tapered with the diameter changing at a rate of 0.14 inch per foot with an eight sided pole shaft and maximum of two longitudinal seam welds. Circumferentially welded pole shaft butt splices and laminated pole shafts are not permitted. Longitudinal seam welds within six inches of pole to base must be complete penetration welds. Longitudinal seam welds at telescopic field joints (if provided) must be complete penetration welds for the splice length plus six inches.

The light standard shall be designed to AASHTO “STANDARD Specification for Structural Supports for Highway Signs, Luminaires and Traffic Signals” for 90 mph winds.

The Contractor shall submit shop drawings for approval as specified in Section 1.06 of the contract documents.

The bracket arms, poles, and caps shall be painted to match the color of the existing bridge. The coating application shall be in accordance with Special Provision Item No. 0603801A.

Conductors from the sidewalk junction box to the luminaire shall be #10 AWG in accordance with Article M.15.11 of the Standard Specifications. Insulation shall be THHN/THWN and rated for 600 volts.

Construction Methods:

Light standards shall conform to requirements as cited in section 10.03.03-Construction methods contained in Form 817 **and as applicable and supplemented as follows:**

The decorative light pole shall be installed and leveled at the locations as indicated on the plans. The completely assembled light pole shall be erected plumb with the aid of shims, if necessary.

Each light standard shall be effectively grounded with #8 AWG ground wire attached to the grounding lug in the light pole shaft, run to the equipment grounding conductor in the adjacent CIJB.

Light standards shall be numbered with strip tags. These tags shall be reflective and not less than 1 3/8 in x 1 7/8 in. The tags shall be located 8 ft above the grade on the road side of the light standard. In locations where light standards are mounted in the median, tags shall be located on both road sides. The town number will be the top number and the pole number will be the bottom number.

Conductors shall be run from the primary in the luminaire to the distribution circuit in the adjacent sidewalk cast iron junction box. Conductors shall be connected to the distribution circuit using approved fuse connectors fused at 10 amps (Paid for under a separate bid item).

Welding shall conform to the American Welding Society Structural Welding Code/Steel ANSI/AWS D1.1.

One hundred percent of full penetration groove welds and a random 25 percent of partial penetration groove welds shall be inspected. Full penetration groove weld inspection shall be performed by nondestructive methods of radiography or ultrasonics.

Before fabricating and installation, the Contractor shall submit shop drawings in accordance with section 1.05.02.

The bracket arm shall be securely attached to the light standard and the assembly shall be erected with the bracket placed perpendicular to the centerline of the roadway.

Method of Measurement:

Decorative light standards will be measured for payment by the number of decorative light standards of the type specified, installed, complete and accepted in place.

Basis of Payment:

This work will be paid at the Contract unit price each for “Decorative Light Standard” of the type specified, complete in place, which price shall include all materials, including dampers,

shaft, brackets, arms, pole cap, wiring compartment cover, washers, nuts, bolts, bolt covers, ground wire, strip tags, connections, elastomeric leveling pads, fabrication, galvanizing, painting (including surface preparation and primer), connection to bridge fence, welding, and all equipment, tools, labor incidental thereto, including pole.

This work shall also include disconnecting existing light standards, drilling rivets. It shall also include all materials, including anchor bolts, and all equipment, tools, and labor incidental thereto.

Pay Item

Pay Unit

Decorative Light Standard

ea.

ITEM #1003902A – POLE REMOVAL (STREET LIGHT POLE)

DESCRIPTION: Under this item the Contractor shall remove an existing light standard with luminaire bracket arm owned by the City of Middletown at the location as indicated on the plans or as directed by the Engineer. The removed light standard with associated equipment shall remain the property of the City of Middletown

MATERIALS: The Contractor shall be responsible for damage to all equipment and materials incurred during removal and hauling to the specified area. All repairs or replacements due to damage or loss by the Contractor shall be made at the Contractor's expense.

CONSTRUCTION METHODS: The Contractor shall remove an existing light standard with luminaire bracket arm owned by the City of Middletown at the location as indicated on the plans or as directed by the Engineer. The removed light standard with associated equipment shall remain the property of the City of Middletown. The existing luminaire shall be removed and relocated under a separate bid item.

The Contractor shall contact Eversource at the phone number indicated on the plans to coordinate the disconnection of the underground feed to the pole.

The Contractor shall contact City of Middletown Public Works Department (tel: 860-638-4850) to determine the storage facility where the removed materials are to be delivered. The Contractor shall contact the facility manager at least 24 hours in advance to coordinate unloading and storage. The Contractor shall load, transport, and unload the material. The material shall be stacked and stored according to the directions of the facility manager.

METHOD OF MEASUREMENT: This work will be measured for payment by the number of light standards with associated equipment removed and delivered to the specified storage facility complete and accepted.

BASIS OF PAYMENT: This work will be paid for at the contract unit price each for "Pole Removal (Street Light Pole)" complete, which price shall include the removal of a street light pole with associated bracket, cable and hardware, Utility Company coordination and construction costs, delivering, transporting, hauling, loading and unloading, including all materials, tools, equipment, labor and work incidental thereto.

Pay Item
Pole Removal (Street Light Pole)

Pay Unit
ea.

ITEM #1003904A – RELOCATE LIGHT STANDARD

DESCRIPTION: Under this item the Contractor shall remove and relocate an existing light standard (owned by the City of Middletown) where shown on the plans, or as directed by the Engineer. The installation shall consist of erecting the light standard with bracket and luminaire on the new foundation, and making all necessary electrical connections for proper operation. This item shall also include payment to the City of Middletown's "on-call" Communication vendor for the relocation of the existing CCTV camera station mounted on the light standard. This item shall also include the removal of an existing floodlight from the light standard and delivery of this flood light to the City of Middletown Public Works Department.

MATERIALS: The Contractor shall be responsible for damage to all equipment and materials incurred during removal and re-installation. All repairs or replacements due to damage or loss by the Contractor shall be made at the Contractor's expense.

No. 8 bare grounding conductor shall conform to M.15.13.

CONSTRUCTION METHOD: The Contractor shall remove and relocate an existing light standard (owned by the City of Middletown) where shown on the plans, or as directed by the Engineer. The installation shall consist of erecting the light standard with bracket and luminaire on the concrete foundation, and making all necessary electrical connections for proper operation. The new foundation shall be installed prior to the removal of the light standard and shall be paid for under a separate bid item. Upon installation of the new concrete foundation, the completely assembled light standard shall be removed and reinstalled on the new foundation. The light standard shall be installed plumb with the aid of aluminum shims, if necessary.

Prior to removing the light standard, the Contractor shall contact Mr. Sal Zichichi of Utility Communications Inc., (920 Sherman Avenue, Hamden CT, 06514) at 203-287-1306 to coordinate the temporary removal of the CCTV camera station from the light pole. The Contractor shall also contact: Mr. Geen Thazhampallath of the City of Middletown Parking Department (860-638-4926) to update him on the camera relocation schedule. Out of service time for the CCTV camera station shall be kept to a minimum.

Under the direction of the Contractor, Utility Communications Incorporated shall temporarily remove the CCTV station in its entirety, store the components, and await notification from the Contractor of the reinstallation of the light standard. Once the light standard has been relocated and connected to the underground power feed the Contractor shall notify Utility Communications Incorporated and coordinate/schedule the re-installation of the CCTV camera station onto the relocated light pole. Once the CCTV camera station has been successfully re-installed and is fully operational, the Contractor shall notify Mr. Thazhampallath of the City of Middletown Parking Department. The relocated camera shall function to the satisfaction of the Middletown Parking Department. The Contractor is responsible to pay all removal and installation costs of the CCTV camera station as billed by Utility Communications Incorporated.

The existing tap conductors from the luminaire to the pole base shall be connected to the new lighting circuit conductors in the pole base. All existing splice kits or fuse kits in the existing pole base shall be replaced in kind with new materials. If the existing tap conductors are of insufficient length, then new tap conductors (of the same gauge, insulation, and voltage rating) shall be installed between the luminaire and circuit conductors in the pole base. The light standard shall be connected to the grounding system and ground rod with a No. 8 bare copper grounding conductor.

The Contractor shall carry out all coordination with Eversource for disconnection and connection of the power feed to the light standard and pay for all associated utility costs.

All work shall be in strict conformance with the National Electric Code.

This item shall also include the removal of an existing floodlight from the light standard and delivery of this flood light to the City of Middletown Public Works Department.

The Contractor shall contact City of Middletown Public Works Department (tel: 860-638-4850) to determine the storage facility where the removed floodlight is to be delivered. The Contractor shall contact the facility manager at least 24 hours in advance to coordinate unloading and storage. The Contractor shall load, transport, and unload the material. The material shall be stacked and stored according to the directions of the facility manager.

METHOD OF MEASUREMENT: This work will be measured for payment by the number of light standards relocated, complete and accepted.

BASIS OF PAYMENT: This work will be paid for at the contract unit price each for "Relocate Light Standard" as specified, which price shall include removal and installation of the light standard with bracket and luminaire, Coordination with the City of Middletown and their Communications vendor, payment for the relocation of the CCTV camera station by the City's on-call vendor, fuse holders, fuses, conductors, connections, removal and delivery of floodlight, utility coordination and construction cost, and all work, materials, tools and equipment incidental thereto.

<u>Pay Item</u>	<u>Pay Unit</u>
Relocate Light Standard	ea.

ITEM #1003906A – REMOVE LIGHT STANDARD

Description:

Under this item the Contractor shall remove an existing light standard with transformer base, and bracket as indicated on the plans or as directed by the Engineer. The removed light standard, transformer base, and bracket shall remain the property of the Contractor.

Construction Methods:

The Contractor shall remove a light standard, transformer base, and bracket where required. The removed materials shall remain the property of the Contractor.

All removed materials shall be properly disposed of by the Contractor. The removed luminaire contains regulated materials. All regulated materials shall be as described and disposed of under Item No. 0101143A – Handling and Disposal of Regulated Items.

Method of Measurement:

This work will be measured for payment by the number of light standards with associated equipment removed and disposed of complete and accepted.

Basis of Payment:

This work will be paid for at the contract unit price each for "Remove Light Standard" complete, which price shall include the removal of a light standard with associated transformer base, bracket, cable and hardware, delivering, disposing, hauling, and including all materials, tools, equipment, labor and work incidental thereto.

<u>Pay Item</u>	<u>Pay Unit</u>
Remove Light Standard	ea.

ITEM #1003912A – REMOVE CONCRETE LIGHT STANDARD BASE

Description:

Under this item the Contractor shall remove an existing concrete light standard base where shown on the plans or as directed. The removed concrete base shall remain the property of the contractor.

Construction Methods:

The Contractor shall remove a concrete light standard base where required. The removed base shall be properly disposed of by the Contractor. The hole shall be backfilled with suitable material and graded to match surroundings, unless otherwise noted on the plans.

Method of Measurement:

This work will be measured for payment by the number of concrete light standard bases removed and disposed of, complete and accepted.

Basis of Payment:

This work will be paid for at the contract unit price each for "Remove Concrete Light Standard Base", which price shall include all materials, equipment and work incidental thereto including excavation, removal, backfill when necessary, hauling and disposing of the concrete base.

<u>Pay Item</u>	<u>Pay Unit</u>
Remove Concrete Light Standard Base	ea.

ITEM #1003916A – REMOVE AND RELOCATE LIGHT STANDARD

DESCRIPTION: Under this item the Contractor shall remove, temporarily store as required, and install an existing ConnDOT light standard where shown on the plans, or as directed by the Engineer. The installation shall consist of erecting the light standard with bracket, ballast, luminaire and lamp on the new foundation, and making all necessary electrical connections for proper operation.

MATERIALS: The Contractor shall be responsible for damage to all equipment and materials incurred during removal and hauling to the specified area. All repairs or replacements due to damage or loss by the Contractor shall be made at the Contractor's expense.

Breakaway fuse connectors and fuses shall conform to Section M.15.05.

No. 10 single conductor shall be #10 AWG, THHN, rated for 600 volts. No. 8 bare grounding conductor shall conform to M.15.13.

CONSTRUCTION METHOD: The Contractor shall remove a light standard, bracket, luminaire and ballast where required, or as directed by the Engineer. The removed light standard, transformer base, bracket, luminaire, attachment hardware, shims, and load side conductors shall be properly stored as a unit at a location not to pose a hazard to motorists or cause damage to the unit. Upon installation of the new concrete foundation (paid for under a separate bid item), the completely assembled light standard shall be re-installed plumb with the aid of aluminum shims, if necessary. The bracket shall be securely attached to the light standard and the assembly shall be erected with the bracket placed perpendicular to the center line of the roadway.

The existing No. 10 AWG conductors from the luminaire ballast shall be connected to the lighting circuit conductors in the pole base with new breakaway type fuse connectors. If the existing No. 10 conductors are of insufficient length, then new No. 10 conductors shall be installed between the luminaire and pole base. The light standard shall be connected to the grounding system and ground rod with a No. 8 bare copper grounding conductor.

The Contractor shall make all necessary arrangements with the District Electrical Maintenance Supervisor, for locking and unlocking of the circuits on which any work is to be done, through the Engineer.

All work shall be in strict conformance with the National Electric Code.

METHOD OF MEASUREMENT: This work will be measured for payment by the number of light standards removed and relocated, complete and accepted.

BASIS OF PAYMENT: This work will be paid for at the contract unit price each for "Remove and Relocate Light Standard" as specified, which price shall include removal, storage, delivery, and installation of the light standard with bracket and luminaire, breakaway fuse holders, fuses, conductors, connections, and all work, materials, tools and equipment incidental thereto.

<u>Pay Item</u>	<u>Pay Unit</u>
Remove and Relocate Light Standard	ea.

ITEM #1003917A – REMOVE WOOD POLE

DESCRIPTION: Under this item the Contractor shall remove an existing wood pole with luminaire bracket arms, street lights, floodlights, floodlight brackets, photocell, and surface mounted conduit at the location indicated on the plans or as directed. The removed wood pole, street light bracket arms, photocell, and conduit, shall remain the property of the Contractor. The removed street lights, floodlights, and floodlight support brackets shall remain the property of the City of Middletown.

MATERIALS: The Contractor shall be responsible for damage to the removed street lights, floodlights, and floodlight brackets incurred during removal and delivery. All repairs or replacements due to damage or loss by the Contractor shall be made at the Contractor's expense.

CONSTRUCTION METHODS: The Contractor shall remove an existing wood pole with luminaire bracket arms, street lights, floodlights, floodlight brackets, photocell, and surface mounted conduit at the location indicated on the plans or as directed. The removed wood pole, street light bracket arms, photocell, and conduit shall remain the property of the Contractor. The removed street lights, floodlights, and floodlight support brackets shall remain the property of the City of Middletown.

The Contractor shall contact Eversource at the phone number indicated on the plans to coordinate the removal of the overhead aerial power feed to the pole.

The Contractor shall contact City of Middletown Public Works Department (tel: 860-638-4850) to determine the storage facility where the salvageable materials are to be delivered. The Contractor shall contact the facility manager at least 24 hours in advance to coordinate unloading and storage. The Contractor shall load, transport, and unload the material. The material shall be stacked and stored according to the directions of the facility manager.

METHOD OF MEASUREMENT: This work will be measured for payment by the number of wood poles with associated equipment removed and disposed of, or delivered, complete and accepted.

BASIS OF PAYMENT: This work will be paid for at the contract unit price each for "Remove Wood Pole" complete, which price shall include removal of a wood pole, floodlights, street lights, mounting brackets, and associated equipment, disposing, delivering, hauling, and all materials, equipment, tools and labor incidental thereto.

Pay Item
Remove Wood Pole

Pay Unit
ea.

ITEM #1003919A – REMOVE AND REINSTALL LIGHT STANDARD

DESCRIPTION: Under this item the Contractor shall remove, temporarily store as required, and reinstall an existing light standard (owned by the City of Middletown) where shown on the plans, or as directed by the Engineer. The installation shall consist of erecting the light standard with bracket, luminaire, and floodlight on the new foundation, and making all necessary electrical connections for proper operation.

MATERIALS: The Contractor shall be responsible for damage to all equipment and materials incurred during removal and re-installation. All repairs or replacements due to damage or loss by the Contractor shall be made at the Contractor's expense.

No. 8 bare grounding conductor shall conform to M.15.13.

CONSTRUCTION METHOD: The Contractor shall remove a light standard with bracket, luminaire and floodlight where required, or as directed by the Engineer. Prior to removal of the light standard the Contractor shall note the orientation and aiming direction of the existing floodlight. The new foundation (paid for under a separate bid item) shall be installed prior to the removal of the light standard. Upon installation of the new concrete foundation, the completely assembled light standard shall be removed and reinstalled on the new foundation. The light standard shall be installed plumb with the aid of aluminum shims, if necessary.

The existing tap conductors from the luminaire to the pole base shall be connected to the new lighting circuit conductors in the pole base. All existing splice kits or fuse kits in the existing pole base shall be replaced in kind with new materials. If the existing tap conductors are of insufficient length, then new tap conductors (of the same gauge, insulation, and voltage rating) shall be installed between the luminaire and circuit conductors in the pole base. The light standard shall be connected to the grounding system and ground rod with a No. 8 bare copper grounding conductor.

Once the light standard has been reinstalled on the new foundation the Contractor shall aim the floodlight at the area that it previously illuminated.

The Contractor shall carry out all coordination with Eversource for disconnection and connection of the power feed to the light standard and pay for all associated utility costs.

All work shall be in strict conformance with the National Electric Code.

METHOD OF MEASUREMENT: This work will be measured for payment by the number of light standards removed and reinstalled, complete and accepted.

BASIS OF PAYMENT: This work will be paid for at the contract unit price each for "Remove and Reinstall Light Standard" as specified, which price shall include removal and installation of the light standard with bracket, luminaires, and camera, fuse holders, fuses, conductors,

connections, floodlight aiming, utility coordination and construction cost, and all work, materials, tools and equipment incidental thereto.

<u>Pay Item</u>	<u>Pay Unit</u>
Remove and Reinstall Light Standard	ea.

ITEM #1003925A – REMOVE EXISTING LUMINAIRE

Description:

Under this item the Contractor shall remove an existing luminaire, and associated equipment as indicated on the plans or as directed and in accordance with these specifications. The removed luminaire and lamp shall be properly disposed of by the Contractor.

Construction Methods:

The Contractor shall remove an existing luminaire, and associated equipment where required. The removed luminaire and lamp shall be properly disposed of by the Contractor.

All removed materials shall be properly disposed of by the Contractor. The removed luminaire contains regulated materials. All regulated materials shall be as described and disposed of under Item No. 0101143A – Handling and Disposal of Regulated Items.

Method of Measurement:

This work will be measured for payment by the number of luminaires with associated equipment, removed and disposed of complete and accepted.

Basis of Payment:

This work will be paid for at the contract unit price each for "Remove Existing Luminaire", which price shall include removal of luminaire and associated equipment, hauling and unloading, disposal, and all materials, tools, equipment and labor incidental thereto.

Pay Item

Pay Unit

Remove Existing Luminaire

ea.

ITEM #1004440A – REMOVE AND RELOCATE EXISTING LUMINAIRE

DESCRIPTION: Under this item the Contractor shall remove an existing luminaire (Owned by the City of Middletown) from an existing light standard or traffic signal mast arm pole at the location as indicated on the plans or as directed and in accordance with these specifications. The removed luminaire shall be relocated to the new combination traffic signal mast arm pole. And reconnected to the electric power feed.

MATERIAL: The Contractor shall be responsible for damage to all equipment and material incurred during removal and hauling to the specified area. All repairs or replacements due to damage or loss by the Contractor shall be made at the Contractor's expense.

CONSTRUCTION METHOD: The Contractor shall remove an existing luminaire (Owned by the City of Middletown), from an existing light standard or traffic signal mast arm pole at the location as indicated on the plans or as directed and in accordance with these specifications.

The removed luminaire shall be installed at the end of the new traffic signal mast arm bracket and shall be securely fastened, properly oriented, connected to the power supply conductors, cleaned, and ready for operation. The luminaire shall be properly leveled by placing an electronic (digital) level along the flat bottom face of the luminaire. All luminaires suspected of not being leveled shall be re-leveled by the Contractor at the discretion of the Engineer.

The luminaire shall be properly grounded with a No. 10 AWG equipment ground connected between the ground rod/system in the pole base and the grounding lug in the luminaire.

The Contractor shall ensure that once installed the LED luminaire functions properly.

The Contractor shall carry out all coordination with Eversource for disconnection and connection of the power feed to the luminaire and pay for all associated utility costs.

METHOD OF MEASUREMENT: This work will be measured for payment by the number of luminaires with associated equipment, removed and relocated complete and accepted.

BASIS OF PAYMENT: This work will be paid for at the contract unit price each for "Remove and Relocate Existing Luminaire", which price shall include removal of luminaire and associated equipment, storage, relocation, installation, conductors, connections, utility cost and all materials, tools, equipment and labor incidental thereto.

<u>Pay Item</u>	<u>Pay Unit</u>
Remove and Relocate Existing Luminaire	ea.

ITEM #1005601A – LED LUMINAIRE – TYPE 1

DESCRIPTION: This item shall consist of furnishing and installing a light emitting diode (LED) luminaire of the wattage, distribution, and voltage as specified with integral photocell, completely wired and attached to the bracket arm of a traffic signal span/mast arm pole in accordance with the plans and specifications.

MATERIALS: The LED luminaire shall be one of the following:

Philips Lumec, Road Focus, catalog number: **RFL-180W80LED4K-G2-R3M- UNIV-SP2-PH8XL-GY3**, with the following characteristics: 174 watts, 21,480 lumens, 700mA, 4000 CCT, multi-volt, Type III light distribution, and 20kV surge suppression.

American Electric, Autobahn, catalog number: **ATB2-60BLEDE85-MVOLT-R3-NR-20K-PCLL-NL**, with the following characteristics: 165 watts, 21,351 lumens, 850mA, 4000 CCT, multi-volt, Type III light distribution, and 20kV surge suppression.

General Electric, Evolve, catalog number: **ERL2-0-21-C3-40-E-GRAY-G-T** with the following characteristics: 177 watts, 21,000 lumens, 4000 CCT, multi-volt, Type III light distribution, and 20kV surge suppression.

Cooper Lighting, Archeon-L, catalog number: **ARCH-L-AF72-170-U-T3-20K-AP-OA/RA1014**, with the following characteristics: 173 watts, 21,981 lumens, 4000 CCT, multi-volt, Type III light distribution, and 20kV surge suppression.

No alternate luminaires will be accepted. A catalog cut will be required.

The luminaire housing shall be powder coated grey in color.

The luminaire shall have a solid state long life photocontrol.

The luminaire's onboard circuitry shall include a surge protection device (SPD) to withstand high repetition noise transients as a result of utility line switching, nearby lightning strikes, and other interference. The LED luminaire shall be provided with integral 20kV surge protection which shall conform and be labeled as UL 1449 compliant. The SPD protects the luminaire from damage and failure for common and differential mode transient peak currents up to 10 kA (minimum). SPD performance shall have been tested per procedures in ANSI C136.2/IEEE C62.41-2:2002 category C high exposure. The SPD shall be connected so that in the event of catastrophic failure the luminaire will no longer operate and the driver and light engine will be isolated from additional spikes. The SPD shall be field replaceable.

A spare surge suppressor shall be supplied with the luminaire and turned over to the Engineer for delivery to ConnDOT District 2 Electrical Maintenance personnel.

The LED luminaire shall carry a limited 5 year warranty on the LEDs and the Driver.

Conductors shall conform to Article M.15.11 and shall be No. 10 AWG, THWN, rated for 600 volts. Conductors shall be factory full length color coded black, white, and green.

CONSTRUCTION METHOD: The LED luminaire shall be installed at the location designated on the plans and in accordance with Section 10.04. The LED luminaire shall be installed at the end of the bracket and shall be securely fastened, properly oriented, connected to the power supply conductors, cleaned, and ready for operation. The luminaire shall be leveled by placing an electronic (digital) level along the flat bottom face of the luminaire. All luminaires suspected of not being leveled shall be re-leveled by the Contractor at the discretion of the Engineer.

The luminaire shall be properly grounded with a No. 10 AWG equipment ground connected between the ground rod/system in the pole base and the grounding lug in the luminaire.

The luminaire shall be electrically fed from a dedicated 15-amp circuit breaker located in the traffic signal control cabinet. The circuit breaker shall be paid for as part of the controller cabinet item. Conductors shall be run from the single pole circuit breaker and the neutral bus bar in the cabinet, to the line side of the luminaire ballast. Conduit shall be paid for under separate bid items.

The luminaire bracket arm shall be paid for and specified under the item for the traffic signal span pole.

The Contractor shall ensure that once installed the LED luminaire functions properly.

METHOD OF MEASUREMENT: This work will be measured for payment by the number of LED luminaires installed, complete and accepted.

BASIS OF PAYMENT: This work will be paid for at the contract unit price each for "LED Luminaire – Type 1" of the type and size specified, complete and accepted in place, which price shall include all materials including luminaire, LEDs, driver, surge suppressor, photocontrol, spare surge suppressor, conductors, connections, leveling, grounding, and all labor, tools, equipment and work incidental thereto.

<u>Pay Item</u>	<u>Pay Unit</u>
LED Luminaire – Type 1	ea.

ITEM #1005602A – LED LUMINAIRE – TYPE 2

Description:

This item shall consist of furnishing and installing a light emitting diode (LED) luminaire of the wattage, distribution, and voltage as specified, completely wired and attached to the arm or bracket of the pole in accordance with the plans and specifications.

Materials:

The LED luminaire shall be one of the following:

For luminaires with a Type II light distribution:

Philips Lumec, Road Focus, catalog number: **RFL-145W64LED4K-G2-R2M-HVU-SP2-GY3**, with the following characteristics: 137 watts, 17,361 lumens, 700mA, 4000 CCT, 480 volt, Type II medium light distribution, and 20kV surge suppression.

American Electric, Autobahn, catalog number: **ATB2-60BLEDE70-480-R2-NR-20K-NL**, with the following characteristics: 130 watts, 18,193 lumens, 700mA, 4000 CCT, 480 volt, Type II light distribution, and 20kV surge suppression.

General Electric, Evolve, catalog number: **ERL2-H-18-B3-40-1-GRAY-G-T**, with the following characteristics: 140 watts, 18,000 lumens, 4000 CCT, 480 volt, Type II wide light distribution, and 20kV surge suppression.

For luminaires with a Type III light distribution:

Philips Lumec, Road Focus, catalog number: **RFL-145W64LED4K-G2-R3M-HVU-SP2-GY3**, with the following characteristics: 137 watts, 17,183 lumens, 700mA, 4000 CCT, 480 volt, Type III medium light distribution, and 20kV surge suppression.

American Electric, Autobahn, catalog number: **ATB2-60BLEDE70-480-R3-NR-20K-NL**, with the following characteristics: 130 watts, 17,714 lumens, 700mA, 4000 CCT, 480 volt, Type III light distribution, and 20kV surge suppression.

General Electric, Evolve, catalog number: **ERL2-H-18-C3-40-1-GRAY-G-T**, with the following characteristics: 140 watts, 18,000 lumens, 4000 CCT, 480 volt, Type III light distribution, and 20kV surge suppression.

No alternate luminaires will be accepted. A catalog cut will be required. It is the Contractors responsibility to install a luminaire of the required light distribution type (II or III) at the location as called for on the plans. Shop drawings for this item shall include both type II and type III light distributions. Prior to ordering the luminaire from the manufacturer, the Contractor shall determine the correct quantity of each distribution type.

The luminaire housing shall be powder coated grey in color.

The luminaire housing shall not have a photocontrol receptacle.

The luminaire's onboard circuitry shall include a surge protection device (SPD) to withstand high repetition noise transients as a result of utility line switching, nearby lightning strikes, and other interference. The LED luminaire shall be provided with integral 20kV surge protection which shall conform and be labeled as UL 1449 compliant. The SPD protects the luminaire from damage and failure for common and differential mode transient peak currents up to 10 kA (minimum). SPD performance shall have been tested per procedures in ANSI C136.2/IEEE C62.41-2:2002 category C high exposure. The SPD shall fail in such a way as the Luminaire will no longer operate and the driver will be isolated from additional spikes. The SPD shall be field replaceable.

The LED luminaire shall carry a limited 5 year warranty on the LEDs and the Driver.

Conductors shall be #10 AWG in accordance with Article M.15.11 of the Standard Specifications. Insulation shall be THHN/THWN and rated for 600 volts. The equipment grounding conductor shall be No. 10 AWG, THHN/THWN, rated for 600 volts. The ground wire shall be green in color.

Fuses and fuse holders shall conform to the requirements of Article M.15.05. Fuses shall be "slow blow" type.

Construction Methods:

The LED luminaire shall be installed at the end of the bracket and shall be securely fastened, properly oriented, connected to the power supply conductors, cleaned, and ready for operation. The luminaire shall be leveled by placing an electronic (digital) level along the flat bottom face of the luminaire. All luminaires suspected of not being leveled shall be re-leveled by the Contractor at the discretion of the Engineer.

It is the Contractors responsibility to install a luminaire of the required light distribution type (II or III) at the location as called for on the plans.

For installation on a new light standard: Fuse holders and fuses shall be installed in the pole base or in the adjacent cast iron junction box for bridge parapet mounted poles. Three No. 10 AWG conductors shall be installed from the fuse holders to the luminaire. The luminaire shall be properly grounded with a No. 10 AWG equipment ground connected between the ground rod/system in the light pole base and the grounding lug in the luminaire.

For installation on an existing light standard: The Contractor shall remove and replace the existing no. 10 AWG conductors and existing fuses/fuse kits. Three No. 10 AWG conductors shall be installed from the fuse holders to the luminaire. The luminaire shall be properly

grounded with a No. 10 AWG equipment ground connected between the ground rod/system in the light pole base and the grounding lug in the luminaire. Existing tap conductors and fuse kits which are removed shall be properly disposed of by the Contractor.

Fuse holders and fuses shall be installed in the pole base or in the adjacent cast iron junction box for bridge parapet mounted poles.

The Contractor shall ensure that once installed the LED luminaire functions properly.

Method of Measurement:

This work will be measured for payment by the number of LED luminaires installed, complete and accepted.

Basis of Payment:

This work will be paid for at the contract unit price each for "LED Luminaire - Type 2" of the type and size specified, complete and accepted in place, which price shall include all materials including luminaire, LEDs, driver, surge suppressor, conductors, fuses, fuse holders, connections, leveling, grounding, and all labor, tools, equipment and work incidental thereto.

Pay Item	Pay Unit
LED Luminaire – Type 2	ea.

ITEM #1005603A – LED LUMINAIRE – TYPE 3

DESCRIPTION: This item shall consist of furnishing and installing a light emitting diode (LED) luminaire of the wattage, distribution, and voltage as specified, with integral photocell, completely wired and attached to the luminaire bracket arm of a wood pole at the location as indicated on the plans. Once installed the luminaire shall become the property of the City of Middletown.

MATERIALS: The LED luminaire shall be one of the following:

Philips Road Focus, catalog number: **RFM-108W48LED4K-G2-R3M-UNIV-API-SP2-004-PH8XL-GY3**, with the following characteristics: 106 watts, 13,170 lumens, 700mA, 4000 CCT, multi-volt, Type III light distribution, and 20kV surge suppression.

American Electric, Autobahn, catalog number: **ATB0-30BLEDE10-MVOLT-R3-20K-PCLL**, with the following characteristics: 105 watts, 12,748 lumens, 1000mA, 4000 CCT, multi-volt, Type III light distribution, and 20kV surge suppression.

General Electric, Evolve, catalog number: **ERLH-0-13-C3-40-E-GRAY-G-T** with the following characteristics: 111 watts, 13,000 lumens, 4000 CCT, multi-volt, Type III light distribution, and 20kV surge suppression.

Cooper Lighting, Archeon-M, catalog number: **ARCH-M-AF48-100-U-T3-4-20K-AP-OA/RA1014**, with the following characteristics: 101 watts, 13,317 lumens, 4000 CCT, multi-volt, Type III light distribution, and 20kV surge suppression.

No alternate luminaires will be accepted. A catalog cut will be required.

The luminaire housing shall be powder coated grey in color.

The luminaire shall have a solid state long life photocontrol.

The luminaire's onboard circuitry shall include a surge protection device (SPD) to withstand high repetition noise transients as a result of utility line switching, nearby lightning strikes, and other interference. The LED luminaire shall be provided with integral 20kV surge protection which shall conform and be labeled as UL 1449 compliant. The SPD protects the luminaire from damage and failure for common and differential mode transient peak currents up to 10 kA (minimum). SPD performance shall have been tested per procedures in ANSI C136.2/IEEE C62.41-2:2002 category C high exposure. The SPD shall be connected so that in the event of catastrophic failure the luminaire will no longer operate and the driver and light engine will be isolated from additional spikes. The SPD shall be field replaceable.

The LED luminaire shall carry a limited 5 year warranty on the LEDs and the Driver.

CONSTRUCTION METHOD: The LED luminaire shall be installed at the location designated on the plans and in accordance with Section 10.04. The LED luminaire shall be installed at the end of the bracket and shall be securely fastened, properly oriented, connected to the power supply conductors, cleaned, and ready for operation. The luminaire shall be leveled by placing an electronic (digital) level along the flat bottom face of the luminaire. All luminaires suspected of not being leveled shall be re-leveled by the Contractor at the discretion of the Engineer.

The luminaire shall be electrically fed from a direct power feed from Eversource. The luminaire shall be properly bonded to the ground rod at the base of the wood pole. The Contractor shall contact Eversource at the contact number listed on the plans to coordinate the connection of the power feed.

The Contractor shall ensure that once installed the LED luminaire functions properly.

METHOD OF MEASUREMENT: This work will be measured for payment by the number of LED luminaires installed, complete and accepted.

BASIS OF PAYMENT: This work will be paid for at the contract unit price each for "LED Luminaire – Type 3" of the type and size specified, complete and accepted in place, which price shall include all materials including luminaire, LEDs, driver, surge suppressor, photocontrol, connections, leveling, grounding, utility coordination and construction costs, and all labor, tools, equipment and work incidental thereto.

<u>Pay Item</u>	<u>Pay Unit</u>
LED Luminaire – Type 3	ea.

ITEM #1008015A – 2” RIGID METAL CONDUIT- SURFACE

Description:

The 2” (50 mm) rigid metal conduit shall be used for mainline optical fiber cable installations. For RMC in structure, the Contractor shall be required to install a minimum of 10 feet (3.0 meters) of Flexible Conduit on each side of the junction box to ensure that the duct enters the pullbox at exactly a 90-degree angle to the side of the junction box. **The cost of the Flexible Metal Conduit shall be included in the cost of the appropriate conduit system; it shall not be paid for separately.**

As part of this item, the Contractor will be required to test the integrity of the conduit with a poly-line and to install a pull tape as required in the specification.

Work under the above items shall conform to Public Utility Commission Rules and Regulations, where applicable, and to Section 10.08 of the standard specifications, supplemented and amended as follows:

Materials:

A. General:

The conduit shall be free from defects including non-circularity and foreign inclusions. It shall be nominally uniform (as commercially practical) in color, density, and physical properties. It shall be straight and the ends shall be cut square to the inside diameter. Rigid Metal Conduit shall be galvanized steel conforming to Section M.15.09 of the standard specifications.

B. Shop Drawings

Prior to beginning work and fabrication of any materials, the Contractor shall take all field measurements necessary to assure the proper fit of the finished structure mounted conduit. This shall include all supports, brackets and hangers, fixed and flexible sweep bends, expansion/contraction fittings, junction boxes, and other structure mounted appurtenances. The Contractor shall submit shop drawings to the Engineer for approval in accordance with Article 1.05.02-3.

a. Layout plans and other pertinent information, including conduit lengths, locations and type of supports, sweep-bends, expansion fittings, junction boxes, etc. for each bridge or sign support that has structure mounted conduit and appurtenances.

b. Commercial items shall be identified by manufacturer, trade name and catalog number. Catalog sheets, including pertinent specifications, shall be included with the submission.

- c. Complete fabrication details, including material and galvanizing specifications, for all conduit supports, brackets and hangers, hardware, field fasteners including chemical anchorages, etc.
- d. All field measurements shall be submitted for reference to the reviewer.

C. Rigid Metal Outerduct:

All components of the conduit system shall meet or exceed the following specifications and standards:

1. ASTM A 36. Standard Specification for Structural Steel.
2. ASTM A 53. Standard Specification for Steel Pipe.
3. ASTM A 570 Standard specification for Steel.
4. ASTM A 479 Standard Specification For Stainless Steel.

In addition, the steel outer duct shall conform to the following industry standards:

NEC Article 346

ANSI C80.1

U.L. 6

The conduit system shall be a complete system with all the following fittings:

Deflection Fittings

Offset Fittings

Expansion/Contraction Fittings

Lubrication Fittings

Repair Kits

Installation Accessories

Stand Off Fittings

Entrance Fittings

Galvanized outer-duct shall be hot dipped galvanized inside and out; conduit shall be smooth and free from burrs and coated with rust inhibitor.

Rigid steel shall be supplied in 10-foot (3-meter) lengths with a length tolerance of +/- 1/2" (10mm) and shall be Schedule 40 minimum. Conduit shall be supplied with thread protectors.

Each section of steel conduit shall be supplied with one reversing spin coupling that allows straight sections and fittings to be joined without spinning the conduit. The reversing coupling shall be galvanized and have three set screws to lock the coupling in place.

The Steel Outerduct system shall be designed so that the assembly of components can be accomplished in the following steps:

- a. Loosen set screws on coupling spin back to allow for insertion

- b. Insert male into female and spin coupling forward to bottom
- c. Once the spin coupling is installed, there shall be no threads visible on the 4” (100 mm) steel conduits.
- d. Tighten set screws

The Steel conduit system shall offer a complete line of fixed and flexible sweep-bends with system compatible bell and spigot ends. The Steel conduit system shall offer and the Contractor shall utilize the following standard fixed sweep-bends:

Radius	Bend	System
4 ft & 3 ft. (1200mm & 900mm)	11.25°, 22.5°, 45°, 90°	4-way

Note: Direction changes shall not exceed 90 degrees.

The rigid steel conduit system shall offer expansion/contraction fittings with system compatible threads and reversing couplings. The inner-duct of the expansion/contraction fittings shall also be system compatible. The capacity of the fitting shall be 8” (200 mm) total stroke with 4” (100 mm) expansion and 4” (100 mm) contraction capacities.

D. Structure Mounted Conduit Supports

For applications in which the multi-cell conduit system is specified on the plans and/or by the Engineer to be attached to a bridge or other structure, bridge hanger assemblies and conduit support devices shall be required as shown on the details for these attachments. These hanger assemblies and support devices shall be designed for application to the specific bridge or structure for which they will be used, and their materials and design shall be approved by the Department prior to their use.

Threaded rods, anchor bolts, nuts and washers shall conform to ASTM A449 and shall be galvanized in accordance with ASTM A153.

All hex nuts shall be “Prevailing Torque Reusable Type Lock Nuts.”

E. Conduit Testing:

The poly-line installed to verify the integrity of the conduit system shall be ¼” (6 mm) polypropylene.

The detectable pull tape shall consist of a single 24 AWG copper wire with polyethylene or PVC jacket woven into the polyester tape. The pull tape shall be NEPTCO Part No. DP1250P, or approved equal, for cable sizes of less than 97 fibers. NEPTCO Part No. DP1800P, or approved equal, shall be used for cable size of 97-288 fibers.

The detectable pull tape shall have the following properties:

- 1250 lb (5.56 kN) tensile strength
- flat, not round, construction
- printed foot markings
- pre-lubricated for reduced pulling tension at start of cable pull
- low susceptibility to absorption of moisture; moisture resistant

Construction Methods:

A. General:

Construction methods shall conform to Article 10.08.03 of the Standard Specifications and to the manufacturer's instructions.

The Contractor shall layout the conduit in conjunction with the installation of pullboxes, vaults, or junction boxes. When installing the conduit, the Contractor shall be aware of the location of the proposed conduit terminal point when they are at a sufficient distance from the terminal point to allow for adjustment so that the conduit will line up flush with the applicable entry point. Flexible conduit will not be used indiscriminately.

A silicon, non-petroleum based lubricant on the coupling body may be used to facilitate installation.

Galvanized rigid steel conduit shall extend 2" (50 mm) into the junction box/vault/pullbox for installation of grounded end bushings.

B. Structure Mounted Conduit Supports

The Contractor will be required to submit to the Engineer for approval a proposal detailing the proposed installation method of the surface mounted conduit including the spacing between the conduit supports. The Contractor shall support the conduit as recommended by the manufacturer and approved by the Engineer.

Surface mounted conduit shall be installed where indicated on the plans; using mounting brackets and/or clamps as detailed on the plans or as directed by the Engineer.

Anchor bolts for conduit supports shall be drilled and anchored into sound concrete only. The anchorage system shall be installed per the manufacturers' recommendations. If existing reinforcement is encountered during drilling, the hole shall be abandoned, filled with non-shrink grout and relocated as directed by the Engineer. After installation of the conduit support, tighten all chemical anchor bolts to the torque as recommended by the anchorage system manufacturer.

C. Conduit Testing:

The Contractor shall test the full length of conduit after the conduit is installed. All testing shall be performed using the procedures and mandrel size recommended by the conduit manufacturer.

The Contractor will be required to install a poly-line within each cell of the conduit. The intention of the conduit testing is to verify the integrity of the completed system; therefore, this testing will only be allowed to commence once the conduit system has been completely installed. Testing shall be performed in the presence of the Engineer. The Engineer will document the date, time, and the results of the testing and shall submit this information to Highway Operations for record keeping purposes.

D. Detectable Pull Tape:

The Contractor shall install detectable pull tape, by hand pulling, blowing, or via vacuum method, into each empty conduit and empty cell within a multi-cell conduit during conduit installation. The Contractor shall install the detectable pull tape after conduit testing has been completed. The Contractor shall neatly coil and secure 10 ft (3 meters) of slacked pull tape in each vault location.

The detectable pull tape shall be field installed within each innerduct for the purpose of attaching to, and pulling of, the fiber optic cable. The Detectable Pulling Tape shall be tied off to an expanding Neoprene Plug.

E. Chemical Anchor Material:

Chemical anchor material shall meet the requirements of M03.07.

F. As -Built Plans:

The Contractor shall advise the Engineer of any change of measurement or layout of the Plans submitted to them. Upon completion of construction but prior to acceptance of the contract, the Contractor shall furnish one copy of the as-built plans on 2 ft. by 3 ft. (55 cm by 91 cm) standard plan sheets (hard copy) form and one portable document format (.pdf) created on ANSI D (22-inch x 34-inch) full scale sheet(s). All construction changes, with the final location and depth of the conduits, etc. shall be shown. These plans shall include all field installations. One sepia or other reproducible of the Project Plans will be provided to the Contractor for their use. Any other base maps that may be necessary for the Contractor to comply with this requirement shall be the Contractor's responsibility.

Method of Measurement:

The conduit shall be measured for payment by the actual number of linear feet of the type and size installed and accepted. **Expansion fittings, fixed and flexible sweep-bends, flexible metal conduit, and conduit fittings will not be measured for payment but shall be included in the pay item for the conduit of the type and size specified.** The measured length shall be from end to end along the centerline through all fittings.

The pull tape, and the poly-line conduit testing will not be measured for payment but shall be included in the pay item for the conduit of the type and size specified.

Basis of Payment:

Article 10.08.05 – Basis of Payment shall be amended as follows:

In the second paragraph, after the words “bonding bushings”, add the words “bonding wire,”.

This work shall be paid for at the contract unit price per linear foot for conduit of the size and type indicated, within the limits shown on the plans and in the details. This price shall include all materials required including expansion fittings, fixed and flexible sweep-bends, conduit fittings, pervious structure backfill, boxes, caps, entrance fittings, detectable pull tape, poly-line, inserts, bridge hanger assemblies, U-bolts, and conduit support devices, chemical anchors, equipment, tools, labor and work incidental thereto.

Pay Item

Pay Unit

(Size) (Kind) Conduit (Type)

l.f.

ITEM #1008901A – REMOVE CONDUIT

Description:

This item shall consist of the removal of existing surface mounted conduit that are attached to a bridge structure. The limits of conduit removal shall be as indicated on the plans or as ordered and in accordance with these specifications. The removed conduit shall remain the property of the Contractor. This item does not include the removal of the surface mounted IMS conduit, which is specified to be removed under Item No. 0503030A- Removal of Bridge Deck Concrete.

Construction Methods:

The Contractor shall remove surface mounted conduit with conductors from the bridge structure as indicated on the plans or as directed. This item shall also include the removal of any surface mounted junction boxes and conduit bodies associated with the conduit to be removed. The Contractor shall only remove the conduit once the new conduit and conductors have been installed and are supplying power to the bridge electrical systems (new conduit, conductors and navigation lights to be paid for under separate bid items). The conduits containing the IMS wiring shall not be removed.

Removed conduit with conductors shall be properly disposed of by the Contractor.

Method of Measurement:

This work will be measured for payment by the actual number in linear feet of conduit removed.

Basis of Payment:

This work will be paid for at the contract unit price per linear foot for "Remove Conduit" which price shall include the removal of the conduit with conductors, surface mounted junction boxes, cutting, removal of clamps, disposal, and all equipment, labor and work incidental thereto.

Pay Item

Pay Unit

Remove Conduit

l.f.

ITEM #1008908A – CLEAN EXISTING CONDUIT

Description:

Clean existing conduit as required, as shown on the plans or as directed by the Engineer to remove dirt and debris to facilitate the installation of new cable.

Construction Methods:

Where cable is to be installed in existing conduit the conduit may have to be cleared prior to the installation. Cleaning will only be necessary if the new cable cannot be easily installed in the existing conduit. By field inspection, and with the concurrence of the Engineer, determine the sections of conduit that require cleaning.

Remove all existing cable from conduit. Install temporary cable elsewhere, as necessary, to maintain normal signalization complete with vehicle & pedestrian detection, EVPS, and coordination. Clean the conduit 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.

Submit in writing the anticipated method of cleaning the conduit to the Engineer for approval prior to cleaning any conduit.

If the conduit is found 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 and replace only the damaged section. If the existing conduit is found to be missing hardware such as bonding bushings and bond wire, the missing material shall be provided and installed under this item prior to installation of the cable.

Method of Measurement:

This work shall be measured from termination point to termination point. This work shall be measured for payment on actual number of linear feet.

Basis of Payment:

The work under the Item “Clean Existing Conduit” shall be paid for at the contract unit price per linear foot, which price shall include all material, tools, equipment, labor, and work incidental thereto. Replacement of any damaged conduit shall be paid for under the applicable conduit item.

Pay Item
Clean Existing Conduit

Pay Unit
l.f.

ITEM #1010060A – CLEAN EXISTING CONCRETE HANDHOLE

Description:

Under this item the Contractor shall clean all debris from an existing concrete handhole where shown on the plans or as directed.

Construction Methods:

The Contractor shall remove all sand, silt and other debris from within an existing concrete handhole where shown on the plans or as directed. Debris shall be removed to a level of 12” below the incoming electrical conduit. Removed debris shall be properly disposed of by the Contractor. Where new conductors are to be installed in existing rigid metal conduit entering the handhole, the Contractor shall remove the old insulated bonding bushing from the end of each conduit and install a new insulated bonding bushing.

Method of Measurement:

This work will be measured for payment by the number of concrete handholes cleaned, complete and accepted.

Basis of Payment:

This work will be paid for at the contract unit price each for "Clean Existing Concrete Handhole", which price shall include the removal and disposal of debris from handhole, removal of existing bonding bushings, furnishing and installing new insulated bonding bushings, and all equipment and work incidental thereto.

Pay Item

Pay Unit

Clean Existing Concrete Handhole

ea.

ITEM #1010902A – REMOVE CONCRETE HANDHOLE

Description:

Under this item the contractor shall remove an existing concrete handhole where shown on the plans or as directed by the Engineer. The removed concrete handhole with cover shall remain the property of the contractor.

Construction Methods:

The contractor shall remove an existing concrete handhole and cover where indicated on the plans or as directed by the engineer. The removed concrete handhole with cover shall remain the property of the contractor. The resulting excavation shall be backfilled, graded and seeded to match surroundings, unless otherwise noted on the plans.

Method of Measurement:

This work will be measured for payment by the number of concrete handholes removed and disposed of, complete and accepted.

Basis of Payment:

This work will be paid for at the contract unit price each for "Remove Concrete Handhole", which price shall include all materials, equipment and work incidental thereto including removal, excavation, backfilling, grading, seeding, hauling and disposing of the concrete handhole and cover.

Pay Item

Pay Unit

Remove Concrete Handhole

ea.

ITEM #1014901A – REMOVE CABLE

Description:

The work under this item shall include the removal and legal disposal of Incident Management System (IMS) fiber optic cable, copper communications cable and electric service cable and conductors where shown on the plans or as directed by the Engineer.

Materials:

The Contractor shall be responsible for damage to all equipment and materials incurred during removal, hauling and disposal. All repairs or replacements due to damage or loss by the Contractor shall be made at the Contractor's expense.

A 1/4" (6 mm) polyester rope (pull line) shall be installed in all abandoned conduits for future pulling purposes.

A detectable pull tape, NEPTCO Part No. DP1250P, shall be installed in all abandoned innerducts of multiduct conduit installations.

Construction Methods:

Removal of existing IMS fiber optic cable, copper communications cable and electrical service cable/conductors shall be performed in a manner and sequence not to damage portions of the cable that shall remain or other adjacent or nearby appurtenances.

The Contractor shall install a 1/4-inch (6 mm) poly pull line for future use within any and all conduit where the IMS fiber optic cable has been removed. A pull rope shall be installed in communications and electrical service conduits only where noted on the plans. The pull line shall have sufficient length at each end and be neatly tied off within the nearest manhole, handhole, or pullbox.

Method of Measurement:

This work will be measured for payment by the actual number of linear feet (meters) of IMS cables removed. For communications cable and electrical service cable/conductors where more than one cable or conductor is to be removed from within the same conduit, measurement shall be based on the length of conduit (and any manholes, pullboxes, handholes, etc.) from which the cables/conductors are removed.

Basis of Payment:

This work will be paid for at the contract unit price per linear foot for "Remove Cable" as specified, which price shall include removal, storage, disposal, installation of polyester pull

line, and all work, materials, tools and equipment incidental thereto.

Pay Item

Pay Unit

Remove Cable

l.f.

ITEM #1017020A – REMOVE AND RELOCATE EMERGENCY CALL BOX

DESCRIPTION: Under this item the Contractor shall remove, temporarily transfer to the City of Middletown, and relocate an existing emergency call box pole (Owned by the City of Middletown) where shown on the plans, or as directed by the Engineer. The installation shall consist of erecting the existing aluminum pole with emergency call box and antenna on the new foundation.

MATERIALS: The Contractor shall be responsible for damage to all equipment and materials incurred during removal and re-installation. All repairs or replacements due to damage or loss by the Contractor shall be made at the Contractor's expense.

The concrete foundation shall be of the size indicated on the plans and shall be formed from Class A concrete which shall conform to the requirements of Section M.03.01.

CONSTRUCTION METHOD: The Contractor shall remove and relocate an existing emergency call box pole (Owned by the City of Middletown) where shown on the plans, or as directed by the Engineer. Upon installation of the new concrete foundation, the completely assembled call box pole shall be relocated to the new foundation. The pole shall be installed plumb with the aid of aluminum shims, if necessary.

Once removed, the emergency call box, pole, and mounting hardware, shall be temporarily transferred to the City of Middletown Fire Department for storage, while the new foundation is installed. The Middletown Fire Department will store and re-supply the existing Emergency Call Box and associated materials upon Contractor request. The Contractor shall coordinate the storage and re-supply of Emergency Call Box with Mr. Joe Rigano at (860) 883-7753 of the Middletown Fire Department.

The existing concrete foundation shall be removed and disposed of.

METHOD OF MEASUREMENT: This work will be measured for payment by the number of emergency call box poles removed and relocated, complete and accepted.

BASIS OF PAYMENT: This work will be paid for at the contract unit price each for "Remove and Relocate Emergency Call Box" as specified, which price shall include removal and installation of the aluminum pole and call box, removal and disposal of the existing concrete foundation, excavation, foundation, concrete, anchor bolts, coordination with the Fire Department, and all work, materials, tools and equipment incidental thereto.

<u>Pay Item</u>	<u>Pay Unit</u>
Remove and Relocate Emergency Call Box	ea.

ITEM #1017052A – REMOVE SERVICE

Description:

Work under this item shall consist of removal of an existing electric service cabinet for highway and navigation lighting at the location shown on the plans.

Materials:

The Contractor shall be responsible for damage to all equipment and material incurred during removal and hauling to specified area. All repairs or replacements due to damage or loss by the Contractor shall be made at the Contractor's expense.

Construction Methods:

The Contractor shall notify The Utility Co. to disconnect service 30 days prior to removing the service equipment. The service cabinet with all components shall be removed and shall be transported to the contractor's storage yard for the project.

The Contractor shall contact ConnDOT District 2 Electrical (tel: 860-537-8942) and arrange for ConnDOT Electrical personnel to have the opportunity to inspect the cabinet and to salvage the cabinet as a unit or salvage specific components. The Contractor shall assist ConnDOT Electrical personnel in loading the material onto ConnDOT vehicles for transport. Any material not selected for salvage shall remain the property of the Contractor.

The electric meter shall be returned to the appropriate Utility company representative and the Contractor shall note the date on which the meter was returned.

The concrete foundation shall be removed and disposed of by the contractor. The resulting excavation shall be properly backfilled, graded and seeded to match the surrounding area or as indicated on the plans.

The Contractor shall not remove the existing cabinet until the new lighting control cabinet(s) have been installed and are operational.

The existing controller cabinet shall remain in place through duration of construction until the final illumination design is installed. Contractor shall coordinate installation of new service and removal of existing service with Eversource.

Method of Measurement:

This work will be measured for payment by the number of services removed and delivered, complete and accepted.

Basis of Payment:

This work will be paid for at the contract unit price each for "Remove Service" which price shall include removal, delivery and unloading of the cabinet, removal and disposal of the foundation, excavation, backfilling, grading, seeding, and all equipment, labor, work and incidentals thereto.

Pay Item

Pay Unit

Remove Service

ea.

ITEM #1018002A – AVIATION OBSTRUCTION LIGHT

Description:

This item shall consist of furnishing and installing an LED dual light aviation obstruction light as specified, completely wired and attached to the bridge structure in accordance with the plans and specifications.

Materials:

The LED dual light aviation obstruction light shall conform to all requirements as set forth in FAA Advisory Circular Nos. 70/7460-1L and 150/5345-43G and shall consist of two L-810 steady-burn red LED obstruction lights. The center of the vertical beam spread must be between +4 and +20 degrees. With a minimum vertical beam spread of 10 degrees and at all radials throughout 360 degrees, there must be a minimum intensity of 32.5 candela. Mechanical interface for installation must be 3/4 or 1 inch National Pipe Thread (NPT) side and/or bottom. The aviation obstruction light shall operate on a 120 volt AC electrical circuit. The LED obstruction light shall be NEMA 4x and IP66 rated and capable of operation at temperatures between -67°F and 131°F. The obstruction light shall feature a cast aluminum housing and stainless steel hardware. The lamp assembly and housing shall be weather/corrosion resistant and shall be resistant to shock and vibration. The obstruction light shall feature a 5 year warranty.

The following LED obstruction lights will be accepted:

Cooper Crouse-Hinds, model OWLFDR/120

Unimar, model 860-1R01-002

Dialight, model 860-1R01-002

No alternate luminaires will be accepted. A catalog cut will be required in accordance with 1.05.02.

Conductors shall be #10 AWG in accordance with Article M.15.11 of the Standard Specifications. Insulation shall be THHN/THWN and rated for 600 volts. The equipment grounding conductor shall be No. 10 AWG, THHN/THWN, rated for 600 volts. The ground wire shall be green in color.

Construction Methods:

The LED dual light aviation obstruction light assembly shall be installed at the same location as the existing aviation light to be removed. The removal of the existing aviation obstruction light assembly shall be coordinated with the installation of the new aviation obstruction light assembly so that the proper nighttime (or fog related) demarcation of the bridge structure is maintained. The removal of an existing aviation light shall be postponed if the light is found to be operating during daylight hours due to the presence of fog. The installation of the navigation light shall be carried out during daylight hours and the installation shall be completed prior to sunset. The dual aviation light with “bull horn” bracket shall be securely fastened, properly oriented,

connected to the power supply conductors, cleaned, and ready for operation. The new aviation light assembly shall be installed and powered immediately upon the removal of the existing light.

The luminaire shall be properly grounded with a No. 10 AWG equipment ground.

All attachment hardware to the bridge structure shall be stainless steel and shall be appropriately sized for the application. All attachment bolts shall feature flat washers, and either lock washers or lock nuts.

The Contractor shall ensure that once installed the LED dual light aviation obstruction light functions properly.

The installation of surface mounted PVC coated rigid metal conduit, condulets, and device boxes and the removal of all existing surface mounted conduit, condulets, junction boxes, and device boxes shall be paid for under separate bid items.

The removed aviation obstruction light assembly shall be properly disposed of by the Contractor.

Method of Measurement:

This work will be measured for payment by the number of aviation obstruction lights installed, complete and accepted.

Basis of Payment:

This work will be paid for at the contract unit price each for "Aviation Obstruction Light" of the type and size specified, complete and accepted in place, which price shall include all materials including dual LED aviation obstruction light, LEDs, driver, surge suppressor, conductors, connections, leveling, mounting, hardware, mounting brackets, drilling, grounding, and all labor, tools, equipment and work incidental thereto.

Pay Item

Pay Unit

Aviation Obstruction Light

ea.

ITEM #1018007A – NAVIGATION LIGHT (PIER)

Description:

This item shall consist of furnishing and installing a pier mounted light emitting diode (LED) 180 degree red navigation light of the wattage, distribution, and voltage as specified, completely wired and attached to the bridge structure in accordance with the plans and specifications.

Materials:

The navigation light shall have LED optics and shall produce a 180° sectored red light output. The navigation light shall be U.S. Coast Guard approved and shall carry the following certifications:

CE (European Conformity)	EN61000-6-3:1997, EN61000-6-1:1997
IALA	E-200-1
USCG	33 CFR Part 66
Quality Assurance	ISO9001:2008
IP	IP67

The LED navigation light shall have a visible range of up to 4NM and shall operate at 120 volts AC. The navigation light body and lens material shall be LEXAN polycarbonate which shall be UV stabilized. The following characteristics shall apply:

Visible Range:	AT@0.74: 4 NM (nominal) AT@0.85: 4.6 NM (nominal)
Vertical Divergence:	9°
LED Life Expectancy:	>100,000 hours
Temperature Range:	-40 to 80°C
Lens Diameter:	4.25"
Mounting:	2" O.D. slip-fitter
Height:	4"
Width	4.25"
Mass:	2.625 lbs.
Warranty:	3 Years

The LED navigation light shall feature an aluminum slip fitter type post mount fabricated of aluminum and powder coated red. All hardware used in the construction of the light shall be stainless steel. The navigation light shall feature a factory connected, 3 conductor, outdoor rated, flexible power cable. The Contractor shall take field measurements to determine the required length of the power cable allowing enough slack in the cable to create a suitable drip loop and allow for conductor splicing in the adjacent junction box as indicated on the plans.

The stanchion shall be manufactured from 2" stainless steel tubing and shall position the new navigation light at the same height as the existing light to be removed. The stanchion shall be

supplied by the same manufacturer as the navigation light and shall be equipped with a stainless steel mounting flange.

All mounting bolts shall be Type 316 stainless steel and shall be sized per the manufacturer's recommendations to fit the mounting flange

Flexible conduit where installed shall be Liquidtight Flexible Metallic Conduit (LTFMC) with a trade size diameter of 1". LTFMC shall conform to Article M.15.09-4. LTFMC and fittings shall be wet location rated.

Construction Methods:

The 180° red navigation light shall be used to light the channel margin and shall be installed in conformance with Section 10.18 and the plans and details.

The stainless steel stanchion shall be installed at the location indicated on the plans and details. If possible the Contractor shall use one or more of the existing mounting holes drilled into the maintenance platform to mount the stanchion. Where necessary the contractor shall drill new mounting holes as needed.

The 180° red navigation light shall be installed on the stanchion and the power cable shall be run to the surface mounted junction box as indicated on the plan details and connected to the power circuit.

Surface conduit shall be furnished and installed under a separate bid item for rigid metal conduit. Where necessary to accommodate structural movement at bridge joints, limited lengths of liquidtight flexible non-metallic conduit can be installed.

The navigation light shall be tested for proper operation.

The installation of the navigation light shall be carried out prior to the removal of the existing navigation light. Under no circumstances shall the proper nighttime demarcation of the pier be disrupted.

Method of Measurement:

This work will be measured for payment by the number of navigation lights installed, complete and accepted.

Basis of Payment:

This work will be paid for at the contract unit price each for "Navigation Light (Pier)" of the type and size specified, complete and accepted in place, which price shall include all materials including navigation light, stainless steel bracket arm, power cables, slip-fitter, connections, liquidtight

flexible non-metallic conduit, mounting hardware, drilling, mounting, measuring, testing, and all labor, tools, equipment and work incidental thereto.

Pay Item

Pay Unit

Navigation Light (Pier)

ea.

ITEM #1018008A – NAVIGATION LIGHT (PIVOT TYPE CENTER OF CHANNEL)

Description:

This item shall consist of furnishing and installing a pivot arm mounted light emitting diode (LED) 360 degree green navigation light of the wattage, distribution, and voltage as specified, completely wired and attached to the bridge structure in accordance with the plans and specifications.

Materials:

The navigation light shall have LED optics and shall produce a 360° green light output. The navigation light shall be U.S. Coast Guard approved and shall carry the following certifications:

CE (European Conformity)	EN61000-6-3:1997, EN61000-6-1:1997
IALA	E-200-1
USCG	33 CFR Part 66
Quality Assurance	ISO9001:2008
IP	IP67

The LED navigation light shall have a visible range of up to 4NM and shall operate at 120 volts AC. The navigation light body and lens material shall be LEXAN polycarbonate which shall be UV stabilized. The following characteristics shall apply:

Visible Range:	AT@0.74: 4 NM (nominal) AT@0.85: 4.6 NM (nominal)
Vertical Divergence:	9°
LED Life Expectancy:	>100,000 hours
Temperature Range:	-40 to 80°C
Lens Diameter:	4.25"
Mounting:	2" O.D. slip-fitter
Height:	4"
Width	4.25"
Mass:	2.625 lbs.
Warranty:	3 Years

The LED navigation light shall feature an aluminum slip fitter type post mount fabricated of aluminum and powder coated green. All hardware used in the construction of the light shall be stainless steel. The navigation light shall feature a factory connected, 3 conductor, outdoor rated, flexible power cable. The Contractor shall take field measurements to determine the required length of the power cable allowing enough slack in the cable to accommodate the 180° degree rotation of the pivot arm bracket, create a suitable drip loop, and allow for conductor splicing in the adjacent junction box as indicated on the plans.

The pivot arm bracket shall be manufactured from 2" stainless steel tubing and shall be supplied by the same manufacturer as the navigation light. The pivot arm shall allow full 180° rotation of the navigation light from the "down" position to the "service" position and shall feature a locking plate which when engaged will lock the pivot arm in the downward position. The Contractor shall take field measurements to determine the required length of the pivot arm. The length of the arm shall be such that the navigation light is positioned at the same elevation as the existing light (to be removed) or as called for on the plans.

All hardware used to mount the pivot arm to the bridge structure shall be stainless steel and shall be sized per the manufacturer's recommendations for the given loads.

The pendant mounted navigation light shall be equipped with an articulated stainless steel chain which will allow retrieval of the navigation light up to a maintenance position above the safety fence on the maintenance platform.

All cable connectors/connections shall be watertight.

The fuse and fuse holders shall be as detailed on the plans.

Flexible conduit shall be LFMC (Liquidtight Flexible Metallic Conduit) with a trade size diameter of 1". LFMC shall meet the requirements set forth in Article M.15.09-4. LFMC and fittings shall be wet location rated.

Rigid metal conduit shall be furnished and paid for under a separate bid item.

The swiveling mount bracket shall be fabricated to the requirements and dimensions as indicated on sheet ILL-09.

Construction Methods:

The Pivot type 360° green navigation light shall be used to light the center of the navigable channel and shall be installed in conformance with Section 10.18 and the plans and details.

The pivot arm shall attach to the structural steel at the same location as the existing light. The Contractor shall re-use existing bolt holes where possible. Where bolt holes must be drilled in the structural steel the holes shall have a diameter no larger than the minimum diameter required inserting the anchoring hardware.

The navigation light shall be installed at the end of the pivot arm and the swivel assembly shall be securely bolted to the structural steel. Mounting hardware shall include lock washers or lock nuts to eliminate the possibility of vibration induced loosening.

The Contractor shall ensure that the installed navigation light is completely accessible, including access to the lift chain and latch plate. The Contractor shall demonstrate that when raised, the navigation light is accessible from the maintenance platform at a height above the safety fence.

The manufacturer supplied power cable shall be connected to the navigation lighting circuit as indicated in the plan details. The navigation light shall be properly connected to the equipment ground. Fuse holders and fuses (brass slug for neutral) shall be installed in the parapet cast iron junction box to protect the No. 10 AWG tap conductors (paid for under a separate bid item) to the navigation light.

Surface conduit shall be furnished and installed under a separate bid item (see Item No. 1008012 – 1” Rigid Metal Conduit – Surface). Where necessary to accommodate structural movement at bridge joints, limited lengths of liquidtight flexible metallic conduit can be installed.

The navigation light shall be tested for proper operation.

The installation of the navigation light shall be carried out during daylight hours and the installation shall be completed prior to sunset. Under no circumstances shall the proper nighttime demarcation of the center of channel be disrupted.

Method of Measurement:

This work will be measured for payment by the number of navigation lights installed, complete and accepted.

Basis of Payment:

This work will be paid for at the contract unit price each for "Navigation Light (Pivot Type Center of Channel)" of the type and size specified, complete and accepted in place, which price shall include all materials including navigation light, stainless steel pivot arm, structural steel for swiveling mount bracket, latch plate, lift chain, lift chain eye bolt, power cable, slip-fitter, fuses, fuse holders, liquid-tight flexible metallic conduit, connections, mounting hardware, drilling, mounting, measuring, testing, grounding, and all labor, tools, equipment and work incidental thereto. The removal of the existing navigation light mounting bracket as well as the materials and installation of the new structural steel navigation light swiveling mounting bracket will be paid for under this item.

Pay Item

Pay Unit

Navigation Light (Pivot Type Center of Channel)

ea.

ITEM #1018101A – REMOVE NAVIGATION LIGHTS

Description:

Under this item the Contractor shall remove a complete navigation lighting system consisting of navigation lights, brackets, surface conduit and junction boxes, mountings, and cables, where, shown on the plans or as directed by the Engineer. The removed navigation lighting equipment shall remain the property of the Contractor.

Construction Methods:

The Contractor shall remove a complete navigation lighting system consisting of navigation lights, brackets, surface conduit and junction boxes, mountings, and cables, where, shown on the plans or as directed by the Engineer. The removed navigation lights, pendant brackets and stanchion brackets shall remain the property of ConnDOT. Removed conduit, conductors and junction boxes shall remain the property of the contractor.

The removal of the existing navigation lighting equipment shall be coordinated with the installation of the new navigation lighting equipment (paid for under separate bid items) so that proper nighttime navigation lighting of the river channel is maintained at all times. The removal of navigation lights shall be carried out on a “one for one” basis during daylight hours.* with the new navigation light installed and powered immediately upon the removal of the existing light.

*The removal of an existing navigation light shall be postponed if the light is found to be operating during daylight hours due to the presence of fog. Nighttime navigation lighting of the maritime channel shall be maintained throughout all stages of construction.

Removed materials shall be properly disposed of by the Contractor.

The Contractor shall contact the Maintenance Supervisor of ConnDOT District 2 Electrical Maintenance (tel: 860-537-8942) to coordinate transfer of the removed materials. The Contractor shall contact the Maintenance Supervisor at least 24 hours in advance to coordinate unloading and storage. The Contractor shall load, transport, and unload the material. The material shall be stacked and stored according to the directions of the Maintenance Supervisor.

Method of Measurement:

This work will be measured for payment as an each item for the removal of the complete existing navigation light system as described.

Basis of Payment:

This work will be paid for at the contract unit price each for "Remove Navigation Lights", which price shall include the removal of navigation lights, pendant brackets, mounting hardware,

stanchions, surface conduit, junction boxes, cables, disconnection, transfer of materials, disposal, hauling, and all work, labor and materials incidental thereto.

Pay Item

Pay Unit

Remove Navigation Lights

ea.

ITEM #1020001A – WOOD POLE

DESCRIPTION: This work shall consist of furnishing and installing a wood pole with twin luminaire brackets, ground rod, at the location shown on the plans.

MATERIALS: Wood poles shall conform to the pertinent requirements of Article M.16.04-2. Wood poles shall be 35' in length.

The luminaire bracket arms shall be 4' in length (single member) of an upsweep design fabricated from tubular aluminum. The luminaire end shall have a 2-3/8" outside diameter. The pole shall be furnished with two bracket arms. When mounted, the bracket arms shall provide a 30' luminaire mounting height over the roadway.

Ground rods shall be 5/8" x 8' copper-clad steel with an approved square head bolt-type ground clamp.

Ground wire shall be #8 AWG stranded bare soft-drawn copper.

CONSTRUCTION METHODS: The Contractor shall install the wood pole, luminaire brackets, ground rod and ground wire, including excavation of earth or rock, at the locations shown on the plans.

METHOD OF MEASUREMENT: This work will be measured for payment by the number of wood poles with associated equipment installed of complete and accepted.

BASIS OF PAYMENT: This work will be paid for at the contract unit price each for "Wood Pole", as specified and complete and accepted in place which price shall include all materials including wood pole, brackets, ground rod, ground wire, including excavation of earth or rock and all labor, tools and work incidental thereto.

Pay Item
Wood Pole

Pay Unit
ea.

ITEM #1020030A – TEMPORARY ILLUMINATION UNIT

Description:

Under this item the Contractor shall furnish and install a fiberglass light pole, bracket, luminaire, and associated hardware, to be used 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 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 1/2" 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° F, cycle lamp 4 hours on 4 hours off) with the following results: Fiber exposure: none, Crazeing: none, Checking: none, Chalking: none, Color: may dull slightly.

Anchorage mounted poles: The pole shaft shall be equipped with an anchor base of heavy duty A356-T6 aluminum which shall be permanently bonded to the outside of the fiberglass shaft. The anchor base pole shall be installed on a concrete foundation, parapet anchorage, temporary bracket, or other fixed anchorage as called for on the plans. The anchor base pole shall be non-breakaway, but shall be attached to the anchorage using breakaway couplings as indicated on the plans or as directed by the Engineer. The pole shall provide a 30' luminaire mounting height when measured from the top of the pole anchorage. The luminaire bracket arm shall be 6' in length (single member) of an upsweep design fabricated from tubular aluminum. The luminaire end shall have a 2-3/8" outside diameter.

Direct buried poles: The pole shall be suitable for direct burial and shall conform to the breakaway requirements of the current AASHTO *Standard Specification for Structural Supports for Highway Signs, Luminaires and Traffic Signals*. For direct buried break-away poles the butt end shall be enlarged so as to provide resistance to rotation and pull out. The pole shall provide a 30' luminaire mounting height when measured from the roadway surface. 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.

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" 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 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 luminaires will have a dual-tap (240/480 volts) ballast to allow for the different voltage requirements between Stages 1 and 3. The socket shall be adjustable to provide I.E.S. light distribution type M-C-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 Methods:

The fiberglass pole shall be securely bolted to the anchor bolts of the fixed anchorage or installed in an augured hole where indicated on the plans. The bracket and luminaire assembly shall be installed perpendicular to the center line of the roadway. When necessary, the temporary light pole and luminaire shall be relocated to maintain different illumination circuits as dictated by the construction stages.

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, anchor base bracket, luminaire, lamps, ballast, hardware, breakaway couplings, breakaway base section, connections, hauling, and all equipment, tools, labor and all work incidental thereto including 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.

Pay Item

Pay Unit

Temporary Illumination Unite

ea.

ITEM #1020042A – MAINTAIN EXISTING ILLUMINATION

Description:

Under this item the Contractor shall maintain existing illumination circuits disturbed by the reconstruction of the bridge parapet. This item will involve the installation of temporary surface mounted conduit and conductors, junction boxes, and/or aerial cable to maintain the existing highway lighting circuits in proper operating condition.

Upon installation of the permanent lighting conductors in the reconstructed parapet, all materials used in the temporary maintenance of the existing illumination will be removed and shall remain the property of the Contractor.

Materials:

Aerial cable shall be 7 strand aluminum containing a No. 4 AWG bare messenger with 3 No. 4 AWG cross-linked polyethylene insulated conductors rated at 600 volts.

Surface conduit shall be either 1-1/2" polyethylene cable in duct or 1-1/2" schedule 40 PVC.

Cable in duct shall conform to the requirements of article M.15.12 and shall have three No. 4 AWG copper conductors, with XHHW insulation rated for 600 volts.

PVC conduit shall conform to the requirements of Article M-15.09-3.

Flexible conduit shall be 3/4" liquid-tight flexible metallic conduit (LFMC) and shall conform to the requirements of Article M.15.09-4, and shall be UL listed for outdoor use.

Temporary junction boxes with cover shall be polycarbonate, NEMA 3 rated, with approximate dimensions of 18" x 16" x 8". The cover shall be gasketed overlap type attached to the enclosure body with mounting screws. Junction boxes shall have external mounting tabs.

Conductors in conduit shall be No. 4 AWG, with XHHW insulation rated for 600 volts. The conductors shall conform to the requirements of Article M.15.11 and shall be permanently factory color coded throughout their entire length. Three phase colors shall be black, red and blue.

Luminaire tap conductors shall be stranded copper, No. 10 AWG with type THWN insulation.

Bare copper grounding conductor shall be No. 8 AWG and shall conform to the requirements of Article M.15.13.

Fuses and breakaway fuse holders shall conform to the requirements of Article M15.05.

Construction Methods:

Under this item the Contractor shall maintain existing illumination circuits disturbed by the reconstruction of the bridge parapet at the expansion joint and sign support locations, through the installation of temporary conduit, junction boxes, conductors, and aerial cable.

Under this item the Contractor shall maintain the continuity of the lighting circuits using any combination of the following methods:

Install aerial cable between existing light standards. Aerial cable shall be securely clamped to the top of the light standard and all required connections shall be made to restore the lighting circuit to proper operation. The light standard shall be guyed with a braided steel guy wire in the opposite direction of the aerial cable attachment. The guy wire shall be securely attached to the concrete parapet.

Install lighting conductors (or aerial cable) in PVC conduit or cable in duct behind the temporary precast barrier curb (TPCBC). Temporary branch circuit conductors shall be installed within the surface mounted conduit and connected to the light standards mounted to the parapet. Temporary conduit shall be clamped to the TPCBC every 36" as per the NEC. All temporary conductors shall be contained in conduit and all temporary circuit splices shall be made in existing junction boxes, temporary junction boxes, or at the top of the light standard. Temporary LFMC can access the light standard through the aluminum access door at the base of the light standard. The access door shall be drilled to accept a male LFMC connector. Under no circumstances shall conductors or splices be accessible to the public using the sidewalk.

The Contractor shall install all materials associated with the temporary maintenance of existing illumination prior to the removal of the existing lighting circuitry. The switch over to the temporary circuits shall be carried out during daylight hours. Under no circumstances shall the proper nighttime operation of the highway lighting system be disrupted.

Upon completion of the parapet reconstruction and installation and connection of the permanent illumination circuitry, the materials used in the temporary maintenance of existing illumination shall be removed by the Contractor, and shall remain the property of the Contractor.

The Contractor shall submit his method of maintaining the existing lighting circuits including all proposed materials for review and approval prior to beginning the installation.

Upon the completion of the parapet reconstruction at a given expansion joint or sign support location, the Contractor will be expected to remove the temporary lighting materials (conduit, duct, cable, junction boxes, etc.) and re-use them at the next parapet section to be reconstructed. It is anticipated that not more than two parapet reconstruction locations will be active at any given time.

Method of Measurement:

This work will be measured for payment as a lump sum.

Basis of Payment:

This work will be paid for at the contract lump sum price for "Maintain Existing Illumination" complete and accepted, which price shall include all materials, conduit, aerial cable, cable in duct, junction boxes, flexible conduit, fuses, fuse holders, conductors, insulators, hardware, connections, drilling, anchoring, removal and reinstallation, removal of temporary materials, and all equipment, tools, labor, and work incidental thereto.

Pay Item

Pay Unit

Maintain Existing Illumination

l.s.

ITEM #1020998A – TEMPORARY LIGHT STANDARD ATTACHMENT BRACKET

Description:

Work under this item shall consist of furnishing, installing and removing temporary brackets to support temporary illumination units on bridge parapets and temporary precast concrete barrier curbs in order to maintain proper illumination of Route 66 during all construction stages. The temporary support brackets shall be any type which the Contractor elects to build which adequately support the temporary light standard units. Holes and anchorages installed in bridge parapets for the purpose of anchoring or supporting the brackets and light standards shall be repaired as part of this work.

Materials:

Steel plate used for temporary support brackets shall conform to the requirements of ASTM A36.

Expansion anchors shall be Hilti HSL Expansion Anchor, Rawl-Bolt or other similar type of expansion anchor which uses a hexagon headed bolt for expanding the anchor.

The chemical anchoring material shall be a resin compound specially formulated to anchor steel bolts in holes drilled in concrete. The chemical anchoring material shall be from the Department of Transportation's approved list.

Anchor bolts shall conform to the requirements of Subarticle M.15.02.

Non-shrink grout shall conform to Subarticle M.03.05.

Class "A" Concrete shall conform to the requirements of Article M.03.01.

Reinforcing steel shall conform to ASTM A615, and shall be deformed Grade 420.

Construction Methods:

Temporary support brackets to support temporary illumination units shall be designed by the Contractor to support the temporary light standard under design loadings called out in the AASHTO publication "Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals", 1994.

The Contractor shall submit working drawings and design calculations for temporary light standard attachment brackets 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. These drawings shall be submitted for approval in accordance with Article 1.05.02-2.

Temporary light standard attachment bracket shall be secured to the non-traffic side of concrete barrier curbs and parapets. No part of the support bracket shall extend into or beyond the traffic side face of the concrete barrier curb or parapet.

The temporary attachment brackets are the property of the Contractor and shall be removed from the project site when no longer required. Temporary anchors, threaded rods and hardware fastened to concrete barrier curbs and parapets shall be removed and disposed of off site. All holes in the concrete barrier curbs and parapets shall be filled with non-shrink grout after the temporary attachment brackets have been removed.

The unit cost for this item is a one-time only cost. The cost of removing and relocating the temporary light standard attachment bracket to maintain different illumination circuits shall be included in the unit cost.

Method of Measurement:

This work will be measured for payment by the number of temporary light standard support bracket units installed and accepted.

Basis of Payment:

This work will be paid for at the contract unit price per each for "Temporary Light Standard Attachment Bracket", complete in place, which price shall include all materials, anchors, guys, hardware, and all equipment, tools, labor and all work incidental thereto and the removal of these materials at the end of the project. The unit cost for this item is a one-time only cost. The cost of removing and relocating the temporary light standard attachment bracket to maintain different illumination circuits shall be included in the unit cost.

Pay Item

Pay Unit

Temporary Light Standard Attachment Bracket

ea.

ITEM #1102048A – 8’ ORNAMENTAL ALUMINUM PEDESTAL

11.02.01 – Description: This item shall consist of furnishing and installing an ornamental pedestal of the type, size, and color specified on a prepared foundation at locations as shown on the plans and to the details included within this Special Provision, or as ordered, and in accordance with these specifications.

11.02.02 – Materials: The materials for this work shall conform to the requirements of Article M.16.03 and as amended below:

M.16.03 – Pedestals: The material for this work shall conform to the following requirements:

1. Ornamental Aluminum Pedestals:

- a. **Shaft:** The shaft shall be a 16-flat fluted aluminum design manufactured by Valmont.

The shaft length shall be 8 feet, 6 inch round diameter, minimum wall thickness of 0.188 inches, seamless, extruded 6061 aluminum of the height indicated, or as shown on the detail included within this Special Provision. It shall be strengthened to T-6 temper. A standard mounting assembly for pedestrian signals shall be provided at the top. A standard mounting assembly for pedestrian push button shall be provided as shown on the plans. The pedestal and associated mounting assemblies shall be powder coated Federal Standard 595 Color #27038 (BLACK).

The shaft shall be individually protected from scratches, dents and abrasions during handling and shipping.

- b. **Base:** The base shall be a 24” Washington cast aluminum clamshell decorative base manufactured by Valmont.

The Base shall be cast aluminum #356 alloy, have a removable access cover, secured with tamperproof stainless steel screws, and four reinforced lugs, slots or holes integrally cast into the bottom to accept anchor bolts. Each base shall be furnished with grounding provision. The base shall have an internal sleeve to accept the pole shaft. The pole shaft shall be seated into the base sleeve and welded around the outside of the base and internally where the pole is seated into the base casting. The Base shall be powder coated Federal Standard 595 Color #27038 (BLACK).

The pedestal shall be coordinated with the traffic signal mounting hardware. The use of banding shall not be permitted. The means of attaching the pedestrian signals and push buttons shall be submitted for approval.

11.02.03 – Construction Methods: The complete unit shall be erected vertically, mounted plumb, and shall be securely bolted to the foundation. All pedestals shall be effectively grounded using a 5/8 inch x 10-foot copper ground rod with #8 AWG solid, bare, tinned copper wire attached to the pedestal by a stainless steel bolt and to the ground rod by a square head bolt clamp.

11.02.04 – Method of Measurement: This work will be measured for payment by the number and type of pedestals specified, completed and accepted in place.

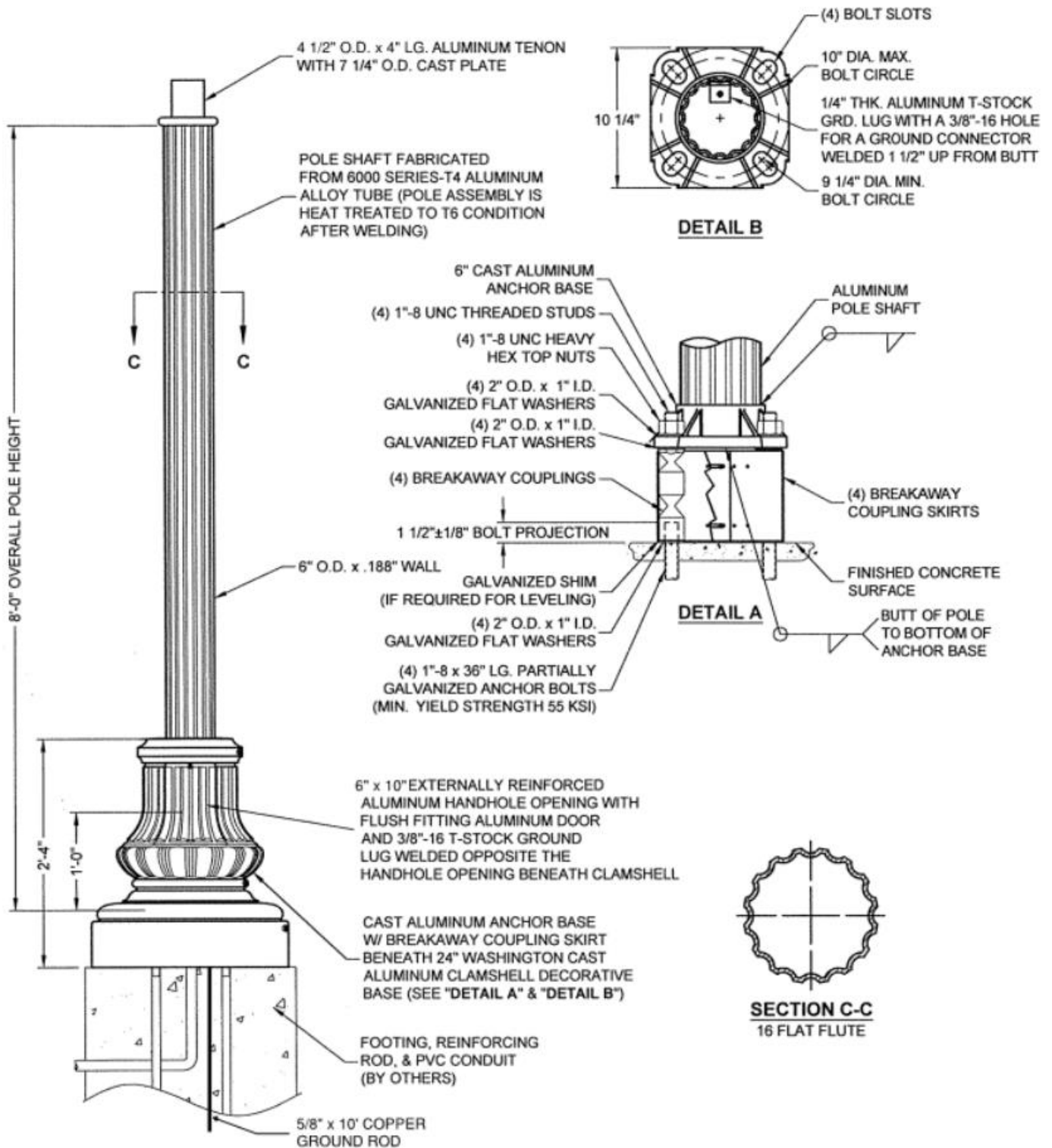
11.02.05 – Basis of Payment: This work shall be paid for at the Contract unit price each for “Ornamental Aluminum Pedestal”, which price shall include all materials, pedestal base, shaft, ground wire, paint, painting, labor, tools, equipment, miscellaneous fittings and work incidental thereto.

Pay Item

Ornamental Aluminum Pedestal

Pay Unit

ea.



ITEM #1103002A – STEEL COMBINATION SPAN POLE**ITEM #1114102A – SPAN WIRE****ALL STEEL COMBINATION SPAN POLES SHALL BE POWDER COATED BLACK, FEDERAL NO. 27038.**

Description: Work under this item shall consist of designing, fabricating and installing a steel span pole to carry traffic appurtenances (such as traffic signals or signs), of the type specified, on a prepared foundation, in accordance with the details shown on the plans and as ordered by the Engineer. Work under this item shall also include designing and installing a steel span wire, at the locations indicated, in accordance with the details shown on the plans and as ordered by the Engineer.

Materials: The tubular components, such as the pole and luminaire arm shall be made of steel with a minimum yield stress of 35,000 psi.

The structural plate components, such as the baseplates and handhole frames shall be made of steel that conforms to the requirements of ASTM A572, Grade 50.

Anchorage plates shall conform to the requirements of ASTM A572, Grade 50.

The steel for pole members and structural plate components, such as the baseplates and handhole frames, shall meet Charpy V-notch impact testing requirements for non-fracture critical members in Zone 2 and the following:

Yield Strength	Thickness in.	Minimum Average Energy, ft.-lbf
$F_y \leq 36$ ksi	≤ 4	15 at 40°F
36 ksi < $F_y \leq 50$ ksi	≤ 2	15 at 40°F
36 ksi < $F_y \leq 50$ ksi	$2 < t \leq 4$	20 at 40°F
50 ksi < $F_y \leq 70$ ksi	≤ 4	15 at -20°F
Charpy V-notch sampling and testing shall be in accordance with AASHTO T243, "H" piece frequency.		

The non-structural components, such as hand hole covers, caps and anchor bolt covers, shall be made of steel with minimum yield stress of 36,000 psi.

The filler metal shall have a matching strength relationship with the base metal.

All high strength bolts shall conform to ASTM A325, Type 1. Nuts shall conform to ASTM A563, Grade DH. Circular, flat, hardened steel washers shall conform to ASTM F436. The bolts, nuts and washers shall be galvanized in accordance with ASTM A153 or ASTM B695,

Grade 50. The nuts shall be overtapped to the minimum amount required for the bolt assembly and all surfaces of the nuts shall be lubricated with a lubricant containing a visible dye of any color that contrasts with the color of the galvanizing. The high strength bolts shall conform to the requirements of Subarticle M.06.02-3.

The anchor bolts shall conform to ASTM F1554, Grade 105. The nuts shall conform to ASTM A563, Grade DH. The washers shall conform to ASTM F436. The bolts, nuts and washers shall be galvanized in accordance with ASTM A153. The nuts shall be overtapped to the minimum amount required for the bolt assembly and all surfaces of the nuts shall be lubricated with a lubricant containing a visible dye of any color that contrasts with the color of the galvanizing. Prior to shipping the anchor bolts, the nuts and washers shall be installed by hand on the anchor bolts to ensure that the nuts can be run on the threads. Only anchor bolts on which the nuts are free running shall be shipped. The anchor bolts shall be shipped with the nuts and washers on the threads.

All steel components, including anchor bolts, shall be completely hot-dip galvanized, after fabrication, in accordance with ASTM A123 or ASTM A153, as applicable. Repairs to damaged areas of the hot-dip galvanized coatings shall conform to the requirements of ASTM A780 amended as follows:

Paints containing zinc dust, if used for repairs, shall contain either between 65% to 69% metallic zinc by weight or greater than 92% metallic zinc by weight in dry film.

The silicone sealant shall be a 1-component, 100% silicone sealant recommended for use with galvanized steel.

Neoprene gasket material for the access openings shall conform to ASTM D1056, Grade 2A2 or 2A3. Other grades of neoprene approved by the Engineer may be used.

Closed cell elastomer for sealing the space between the foundation and base plate shall conform to ASTM D1056, Grade 2A2 or 2A3 and shall have a pressure-sensitive adhesive backing on one side for adhesion to steel. Closed cell elastomer contained within the anchor bolt pattern shall not interfere with the anchor bolt leveling nuts and shall not block the opening in the base plate.

Bare copper grounding conductor shall be #8 AWG stranded bare copper wire conforming to M.15.13. The grounding bolt shall be stainless steel with a hex head.

Steel span wire shall conform to Article M.16.15.

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 for span pole members and structural plate components,

high-strength bolts (including nuts and washers) and anchor bolts (including nuts and washers). The Certified Test Reports shall include the following:

- a. Mill test reports that indicate the place where the material was melted and manufactured.
- b. High-strength bolt test results for proof load tests, wedge tests, and rotational-capacity tests that indicate where the tests were performed, date of tests, location 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 for span pole members and components, high-strength bolts (including nuts and washers) and anchor bolts (including nuts and washers).

Construction Methods: The design and fabrication of the span pole, including its anchorage (into the foundation), and the design of the span wire shall conform to the requirements of the latest edition of the AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals, including the latest interim specifications, available prior to the advertising date of the Contract, amended as follows:

1. The design wind speed shall be 120 mph. The calculation of wind pressures in accordance with Appendix C is not permitted.
2. The minimum design life shall be 50 years.
3. The wind importance factor, I_r , for wind pressure shall be 1.00.
4. The span pole and span wire shall be designed to support free swinging traffic signals and signs. The wind drag coefficient for traffic signals and luminaires shall be no less than 1.2.
5. The maximum stress ratio (the ratio of the computed stress to the allowable stress) or combined stress ratio (CSR) in any span pole component or in any span wire due to each group load shall not exceed 0.85. The purpose for limiting the stress ratio is to allow for future additional appurtenance configurations.
6. The span pole shall be designed to support a span wire with a sag no greater than 5% of the span. For definitions of sag and span, refer to Appendix A in the AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals.
7. The span wire properties shall conform to Article M.16.15. All span wires in a span pole configuration shall be the same diameter

8. The maximum luminaire arm length shall be 20.0 ft.
9. The maximum diameter of the pole at the base shall be 18 in.
10. The minimum wall thickness of the pole shall be 0.3125 in. The wall thickness of the pole shall be uniform throughout its length. Joining 2 tubular members together with a circumferential weld to fabricate a pole is not permitted. The use of shop-fabricated stepped members is not permitted. The use of multiple plies (laminations) to obtain the required pole thickness is not permitted.
11. The span pole shall be a tubular member with either a round or multisided cross-section. Multisided tubular members with other than 8, 12 or 16 sides are not permitted. Multisided tubular members with fluted sides are not permitted. The pole shall be fabricated with a taper (change in diameter).
12. Multisided tubular members with diameters less than or equal to 13 in. shall have a minimum of 8 sides. Multisided tubular members with diameters greater than 13 in. and less than or equal to 18 in. shall have no less than 12 sides.
13. Multisided tubular members shall have a minimum internal bend radius of 5 times the tubular member thickness or 1 in., whichever is greater.
14. Slip-type field splices are not permitted in the pole.
15. The pole shall be fabricated with no more than 2 longitudinal seam welds.
16. The longitudinal seam welds within 6 in. of the member ends shall be complete joint penetration groove welds.
17. Non-destructively test 100% of partial joint penetration longitudinal seam welds in accordance with the magnetic particle method. Non-destructively test 100 % of complete joint penetration seam welds in accordance with the ultrasonic method.
18. 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. Non-destructively test 100% of the complete joint penetration groove welds by the ultrasonic method after fabrication and prior to galvanizing. Non-destructively test 100% of the complete joint penetration groove welds by the ultrasonic method for toe cracks after galvanizing. Non-destructively test 100% of backing ring fillet welds by the magnetic particle method after fabrication prior to galvanizing. After galvanizing, the joint between the backing ring and tubular member shall be sealed with silicone sealant to prevent the ingress of moisture.

19. 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.
20. The use of seal and tack welds is not permitted. No welding shall be performed after galvanizing.
21. The use of stiffeners at tubular member to transverse plate connections is not permitted.
22. The minimum base plate thickness shall be no less than 2.5 in. or at least as thick as the anchor bolt diameter, whichever is greater. The determination of the plate thickness in the tubular member to transverse plate connections shall consider the potential for the plate to warp due to the heat from welding. Consideration should be given to the use of thicker plates to allow for subsequent machining of warped plates to a flat surface so that removal of material will not compromise the required strength of the plate.
23. The opening in the base plate shall be sized to allow for proper galvanizing and allow conduits projecting from the foundation to pass through it. The size of the opening shall be kept to a minimum to reduce the flexibility of the baseplate.
24. The pole base plate anchor bolt circle diameter shall be 24 in.
25. The anchor bolt to base plate connection shall be designed as a double-nut connection with shear holes. The minimum distance from the center of the anchor bolt hole to the edge of the base plate shall be no less than 2 times the diameter of the anchor bolt. The anchor bolts shall use an embedded anchorage plate, 0.5 in. minimum thickness, to transmit loads from the pole base to the concrete foundation. The use of hooked anchor bolts is not permitted. The minimum number of anchor bolts shall be 8. The minimum anchor bolt diameter shall be 2 in. The minimum anchor bolt embedment, the distance from the top of the foundation to the top of the embedded anchorage plate, shall be 3.5 ft. or the tension development length of the vertical foundation reinforcement plus the end concrete cover, whichever is greater. Each anchor bolt shall be supplied with 4 nuts and 4 washers. Washers shall be placed on the top and bottom surfaces of the pole base plate and anchorage plate. Welding to the anchor bolts is not permitted. The use of lock washers with the anchor bolt assembly is not permitted.
26. The span wire pole clamp shall be designed to support a minimum tensile force of 12,000 pounds or 3 times the maximum calculated tensile force in the span wire, whichever is greater.

The span pole shall be designed for the load effects due to the span wire(s) attached to the poles and all the traffic appurtenances (signals, signs, luminaires, cameras, etc.) attached to the span wire and the pole. The load effect due to the span wire, resulting from the attached traffic appurtenances, will not be provided and shall be determined by the Contractor. The span pole and span wire shall also be designed for load effects from future traffic appurtenances arranged, positioned and located as shown on the plans. The span pole and span wire shall also be designed for load effects during all stages of construction that may exist during the Project under which the span pole is installed. The span pole and span wire shall be designed to support traffic appurtenances with properties no less than those tabulated on the plans.

The locations and dimensions of the span poles are shown on the traffic plans. The luminaire arm and pole lengths and the attachment heights shall be verified by the Contractor based on the finished grade at the site, top of foundation elevation, the locations of overhead utility cables and the traffic appurtenance mounting heights. If either the wire or pole length is inadequate, the Contractor shall notify the Engineer.

The minimum vertical clearance from the top of the finished road to the bottom of the traffic signals shall be 16.0 ft. The maximum vertical clearance from the top of the finished road to the bottom of the traffic signals shall be 18.0 ft. The traffic signals shall be installed so that the bottom of all the signals for each approach is at the same elevation.

Vent and drain holes shall be provided for galvanizing. The number, size and location of vent and drain holes shall be coordinated with the galvanizer prior to the submission of the working drawings and design calculations. 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 with diameters 3 in. and greater and 45% of the inside area of the member for members with diameters less than 3 in. The vent and drain holes shall be strategically located for reducing stress and for proper galvanizing. The holes shall be made by drilling. Flame cut holes are not permitted. The edges of all holes shall be rounded by grinding. After galvanizing, exposed holes placed in the sign support components for galvanizing shall be sealed with neoprene plugs.

A J-hook shall be welded to the inside of the pole at the top for wire handling and support.

The span pole shall have a handhole, reinforced with a frame, located at the base of the pole. The handhole shall be located with a normal direction that is 90° to the plane formed by the pole and span wire. The minimum clear distance from the top of the baseplate to the outside face of the bottom of the handhole frame shall be no less than the diameter of the tubular member or 1.25 ft., whichever is greater. The handhole frame shall have a minimum 4 in. wide by minimum 6 in. high clear opening. The maximum width of the handhole opening, the clear opening plus twice the frame thickness, shall not be greater than 40% of the tubular member diameter at that section. The inside corners of the handhole frame shall be rounded to a radius of 30% to 50% of the width of the clear opening. The minimum thickness of the handhole frame shall be no less than the thickness of the pole or 0.3125 in., whichever is greater. The handhole frame shall be connected to the pole with a partial joint penetration groove weld reinforced with a fillet weld. The handhole weld shall start and end at the point that is coincident with the longitudinal axis of

symmetry of the tubular member and the longitudinal axis of symmetry of the handhole frame. Non-destructively test 100% of each handhole weld in accordance with the magnetic particle method. The handhole shall be provided with a cover connected to the frame with no less than 2 stainless steel screws. The cover shall be installed with a neoprene gasket matching the dimensions of the cover. The cover and the gasket and the handhole frame shall be in firm and continuous contact after tightening the fasteners. The cover shall also be attached to the frame with a 1.5 ft. long stainless steel chain. The inside bottom of the frame shall have a hole tapped for the stainless steel grounding bolt.

The span pole shall include wire entrance fittings. The number and size of the wire entrance fittings shall be as shown on the plans. The fittings shall be welded, all-around, to the pole at a 45-degree angle to the pole.

The span pole shall be supplied with a pole cap plate and anchor bolt covers. The cap plates shall be attached with fasteners. The joint between the tubular member and plate shall be sealed with a neoprene gasket matching the dimensions of the plate.

The luminaire arms shall be fabricated of pipe with a minimum thickness equal to schedule 40. Single arm luminaires shall be used for luminaires with arm lengths less than or equal to 8.0 ft. Truss type luminaires shall be used for luminaires with arm lengths greater than 8.0 ft. The truss type luminaires shall consist of upper and lower members joined with vertical members at the tip and midspan. To accommodate the luminaire fixture, the size of the pipe in the luminaire arm at the tip shall be 2 in. diameter, schedule 40. If necessary, a reducing tenon shall be installed at the tip of the arm to accommodate the luminaire fixture.

The luminaire arm(s) shall be connected to the pole with clamp connections. Each clamp connection shall use 4 high-strength bolts. The installed nuts shall be prevented from loosening while in service. The use of lock washers to meet this requirement is not permitted. The arms shall be fillet welded, all-around, to the clamp(s). The size of the weld shall be no less than 0.25 in. A hole shall be provided in the clamp, (upper arm clamp for truss type arms) and pole to allow for wires to pass from the pole to the luminaire arm. The sides of all holes in the connection shall be ground smooth and edges rounded by grinding to prevent the wires from chafing.

Prior to fabrication, the Contractor shall submit working drawings and design calculations, with all details and documents necessary for fabrication and erection of the structure and its components, for each **span wire structure configuration** for review in accordance with the "Notice To Contractor – Special Provision 1.05" and the special provision "Section 1.05 – Control Of Work".

The working drawings and design calculations for span poles and the calculations for the span wire shall conform to working drawing requirements for permanent construction. **A single set of working drawings with tabulated data for multiple span poles in span wire structure configuration is allowed.** Each span pole shall be referenced with an alpha-numeric identifier

noted on the Contract documents. The working drawings and calculations shall be prepared in Customary U.S. units.

The span pole working drawing and calculation submittal shall include the following:

1. title sheet
2. table of contents
3. contact information for designer, fabricator and galvanizer – contact information shall include name and address of each firm and the name of contact person with phone number and email address
4. copy of the certificate of insurance
5. copy of fabricator's AISC certification
6. copy of the traffic signal control plan detailing the span wire structure configuration
7. span pole working drawings
8. span pole design calculations
9. span wire calculations
10. welding procedures
11. span pole installation procedure, including the method to plumb the pole

The working drawings shall include complete details of all span pole components. The drawings shall include, but not be limited to the following:

1. the Project number, town and span pole identification number
2. reference to the design specifications, including interim specifications
3. reference to the design specifications design criteria, such as design wind speed, minimum design life, vehicle speed, etc.
4. material specifications for all components
5. material designations for the pole, with an explanation of the alpha numeric characters (equivalent thickness, in inches, shall be provided for gage numbers)

6. non-destructive weld testing requirements
7. details of the location of the longitudinal seam weld(s) in the pole
8. vent and drain holes for galvanizing
9. a plan view of the anchor bolt layout relative to the orientation of the wire
10. anchor bolt dimensions, including embedment and projection
11. span pole installation procedure, including the method to plumb the pole, if procedure differs from that described in this specification

The design calculations shall include, but not be limited to the following:

1. the Project number, town and alpha-numeric span pole identifier
2. references to design specifications, including interim specifications, and the applicable code section and articles
3. description/documentation for all computer programs used in the design
4. 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
5. a tabulation of the section properties of the tubular members at each analyzed section. The tabulated values shall include:
 - a. the diameter, D (if round member)
 - b. effective width, b (if multisided member, AASHTO 5.5.2)
 - c. equivalent diameter (if multisided member, AASHTO 5.6)
 - d. wall thickness, t
 - e. inside bend radius, r_b (if multisided member, AASHTO 5.5.2)
 - f. cross-sectional area, A
 - g. moment of inertia, I
 - h. section modulus, S
 - i. 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.

6. coefficients and factors used in the design

7. results of all group loads and load combinations
8. stress ratios and combined stress ratios for all group loads and load combinations
9. horizontal due to Group Load Combinations I, II and III for dead, wind and ice loads

The span poles shall be fabricated in accordance with the latest edition of the AASHTO LRFD Bridge Construction Specifications, including the latest interim specifications, amended herein.

The steel fabricator shall be AISC certified for the fabrication to the Standard for Bridge and Highway Metal Component Manufacturers (CPT).

Fabrication of the span pole may begin only after the working drawings and design calculations have been reviewed. 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 Department QA 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 Contract 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 shall be made at the Contractor's expense.

The pieces selected for re-inspection and found to be in conformance, or adequately repaired pieces, may be marked by the QA inspector. Such markings indicate the Engineer takes no

exception to the pieces being sent to the Project site. Such marking does not indicate acceptance or approval of the material by the Engineer.

All welding details, procedures and nondestructive testing shall conform to the requirements of AWS D1.1 Structural Welding Code - Steel.

Personnel performing the nondestructive testing shall be certified as a NDT Level II technician in accordance with the American Society for Non Destructive Testing (ASNT), Recommended Practice SNT-TC-1A and approved by the Engineer.

All nondestructive testing shall be witnessed by Engineer. Certified reports of all tests shall be submitted to the Engineer for examination. Each certified report shall identify the structure, member, and location of weld or welds tested. Each report shall also list the length and location of any defective welds and include information on the corrective action taken and results of all retests of repaired welds.

The Department reserves the right to perform additional testing as determined by the Engineer. Should the Engineer require nondestructive testing on welds not designated in the Contract, the cost of such inspection shall be borne by the Contractor if the testing indicates that any weld(s) are defective. If the testing indicates the weld(s) to be satisfactory, the actual cost of such inspection will be paid by the Department.

All members and components shall be hot-dip galvanized in a single dip. Double-dipping of members and components is not permitted. All exterior and interior surfaces of the span pole 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.

After galvanizing the joint between the backing ring and the tubular member shall be sealed with silicone sealant to prevent the ingress of moisture.

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 is not 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 exterior and interior 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 span pole members and components with acceptable galvanized coatings shall be shipped. If the

galvanized coating on any member or component is found to be unacceptable, the Contractor shall submit a repair procedure to the Engineer for review.

After fabrication and prior to shipping, aluminum identification tags shall be attached to the span poles with self-tapping tamper resistant screws.

The finished members and components shall be protected with sufficient dunnage and padding to protect them from damage and distortion during transportation. Damage to any material during transportation, improper storage, faulty erection, or undocumented fabrication errors may be cause for rejection of said material at the Project Site. All costs associated with any corrective action will be borne by the Contractor.

Following delivery to the Project Site, the Engineer will perform a visual inspection of all material to verify shipping documents, fabricator markings, and that there was no damage to the material or coatings during transportation and handling.

The Engineer is not responsible for approving or accepting any fabricated materials prior to final erection and assembly at the Project Site.

High-strength bolts, nuts and washers shall be stored in accordance with Subarticle 6.03.03-4(f).

The span pole 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 span pole designer are responsible to ensure that the erection and assembly procedures and methods in this specification are acceptable for use with the span pole. Changes to these method and procedures shall be submitted with the working drawings and calculations.

Prior to installation of the span pole, the exposed threads of all the embedded anchor bolts shall be cleaned of accumulated dirt and concrete and shall be lubricated. The threads and bearing surfaces of all the anchor bolt nuts shall be cleaned and lubricated. The anchor bolts and nuts are properly lubricated if the nuts can be turned by hand on the anchor bolt threads. The lubricant shall contain a visible dye of any color that contrasts with the color of the galvanizing. Re-lubricate the threads of the anchor bolts and nuts if more than 24 hours has elapsed since earlier lubrication, or if the anchor bolts and nuts have become wet since they were first lubricated.

Install (turn) the leveling nuts onto the anchor bolts and align the nuts to the same elevation or plane. The distance from the bottom of the leveling nuts to the top of the foundation shall not exceed 1 in. Place a structural hardened washer on top of each leveling nut, 1 washer on each anchor bolt.

Prior to erecting the pole, place the closed cell elastomer ring within the anchor bolt pattern. The closed cell elastomer ring shall not interfere with the anchor bolt leveling nuts and shall not block the opening in the base plate.

The pole shall be erected so that the centerline of the pole will be plumb after the application of all the dead loads. The pole may be initially installed raked in the opposite direction of the overhead member to obtain the plumb condition. Raking the pole may be accomplished by installing the leveling nuts in a plane other than level.

Install the pole base plate atop the washers resting on the leveling nuts, place a structural hardened washer on each anchor bolt resting it on the top of the base plate, and install (turn) a top nut on each anchor bolt until the nut contacts the washer. The leveling nuts and washers shall be inspected, and if necessary the nuts turned, so that the washers are in full contact with the bottom surface of the base plate.

Tighten the top nuts to a snug tight condition in a star pattern. Snug tight is defined as the maximum rotation resulting from the full effort of one person using a 12 in. long wrench or equivalent. A star tightening pattern is one in which the nuts on opposite or near-opposite sides of the bolt circle are successively tightened in a pattern resembling a star (e.g., For an 8-bolt circle with bolt sequentially numbered 1 to 8, tighten nuts in the following bolt order: 1, 5, 7, 3, 8, 4, 6, 2.).

Tighten leveling nuts to a snug tight condition in a star pattern.

Before final tightening of the top nuts, mark the reference position of each top nut in a snug-tight condition with a suitable marking on 1 flat with a corresponding reference mark on the base plate at each bolt. Then incrementally turn the top nuts using a star pattern one-sixth of a turn beyond snug tight. Turn the nuts in at least two full tightening cycles (passes). After tightening, verify the top nut rotation. The top nuts shall have full thread engagement. The distance from the bottom of the leveling nuts to the top of the foundation shall not exceed 1 in.

After erecting the span pole, the span pole shall be electrically grounded by attaching the bare copper grounding conductor to the inside of the handhole frame with a stainless steel bolt and to the ground rod with a ground clamp. The rigid metal conduit shall be electrically grounded by attaching the bare copper grounding conductor to the insulated bonding bushing and to the ground rod with a ground clamp.

The installation of the span wire shall conform to Article 11.14.03. A span wire pole clamp shall be provided for each span wire connected to the pole. The traffic appurtenances shall be located and mounted on the wire as shown on the cross-sections.

After installation of the traffic appurtenances, the anchor bolt nuts (leveling and top anchor nut) and washers shall be in full contact with the top and bottom surfaces of the pole base plate and the centerline of the pole shall be plumb.

After installation of the traffic appurtenances, a survey shall be performed by the Contractor to confirm that the sag is no less than 5% of the span and to confirm that the minimum vertical clearances from the top of the finished road to the bottom of the traffic appurtenances have been met.

The last character of the span pole identification number shall be stenciled with black paint, unless otherwise specified, on the pole of each span pole. The character shall be 3 in. high and placed approximately 12 in. above the top of the base plate facing the centerline of the roadway.

Method of Measurement: The work for span poles will be measured for payment by the number of span poles, of the type specified, completed and accepted in place. The work for span wires will be measured for payment by the actual number of linear feet of steel span wire installed and accepted in place.

Basis of Payment: The work for the span poles will be paid for at the Contract unit price each for "XX Steel Span Pole" or "Steel Combination Span Pole", of the type specified, complete in place, which price shall include all equipment, materials, tools and labor incidental to the design, fabrication and installation, of the span pole at the locations specified on the plans. The work for the span wire will be paid for at the Contract unit price per linear foot for "Span Wire", complete in place, which price shall include pole clamps, thimble eyebolts, nuts, washers, cable rings, and all equipment, materials, tools and labor incidental to the design and installation, at the locations shown on the plans.

<u>Pay Item</u>	<u>Pay Unit</u>
XX Steel Span Pole	ea.
Steel Combination Span Pole	ea.
Span Wire	l.f.

ITEM #1104023A – 20’ STEEL MAST ARM ASSEMBLY**ITEM #1104026A – 25’ STEEL MAST ARM ASSEMBLY****ITEM #1104033A – 40’ STEEL MAST ARM ASSEMBLY****ITEM #1104090A – STEEL COMBINATION MAST ARM ASSEMBLY****ALL STEEL MAST ARM ASSEMBLIES AND STEEL COMBINATION MAST ARM ASSEMBLIES SHALL BE POWDER COATED BLACK, FEDERAL NO. 27038.**

Description: Work under this item shall consist of designing, fabricating and installing a mast arm assembly to carry traffic appurtenances (such as traffic signals, signs, antenna, etc.) of the type specified, on a prepared foundation, in accordance with the details shown on the plans and as ordered by the Engineer.

Materials: The tubular components, such as the pole, arm and luminaire arm shall be made of steel with a minimum yield stress of 35,000 psi.

The structural plate components, such as the baseplates, handhole frames, and the plates in the arm to pole ring stiffened, built-up box connection, shall be made of steel that conforms to the requirements of ASTM A572, Grade 50.

Anchorage plates shall conform to the requirements of ASTM A572, Grade 50.

The steel for arm and pole members; structural plate components, such as the baseplates, connection/flange plates, gusset plates, handhole frames and the plates in the arm to pole connection, shall meet Charpy V-notch impact testing requirements for non-fracture critical members in Zone 2 and the following:

Yield Strength	Thickness in.	Minimum Average Energy, ft.-lbf
$F_y \leq 36$ ksi	≤ 4	15 at 40°F
36 ksi $< F_y \leq 50$ ksi	≤ 2	15 at 40°F
36 ksi $< F_y \leq 50$ ksi	$2 < t \leq 4$	20 at 40°F
50 ksi $< F_y \leq 70$ ksi	≤ 4	15 at -20°F
Charpy V-notch sampling and testing shall be in accordance with AASHTO T243, “H” piece frequency.		

The non-structural components, such as hand hole covers, caps and anchor bolt covers, shall be made of steel with minimum yield stress of 36,000 psi.

The filler metal shall have a matching strength relationship with the base metal.

All high strength bolts shall conform to ASTM A325, Type 1. Nuts shall conform to ASTM A563, Grade DH. Circular, flat, hardened steel washers shall conform to ASTM F436. The bolts, nuts and washers shall be galvanized in accordance with ASTM A153 or ASTM B695, Class 55. The nuts shall be overtapped to the minimum amount required for the bolt assembly and all surfaces of the nuts shall be lubricated with a lubricant containing a visible dye of any color that contrasts with the color of the galvanizing. The high strength bolts shall conform to the requirements of Subarticle M.06.02-3.

The anchor bolts shall conform to ASTM F1554, Grade 105. The nuts shall conform to ASTM A563, Grade DH. The washers shall conform to ASTM F436. The bolts, nuts and washers shall be galvanized in accordance with ASTM A153. The nuts shall be overtapped to the minimum amount required for the bolt assembly and all surfaces of the nuts shall be lubricated with a lubricant containing a visible dye of any color that contrasts with the color of the galvanizing. Prior to shipping the anchor bolts, the nuts and washers shall be installed by hand on the anchor bolts to ensure that the nuts can be run on the threads. Only anchor bolts on which the nuts are free running shall be shipped. The anchor bolts shall be shipped with the nuts and washers on the threads.

All steel components, including anchor bolts, shall be completely hot-dip galvanized, after fabrication, in accordance with ASTM A123 or ASTM A153, as applicable. Repairs to damaged areas of the hot-dip galvanized coatings shall conform to the requirements of ASTM A780 amended as follows:

Paints containing zinc dust, if used for repairs, shall contain either between 65% to 69% metallic zinc by weight or greater than 92% metallic zinc by weight in dry film.

The silicone sealant shall be a 1-component, 100% silicone sealant recommended for use with galvanized steel.

Neoprene gasket material for the access openings shall conform to ASTM D1056, Grade 2A2 or 2A3. Other grades of neoprene approved by the Engineer may be used.

Closed cell elastomer for sealing the space between the foundation and base plate shall conform to ASTM D1056, Grade 2A2 or 2A3 and shall have a pressure-sensitive adhesive backing on one side for adhesion to steel. Closed cell elastomer contained within the anchor bolt pattern shall not interfere with the anchor bolt leveling nuts and shall not block the opening in the base plate.

Bare copper grounding conductor shall be #8 AWG stranded bare copper wire conforming to M.15.13. The grounding bolt shall be stainless steel with a hex head.

All materials used in the finished structure shall be new. The use of materials that have been previously used in a structure or salvaged from a structure is not permitted.

The Contractor shall submit Certified Test Reports and Materials Certificates in conformance with Article 1.06.07 for the steel used in the mast arm members and components, high-strength bolts (including nuts and washers) and anchor bolts (including nuts and washers). The Certified Test Reports shall include the following:

- a. Mill test reports that indicate the place where the material was melted and manufactured.
- b. High-strength bolt test results for proof load tests, wedge tests, and rotational-capacity tests that indicate where the tests were performed, date of tests, location of where the components were manufactured and lot numbers.
- c. Galvanized material test results that indicate the thickness of the galvanizing.

Prior to incorporation into the work, the Contractor shall submit samples in conformance with Article 1.06.02 for the steel used in the mast arm members and components, high-strength bolts (including nuts and washers) and anchor bolts (including nuts and washers).

Construction Methods: The design and fabrication of the mast arm assembly, including its anchorage (into the foundation), shall conform to the requirements of the latest edition of the AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals, including the latest interim specifications, available prior to the advertising date of the contract, amended as follows:

1. The design wind speed shall be 120 mph. The computation of wind pressures in accordance with Appendix C is not permitted.
2. The minimum design life shall be 50 years.
3. The wind importance factor, I_r , for wind pressure shall be 1.00.
4. The mast arms shall be designed to support fixed mounted traffic signals and signs. The wind drag coefficient for traffic signals and luminaires shall be 1.2.
5. The mast arms shall be designed for fatigue importance category I for cantilever structures. The mast arms shall be designed for the wind load effects due to galloping, natural wind gusts and truck-induced gusts. The luminaire arms shall be designed for the wind load effects due to natural wind gusts. The design pressure for the truck-induced gust shall be based on a truck speed of 65 mph. The design of the mast arms shall assume that vibration mitigation devices will not be installed.
6. The vertical deflection of the free end of the arm due to the wind load effects of galloping and truck-induced gusts shall not exceed 8 in.

7. The maximum stress ratio (the ratio of the computed stress to the allowable stress) or combined stress ratio in any mast arm component due to each group load shall not exceed 0.70. The purpose for limiting the stress ratio is to allow for future additional appurtenance configurations.
8. The maximum arm length shall be 40.0 ft., measured from the centerline of the pole to the tip of the arm.
9. The maximum luminaire arm length shall be 15.0 ft.
10. The maximum diameter of the pole at its base shall be 18 in.
11. The maximum diameter of the arm at the arm-pole connection shall be 15 in.
12. The minimum wall thickness of the arm at the pole connection and the pole shall be 0.3125 in. The wall thickness of the pole and arm component members shall be uniform throughout their lengths. The use of multiple plies (laminations) to obtain the required arm and pole thickness is not permitted. The use of shop-fabricated stepped members is not permitted.
13. The arm, luminaire arm and pole shall be tubular members with either round or multisided cross-sections. Multisided tubular members with other than 8, 12 or 16 sides are not permitted. Multisided tubular members with fluted sides are not permitted. The arm and luminaire arm shall be fabricated with a taper (change in diameter).
14. Multisided tubular members with diameters less than or equal to 13 in. shall have a minimum of 8 sides. Multisided tubular members with diameters greater than 13 in. and less than or equal to 18 in. shall have no less than 12 sides.
15. Multisided tubular members shall have a minimum internal bend radius of 5 times the tubular member thickness or 1 in., whichever is greater.
16. Joining 2 tubular members together with a circumferential weld to fabricate a pole is not permitted.
17. A maximum of 1 slip-type field splice is permitted in the arm. Slip-type field splices are not permitted in the pole.
18. A maximum of 1 longitudinal seam weld is permitted in the arm. A maximum of 2 longitudinal seam welds are permitted in the pole.
19. The longitudinal seam welds within 6 in. of the member ends shall be complete joint penetration groove welds.

20. Non-destructively test 100% of partial joint penetration longitudinal seam welds in accordance with the magnetic particle method. Non-destructively test 100 % of complete joint penetration seam welds in members less than 0.25 in. thick in accordance with the magnetic particle method on both the inside and outside surfaces. Non-destructively test 100% of complete joint penetration seam welds in members greater than or equal to 0.25 in. thick in accordance with the ultrasonic method in accordance with AWS D1.1 Annex S.
21. 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. Non-destructively test 100% of the complete joint penetration groove welds by the ultrasonic method after fabrication and prior to galvanizing. Non-destructively test 100% of the complete joint penetration groove welds by the ultrasonic method for toe cracks after galvanizing. Non-destructively test 100% of backing ring fillet welds by the magnetic particle method after fabrication prior to galvanizing. After galvanizing, the joint between the backing ring and tubular member shall be sealed with silicone sealant to prevent the ingress of moisture.
22. 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.
23. The flange plate connection in the arm to pole in the ring stiffened, built-up box connection shall be designed as slip critical connections with standard holes. The minimum number of high-strength bolts in a flange splice shall be 8. Consideration should be given to the use of smaller diameter bolts since they require lower specified minimum bolt tensions.
24. The minimum flange plate thickness shall no less than 2 in. 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.
25. The minimum thickness of the ring plates and gusset plates in the ring stiffened, built-up box connection shall be 0.5 in.
26. The size of fillet welds specified in designed connections shall be no less than 0.3125 in. The use of seal and tack welds is not permitted. No welding shall be performed after galvanizing.

27. The use of stiffeners at tubular member to transverse plate connections and at the arm to pole connection is not permitted.
28. The minimum base plate thickness shall be no less than 2.5 in. or at least as thick as the anchor bolt diameter, whichever is greater. The determination of the plate thickness in the tubular member to transverse plate connections shall consider the potential for the plate to warp due to the heat from welding. Consideration should be given to the use of thicker plates to allow for subsequent machining of warped plates to a flat surface so that removal of material will not compromise the required strength of the plate.
29. The opening in the base plate shall be sized to allow for proper galvanizing and allow conduits projecting from the foundation to pass through it. The size of the opening shall be kept to a minimum to reduce the flexibility of the baseplate.
30. The pole base plate anchor bolt circle diameter shall be 24 in.
31. The anchor bolt to base plate connection shall be designed as a double-nut connection with shear holes. The minimum distance from the center of the anchor bolt hole to the edge of the base plate shall be no less than 2 times the diameter of the anchor bolt. The anchor bolts shall use an embedded anchorage plate, 0.5 in. minimum thickness, to transmit loads from the pole base to the concrete foundation. The use of hooked anchor bolts is not permitted. The minimum number of anchor bolts shall be 8. The minimum anchor bolt diameter shall be 2 in. The minimum anchor bolt embedment, the distance from the top of the foundation to the top of the embedded anchorage plate, shall be 3.5 ft. or the tension development length of the vertical foundation reinforcement plus the end concrete cover, whichever is greater. Each anchor bolt shall be supplied with 4 nuts and 4 washers. Washers shall be placed on the top and bottom surfaces of the pole base plate and anchorage plate. Welding to the anchor bolts is not permitted. The use of lock washers with the anchor bolt assembly is not permitted.

The mast arm shall be designed for the load effects due to the actual traffic appurtenances (signals, signs, luminaires, cameras, etc.). The mast arm shall also be designed for load effects from future traffic appurtenances arranged, positioned and located as shown on the plans. The mast arm shall also be designed for load effects during all stages of construction that may exist during the Project under which the mast arm is installed. The mast arm shall be designed to support traffic appurtenances with properties no less than those tabulated on the plans.

The dimensions of the mast arm assemblies are shown on the traffic plans, elevations, cross-sections or in the special provisions. The arm, luminaire arm and pole lengths and the attachment heights shall be verified by the Contractor based on the finished grade at the site, top of foundation elevation, the locations of overhead utility cables and the traffic appurtenance mounting heights. If either the arm or pole length is inadequate, the Contractor shall notify the Engineer.

The minimum vertical clearance from the top of the finished road to the bottom of the traffic signals shall be 16.0 ft. The maximum vertical clearance from the top of the finished road to the bottom of the traffic signals shall be 18.0 ft. The traffic signals shall be installed so that the bottom of all the signals for each approach is at the same elevation.

The arm to pole connection shall be made with a ring stiffened, built-up box. The luminaire arm to pole connection shall be made with either a built-up box or a ring stiffened built-up box. A minimum of 8 high-strength bolts shall be used to connect the arm flange plate to the built-up box connection plate. A minimum of 4 high-strength bolts shall be used to connect the luminaire arm flange plate to the built-up box connection plate. All fasteners and their components used in the each connection shall be visible. The use of tapped holes in the plates of each connection is not permitted. A hole(s) shall be provided in each connection to allow wires to pass from the pole to the arm and luminaire arm. The sides of all holes in each connection shall be ground smooth and the edges rounded by grinding to prevent the wires from chafing.

Vent and drain holes shall be provided for galvanizing. The number, size and location of vent and drain holes should be coordinated with the galvanizer prior to the submission of the working drawings and design calculations. 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 with diameters 3 in. and greater and 45% of the inside area of the member for members with diameters less than 3 in. The vent and drain holes shall be strategically located for reducing stress and for proper galvanizing. The holes shall be made by drilling. Flame cut holes are not permitted. The edges of all holes shall be rounded by grinding. After galvanizing, exposed holes placed in the sign support components for galvanizing shall be sealed with neoprene plugs.

A J-hook shall be welded to the inside of the pole at the top for wire handling and support.

The mast arm shall have a handhole, reinforced with a frame, located at the base of the pole. The handhole shall be located with a normal direction that is 90° to the plane formed by the pole and arm. The clear distance from the top of the baseplate to the outside face of the bottom of the handhole frame shall be no less than the diameter of the tubular member plus 1 inch and no greater than the diameter of the tubular member plus 3 inches. The handhole frame shall have a minimum 4 in. wide by minimum 6 in. high clear opening. The maximum width of the handhole opening, the clear opening plus twice the frame thickness, shall not be greater than 40% of the tubular member diameter at that section. The inside corners of the handhole frame shall be rounded to a radius of 30% to 50% of the width of the clear opening. The minimum thickness of the handhole frame shall be no less than the thickness of the pole or 0.3125 in., whichever is greater. The handhole frame shall be connected to the pole with a partial joint penetration groove weld reinforced with a fillet weld. The handhole weld shall start and end at the point that is coincident with the longitudinal axis of symmetry of the tubular member and the longitudinal axis of symmetry of the handhole frame. 100% of the weld shall be non-destructively tested in accordance with the magnetic particle method. The handhole shall be provided with a cover connected to the frame with no less than 2 stainless steel screws. The cover shall be installed with a neoprene gasket matching the dimensions of the cover. Cover and the gasket; and the gasket and the handhole frame shall be in firm and continuous contact after tightening the fasteners. The cover shall also

be attached to the frame with a 1.5 ft. long stainless steel chain. The inside bottom of the frame shall have a hole tapped for the stainless steel grounding bolt.

The mast arm shall be supplied with a pole cap plate, arm cap plate, and anchor bolt covers. The cap plates shall be attached with fasteners. The joint between the tubular member and plate shall be sealed with a neoprene gasket matching the dimensions of the plate.

The luminaire arms shall be fabricated of pipe with a minimum thickness equal to schedule 40. Single arm luminaires shall be used for luminaires with arm lengths less than or equal to 8.0 ft. Truss type luminaires shall be used for luminaires with arm lengths greater than 8.0 ft. The truss type luminaires shall consist of an upper and lower members joined with vertical members at the tip and midspan. To accommodate the luminaire fixture, the size of the pipe in the luminaire arm at the tip shall be 2 in. diameter, schedule 40. If necessary, a reducing tenon shall be installed at the tip of the arm to accommodate the luminaire fixture.

The luminaire arm(s) shall be connected to the pole with clamp connections. Each clamp connection shall use 4 high-strength bolts. The installed nuts shall be prevented from loosening while in service. The use of lock washers to meet this requirement is not permitted. The arms shall be fillet welded, all-around, to the clamp(s). The size of the weld shall be no less than 0.25 in. A hole shall be provided in the clamp, (upper arm clamp for truss type arms) and pole to allow for wires to pass from the pole to the luminaire arm. The sides of all holes in the connection shall be ground smooth and edges rounded by grinding to prevent the wires from chafing.

Prior to fabrication, the Contractor shall submit working drawings and design calculations, with all details and documents necessary for fabrication and erection of the structure and its components, for each mast arm assembly for review in accordance with the “Notice To Contractor – Special Provision 1.05” and the special provision “Section 1.05 – Control Of Work”.

The working drawings and design calculations for the mast arm assemblies shall conform to working drawing requirements for permanent construction. **A single set of drawings with tabulated data for multiple mast arm locations is not permitted.** Each mast arm shall be referenced with an alpha-numeric identifier noted on the Contract documents. The working drawings and calculations shall be prepared in Customary U.S. units.

1. title sheet
2. table of contents
3. contact information for designer, fabricator and galvanizer – contact information shall include name and address of each firm and the name of contact person with phone number and email address
4. copy of the certificate of insurance
5. copy of fabricator’s AISC certification

6. copy of the traffic signal control plan detailing mast arm assembly
7. mast arm assembly working drawings
8. mast arm assembly design calculations
9. welding procedures
10. mast arm installation procedure, including the method to plumb the pole

The working drawings shall include complete details of all mast arm components. The drawings shall include, but not be limited to the following:

1. the Project number, town and mast arm identification number
2. reference to the design specifications, including interim specifications
3. reference to the design specifications design criteria, such as design wind speed, minimum design life, fatigue category, vehicle speed, etc.
4. material specifications for all components
5. material designations for the arm and pole, with an explanation of the alpha numeric characters (equivalent thickness, in inches, shall be provided for gage numbers)
6. non-destructive weld testing requirements
7. details of the location of the longitudinal seam welds in the arm, luminaire arm and pole
8. vent and drain holes for galvanizing
9. dead load and permanent camber
10. a plan view of the anchor bolt layout relative to the orientation of the arm
11. anchor bolt dimensions, including embedment and projection
12. mast arm installation procedure, including the method to plumb the pole

The design calculations shall include, but not be limited to the following:

1. the Project number, town and alpha-numeric mast arm identifier

2. references to design specifications, including interim specifications, and the applicable code section and articles
3. description/documentation for all computer programs used in the design
4. 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
5. a tabulation of the section properties of the tubular members at each analyzed section. The tabulated values shall include:
 - a. the diameter, D (if round member)
 - b. effective width, b (if multisided member, AASHTO 5.5.2)
 - c. equivalent diameter (if multisided member, AASHTO 5.6)
 - d. wall thickness, t
 - e. inside bend radius, r_b (if multisided member, AASHTO 5.5.2)
 - f. cross-sectional area, A
 - g. moment of inertia, I
 - h. section modulus, S
 - i. 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.

6. coefficients and factors used in the design
7. results of all group loads and load combinations
8. stress ratios and combined stress ratios for all group loads and load combinations
9. horizontal and vertical deflections due to Group Load Combinations I, II and III for dead, wind and ice loads
10. vertical deflection of the free end of the arm due to the wind load effects of galloping and truck-induced gusts

The mast arm assemblies shall be fabricated in accordance with the latest edition of the AASHTO LRFD Bridge Construction Specifications, including the latest interim specifications, amended herein.

The steel fabricator shall be AISC certified for the fabrication to the Standard for Bridge and Highway Metal Component Manufacturers (CPT).

Fabrication of the mast arm may begin only after the working drawings and design calculations have been reviewed. 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 Department QA 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 shall be made at the Contractor's expense.

The pieces selected for re-inspection and found to be in conformance, or adequately repaired pieces, may be marked by the QA inspector. Such markings indicate the Engineer takes no exception to the pieces being sent to the Project site. Such marking does not indicate acceptance or approval of the material by the Engineer.

All welding details, procedures and nondestructive testing shall conform to the requirements of AWS D1.1 Structural Welding Code - Steel.

Personnel performing the nondestructive testing shall be certified as a NDT Level II technician in accordance with the American Society for Non Destructive Testing (ASNT), Recommended Practice SNT-TC-1A and approved by the Engineer.

All nondestructive testing shall be witnessed by Engineer. Certified reports of all tests shall be submitted to the Engineer for examination. Each certified report shall identify the structure, member, and location of weld or welds tested. Each report shall also list the length and location

of any defective welds and include information on the corrective action taken and results of all retests of repaired welds.

The Department reserves the right to perform additional testing as determined by the Engineer. Should the Engineer require nondestructive testing on welds not designated in the contract, the cost of such inspection shall be borne by the Contractor if the testing indicates that any weld(s) are defective. If the testing indicates the weld(s) to be satisfactory, the actual cost of such inspection will be paid by the Department.

All members and components shall be hot-dip galvanized in a single dip. Double-dipping of members and components is not permitted. All exterior and interior surfaces of the mast arm members and components, including the interior of the ring-stiffened built-up box connection, shall be completely galvanized.

Galvanized members and components shall be free from uncoated areas, blisters, flux deposits, and gross inclusions. Lumps, projections, globules, or heavy deposits of zinc which will interfere with the intended use of the material will not be permitted.

After galvanizing the joint between the backing ring and the tubular member shall be sealed with silicone sealant to prevent the ingress of moisture.

All damaged areas of the hot-dip galvanized surfaces shall be repaired in accordance with the requirements of ASTM A780. If paint containing zinc dust is used for repairs, the dry coating thickness shall be at least 50% greater than the thickness of the adjacent hot-dip galvanized coating, but no greater than 4.0 mils. The paint shall be brush applied. The use of aerosol spray cans shall not be permitted. The color of the finished repair area shall match the color of the adjacent hot-dip galvanized surface at the time of the repair to the satisfaction of the Engineer.

Prior to shipping, all galvanized surfaces of the members and components shall be inspected, in the presence of the Engineer, to determine the acceptability of the galvanized coating. Galvanized coatings may be found acceptable by the Engineer if all surfaces of the members and components meet the galvanizing requirements herein. Only mast arm members and components with acceptable galvanized coatings shall be shipped. If the galvanized coating on any member or component is found to be unacceptable, the Contractor shall submit a repair procedure to the Engineer for review.

After fabrication, the arm to pole bolted connection shall be assembled in the fabricator's shop, in the presence of the Engineer, to determine the acceptability of the connection. The faying surfaces shall be free of dirt, loose scale, burrs, other foreign material and other defects that would prevent solid seating of the parts. Prior to assembly, the galvanized faying surfaces shall be scored by wire brushing. The faying surfaces of the connection plates shall be checked with a straight edge to ensure that the surfaces are not distorted and the entire faying surface of each plate will be in contact when assembled. The high-strength bolts, including nuts and washes, shall be installed and tensioned in accordance with Subarticle 6.03.03-4(f). A connection may be found acceptable by the Engineer if the faying surfaces of the flange (connection) plates are in firm, continuous contact

after properly tensioning the bolts. Only mast arm assemblies with acceptable arm to pole bolted connections shall be shipped. If a bolted connection is found unacceptable, the Contractor shall submit a procedure to repair the connection to the Engineer for review. The use or installation of galvanized hardened steel washer between the faying surfaces of the connection is not permitted. Galvanized surfaces damaged by the repair procedure shall be hot dip galvanized. Repair of the damaged galvanized surfaces in accordance with the requirements of ASTM A780 or with a galvanizing repair stick is not permitted. Bolts, nuts and washers used for the trial shop fit-up shall not be reused in the final field assembly.

After fabrication and prior to shipping, aluminum identification tags shall be attached to the arm and pole members with self-tapping tamper resistant screws.

The finished members and components shall be protected with sufficient dunnage and padding to protect them from damage and distortion during transportation. Damage to any material during transportation, improper storage, faulty erection, or undocumented fabrication errors may be cause for rejection of said material at the Project site. All costs associated with any corrective action will be borne by the Contractor.

Following delivery to the Project site, the Engineer will perform a visual inspection of all material to verify shipping documents, fabricator markings, and that there was no damage to the material or coatings during transportation and handling.

The Engineer is not responsible for approving or accepting any fabricated materials prior to final erection and assembly at the Project site.

High-strength bolts, nuts and washers shall be stored in accordance with Subarticle 6.03.03-4(f).

The mast arm shall be erected, assembled and installed in accordance with these specifications and the procedures and methods submitted with the working drawings. The Contractor and the mast arm designer are responsible to ensure that the erection and assembly procedures and methods in this specification are acceptable for use with the mast arm assembly. Changes to these method and procedures shall be submitted with the working drawings and computations.

Prior to installation of the mast arm pole, the exposed threads of all the embedded anchor bolts shall be cleaned of accumulated dirt and concrete and shall be lubricated. The threads and bearing surfaces of all the anchor bolt nuts shall be cleaned and lubricated. The anchor bolts and nuts are properly lubricated if the nuts can be turned by hand on the anchor bolt threads. The lubricant shall contain a visible dye of any color that contrasts with the color of the galvanizing. Re-lubricate the threads of the anchor bolts and nuts if more than 24 hours has elapsed since earlier lubrication, or if the anchor bolts and nuts have become wet since they were first lubricated.

Install (turn) the leveling nuts onto the anchor bolts and align the nuts to the same elevation or plane. The distance from the bottom of the leveling nuts to the top of the foundation shall not exceed 1 in. Place a structural hardened washer on top of each leveling nut, 1 washer on each anchor bolt.

Prior to erecting the pole, place the closed cell elastomer ring within the anchor bolt pattern. The closed cell elastomer ring shall not interfere with the anchor bolt leveling nuts and shall not block the opening in the base plate.

The pole shall be erected so that the centerline of the pole will be plumb after the application of all the dead loads. The pole may be initially installed raked in the opposite direction of the overhead member to obtain the plumb condition. Raking the pole may be accomplished by installing the leveling nuts in a plane other than level.

Install the pole base plate atop the washers resting on the leveling nuts, place a structural hardened washer on each anchor bolt resting it on the top of the base plate, and install (turn) a top nut on each anchor bolt until the nut contacts the washer. The leveling nuts and washers shall be inspected, and if necessary the nuts (turned), so that the washers are in full contact with the bottom surface of the base plate.

Tighten the top nuts to a snug tight condition in a star pattern. Snug tight is defined as the maximum rotation resulting from the full effort of one person using a 12 in. long wrench or equivalent. A star tightening pattern is one in which the nuts on opposite or near-opposite sides of the bolt circle are successively tightened in a pattern resembling a star (e.g., For an 8-bolt circle with bolt sequentially numbered 1 to 8, tighten nuts in the following bolt order: 1, 5, 7, 3, 8, 4, 6, 2.).

Tighten leveling nuts to a snug tight condition in a star pattern.

Before final tightening of the top nuts, mark the reference position of each top nut in a snug-tight condition with a suitable marking on 1 flat with a corresponding reference mark on the base plate at each bolt. Then incrementally turn the top nuts using a star pattern one-sixth of a turn beyond snug tight. Turn the nuts in at least two full tightening cycles (passes). After tightening, verify the top nut rotation. The top nuts shall have full thread engagement. The distance from the bottom of the leveling nuts to the top of the foundation shall not exceed 1 in.

High-strength bolts, including nuts and washes, shall be installed and tensioned in accordance with Subarticle 6.03.03-4(f). The arm shall be temporarily and fully supported while all the high-strength bolts are installed and tensioned. The temporary arm support shall not be removed until the Engineer has confirmed that the faying surfaces of the flange (connection) plates are in firm, continuous contact and the high-strength bolts were properly installed and tensioned. All high-strength bolts in the arm to pole bolted connection shall be inspected (in accordance with Subarticle 6.03.03-4(f)) to confirm the high-strength bolts were properly tensioned. The use or installation of galvanized hardened steel washer between the faying surfaces of the connection is not permitted.

After erecting the mast arm, the mast arm shall be electrically grounded by attaching the bare copper grounding conductor to the inside of the handhole frame with a stainless steel bolt and to the ground rod with a ground clamp. The rigid metal conduit shall be electrically grounded by

attaching the bare copper grounding conductor to the insulated bonding bushing and to the ground rod with a ground clamp.

After erection of the mast arm and before the installation of the traffic appurtenances, if the structure exhibits excessive vibration, oscillations or deflections as determined by the Engineer, the Contractor shall immediately stabilize the structure to the satisfaction of the Engineer. Stabilizing the structure may require the removal of a portion of the structure or the entire structure.

The traffic appurtenances shall be located and mounted on the arm as shown on the cross-sections. Holes, if required for wires, shall be located adjacent to the appurtenances and shall be drilled in the bottom of the arm. A rubber grommet shall be installed in each hole to protect the wires from chafing.

After installation of the traffic appurtenances, the anchor bolt nuts (leveling and top anchor nut) and washers shall be in full contact with the top and bottom surfaces of the pole base plate and the centerline of the pole shall be plumb.

After installation of the traffic appurtenances, if the structure exhibits excessive vibration, oscillations or deflections as determined by the Engineer, the Contractor shall design and construct devices to mitigate the movements. The Contractor is responsible for immediately stabilizing the structure to the satisfaction of the Engineer. Stabilizing the structure may require the removal of the traffic appurtenances or the entire structure. Prior to installation of any mitigation device, the Contractor shall submit drawings, design calculations other documentation to the Engineer for review in accordance with Article 1.05.02.

The last character of the mast arm identification number shall be stenciled with black paint, unless otherwise specified, on the pole of each mast arm. The character shall be 3 in. high and placed approximately 12 in. above the top of the base plate facing the centerline of the roadway.

Method of Measurement: This work will be measured for payment by the number of steel mast arm assemblies of the type specified, completed and accepted in place.

Basis of Payment: This work will be paid for at the Contract unit price each for "XX Steel Mast Arm Assembly" or "XX Steel Combination Mast Arm Assembly", of the type specified, complete in place, which price shall include all equipment, materials, tools and labor incidental to the design, fabrication and installation, including mitigation devices if required, of the mast arms at the locations specified on the plans.

<u>Pay Item</u>	<u>Pay Unit</u>
XX Steel Mast Arm Assembly	ea.
XX Steel Combination Mast Arm Assembly	ea.

ITEM #1105003A – 1 WAY, 3 SECTION SPAN WIRE TRAFFIC SIGNAL

ITEM #1105101A – 1 WAY, 1 SECTION MAST ARM TRAFFIC SIGNAL

ITEM #1105103A – 1 WAY, 3 SECTION MAST ARM TRAFFIC SIGNAL

Article 11.05.03 – Construction Methods:

In the second paragraph, delete the last sentence (“A balance adjuster shall...”).

Add the following paragraphs:

Circular indications that have an identification mark (such as an arrow) on the top of the lens shall be installed with that mark at the 12 o'clock position.

Article 11.05.05 – Basis of Payment:

In the first sentence of the first paragraph, delete “balance adjuster,”.

Article M.16.06 - Traffic Signals

Sub Article 3 - Housing:

In the last sentence, between the words “housing” and “shall” add “and all internal hardware”.

Add the following after the last paragraph.

Each section of the housing shall be provided with a removable visor. The visor shall be the cap type, unless otherwise noted on the plan. The visor shall be a minimum .05 inch (.13 mm) thick. The visor shall be the twist on type and secured to the signal by four equidistant flat tabs screwed to the signal head.

Sub Article 4 - Brackets:

Add the following at the end of the last paragraph:

Backplates shall be 5” wide and louvered.

Install a 2” wide yellow retroreflective strip (Type IX sheeting) along the perimeter of the face of the backplate.

Replace the last paragraph with the following:

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When indicated on the plans, a backplate of dimensions, as shown on the plans, constructed of 5052-H32 aluminum alloy sheet between 0.050-in to 0.065-in thickness meeting the requirements of ASTM B209 shall be attached to the signal head housing. The front surface of backplate per MUTCD shall have a dull black finish to minimize light reflection and to increase contrast between the signal indication and its background.

Delete Sub Article 5 - Optical Unit and Sub Article 6 – Lamp Socket and replace with the following:

Optical Unit, Light Emitting Diode:

(a) General:

Only Optical Units that meet the requirements contained herein supplied by the below manufacturers that have been tested by the Department’s Signal Lab will be accepted. Final approval for model numbers will be done at the time of the catalog cut submittals.

Duralight
Trastar, Inc.
860 N. Dorothy Dr., Suite 600
Richardson, TX 75081

GE Lighting Solutions
Corporate Headquarters
1975 Noble Road Building 338E
East Cleveland, OH 44112-6300

Dialight
1501 Foute 34 South
Farmingdale, NJ 07727

Leotek
726 South Hillview Drive
Milpitas, CA 95035

The materials for Light Emitting Diode (LED), Optical Unit, circular and arrow, shall conform to the following:

- The ITE Performance Specification for Vehicle Traffic Control Signal Heads – Light Emitting Diode (LED) Circular Signal Supplement for circular indications dated June 27, 2005.
- The ITE Performance Specification for Vehicle Traffic Control Signal Heads – Light Emitting Diode (LED) Vehicle Arrow Traffic Signal Supplement for arrow indications dated July 1, 2007.

Section 4, Adjustable Traffic Signals and General Housing sections of the **Department of Transportation Functional Specifications for Traffic Control Equipment, current edition**

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governs. Where the Department of Transportation Functional Specifications conflict with this Special Provision or the 2005/2007 ITE Performance Specifications, this Special Provision and the 2005/2007 ITE Performance Specifications shall govern.

The Optical Unit shall have an Incandescent look and be made up of a smooth surfaced outer shell, multiple LED light sources, a filtered power supply and a back cover, assembled into a sealed unit. The Optical Unit shall be certified as meeting the 2005/2007 ITE Specifications by Intertek Testing Services, Inc. (ITSNA, formerly ETL) or another organization currently recognized by the Occupational Safety and Health Administration (OSHA) as a Nationally Recognized Testing Laboratory (NRTL.) The Optical Unit shall perform to the requirements of the ITE Specification for a minimum of 60 months.

A “Swing Test” will be performed by the Department to ensure no significant dimming or blanking occurs, until the lamp is obscured by the visor. All L.E.D Lamps will be subjected to further field testing for reliable operation.

The Arrow Optical Unit shall be “Omni-Directional” so that it may be oriented in a right, left or straight configuration without degradation of performance.

(b) Electrical Requirement:

Operating voltage:

80 to 135 Volts AC with cutoff voltage (no visible indication) below 35Volts AC.

Power requirements:

Circular Indications: 12”, (300 mm) – no more than 16 Watts

Circular Indications: 8”, (200mm) - no more than 16 Watts

Arrows Indications: 12”, (300mm) - no more than 16 Watts

Power Supply:

Fused and filtered to provide excess current protection and over voltage protection from electrical surges and transient voltages.

(c) Photometric Requirement:

Beam Color:

Meet 2005/2007 ITE Specifications

(d) Mechanical Requirements:

Diameter:

The Circular Optical Unit shall fit into standard 12” (300mm) or 8” (200mm) housing.

The Arrow Optical Unit shall fit 12” (300mm) housings only.

Enclosure:

UV (Ultraviolet) stabilized polycarbonate back cover.

Clear lens cover for all Red, Yellow and Green Circular Optical Units.

For Arrow Optical Units the arrow indication segment of the lens shall be clear.

Enclosure sealed and waterproofed to eliminate dirt contamination and be suitable for installation in all weather conditions.

Clearly mark on the housing the following information:

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- Manufacturer & model number
- Date of manufacture (must be within one year of installation)

The model number shall end with the number of LEDs used to comprise the unit as the last digits of the model number. Example, if the unit comprised of 3 LEDs and the model is x12y, then the new model number shall read x12y3.

Operating temperature:

Meet 2005/2007 ITE Specification

Wiring: L.E.D. lamps shall have **color coded 16 AWG wires** for identification of heads as follows:

RED L.E.D. Lamps	RED with WHITE neutral
YELLOW L.E.D. Lamps	YELLOW with WHITE neutral
GREEN L.E.D. Lamps	GREEN or Brown with WHITE neutral
RED L.E.D. ARROWS	RED/WHITE with WHITE neutral
YELLOW L.E.D. ARROWS	YELLOW/WHITE with WHITE neutral
GREEN L.E.D. ARROWS	GREEN/WHITE or BROWN/WHITE with WHITE neutral
GREEN/YELLOW L.E.D. ARROWS	GREEN/WHITE or BROWN/WHITE, YELLOW/WHITE, with WHITE neutral

Wires shall be terminated with a Block Spade, 6-8 stud/ 16-14 wire size.

All Circular Optical Units shall be supplied with a minimum 40” pigtail and all Arrow Optical Units Supplied with a minimum 60” pigtail.

Sub Article 9 - Painting:

Third coat:

Replace with the following:

The housing, housing door, the back surface of the backplate, and all brackets and hardware shall be painted black by the manufacturer. The color shall be No. 27038, Federal Standard No. 595.

The outside of the visors shall have a dull black finish that meets Federal Specification TT-E-527.

The inside of the visors per MUTCD shall have a dull black finish to minimize light reflection and to increase contrast between the signal indication and its background. The dull black finish shall meet Federal Specification TT-E-527.

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ITEM #1105523A – LANE USE CONTROL SIGNAL

Description:

Under this item the contractor shall furnish 6 (six) illuminated LED lane use control signals depicting a red “X”. The contractor shall install, relocate and remove the supplied signals along with selected existing illuminated lane use signals on the portals of the Arrigoni Bridge. The signal light installations, removals, and relocations shall be carried out to provide overhead illuminated lane control consistent with the direction of travel or “Lane Closed” condition below the illuminated signal for the various stages of construction.

This item specifies the requirements for an integral Light Emitting Diode (LED) Lane Use Signal that shall display a Red X, or Off (Blank-Out) signal with an 18” letter height in a weather-proof aluminum housing designed for bridge installation. The Lane Control Signals shall be furnished and installed as subsequently described in this specification. The six lane use signals supplied by the contractor will become the property of ConnDOT upon completion of construction.

The existing signal control cabinet, located on the sidewalk of the bridge (north side) shall be temporarily supported when the sidewalk is reconstructed and reset in its current location upon completion of the sidewalk construction. This Cabinet is the control/distribution cabinet for all of the wiring for the lane use signal system. The Contractor shall supply a working drawing detailing how the cabinet will be supported and how the associated conduit connections and cables will be maintained during construction.

The Contractor shall operate and maintain the Lane Use Control System for the life of the project. Plans and specifications for project 82-300 describe the system and are available from the ConnDOT Engineering Records located at 160 Pascone Place, Newington, Connecticut.

The contractor shall restore the lane use signal system to preconstruction condition when all lanes are open to traffic. The State shall inspect the permanent signal installation prior to acceptance.

Materials:

The new illuminated signs shall match the existing and shall be manufactured by Southern Manufacturing, 501 Herndon Ave., Orlando, Florida 32803 and as further described below. No substitutions will be allowed. The Contractor shall submit a complete set of shop drawings of the signals for review and approval prior to ordering.

General Requirements:

The Lane Control Signal shall comply with MUTCD Chapter 4J requirements. The Lane Control Signal shall utilize all LED illumination technology. The Lane Control Signal shall be capable of continuous operation over a range in temperatures from -35F to +165F. The Lane Control Signal shall be self-contained in a weather-tight NEMA-4X aluminum enclosure and shall be designed with a front access door. All corners and seams of the housing shall be heli-arc welded to provide a weatherproof seal around the entire case. Continuous full-length stainless steel hinges shall connect the housing and the extruded aluminum door. Door gaskets shall be nominally 3/16" x 1" neoprene to provide a weatherproof seal. The Lane Control Signal shall be equipped with an integral automatic photo-dimmer which shall provide dimming control for night operation per ITE VTSCH-STD Part 2 specifications.

The Lane Control Signal shall meet MIL-STD-883 Method 2007 Specification for Mechanical Vibration.

The Lane Control Signal shall have a Red X display of at least 18" height. The LEDs shall have a minimum cone of vision of 30 degrees. The display signals shall consist of at least a triple-stroke font (3Rows of LEDs).

The Lane Control Signal shall be fully compatible with the existing controller.

The Lane Control Signal housing shall be mechanically compatible with the existing signs on the bridge.

The Lane Control Signal shall contain all necessary AC/DC power supplies and transformers integral to the housing. All transformers shall contain Class A insulation and weatherproofing.

The Lane Control Signal shall be equipped with a sun visor and a minimum of 1/4" polycarbonate face.

The Lane Control signal shall have a black baked on powder-coated finish.

The Lane Control Signal shall be designed for a minimum of ten (10) year service life.

Color Functionality:

The red shall operate at a wavelength of approximately 626 nanometers. All signal indications shall typically provide an illumination of greater than 300 CD with half power cone of vision of approximately 15 degrees around the axis. All LED's shall operate at 20 milliamps DC. If one LED fails within a cluster, only a portion of that cluster shall be affected. Each display shall not require more than 0.2 amps at 120 VAC to operate.

Control Signal Requirements:

The Lane Control Signal shall be attached to the controller cabinet via a two (2) conductor housing and shall be equipped with an internal screw terminal block suitable for 14 Gauge wire for the termination of the field wiring.

Warranty:

All equipment supplied by the Contractor to satisfy the requirements of this specification shall be warranted for parts by the vendor against defects and failures, which may occur through normal use for a period of three (3) years from the date of Final Acceptance.

Construction Methods:

The Contractor shall furnish and install all hardware and necessary components to install the Lane Use signals as indicated in these specifications. The contractor shall install, relocate and remove the supplied signals along with selected existing illuminated lane use signals on the portals of the Arrigoni Bridge. The signal light installations, removals, and relocations shall be carried out to provide overhead illuminated lane control consistent with the direction of travel or "Lane Closed" condition below the illuminated signal for the various stages of construction. Prior to removal of the existing signal lights the Contractor shall tag each light to be removed indicating its original location. Upon final re-installation, each light shall be returned to its original marked location.

The Contractor shall remove, properly store, and be responsible for the existing green down arrow signs that will be removed and reinstalled as part of this specification.

The Contractor shall be responsible for damage to all equipment and material incurred during removal, storage, and reinstallation. All repairs or replacements due to damage or loss by the Contractor shall be made at the Contractor's expense.

The Contractor shall contact Mr. Richard Russo of District 2 Electrical Maintenance (Tel: 860-848-0008) when access to the signal cabinet is required.

Upon completion of construction the six (6) new signals shall be delivered to District 2 Electrical Maintenance in their original packaging with all Manufacturers paperwork and warranty information. The Contractor shall contact Mr. Richard Russo of District 2 Electrical Maintenance 24 hours in advance to coordinate delivery. The Contractor shall load, transport, and unload the material. The material shall be stacked and stored according to the directions of Mr. Russo.

All contractor supplied materials shall be new and approved by the Engineer and shall not be previously used.

The Lane Use Signal shall be attached to the mounting plate on the existing sign support

with the use of a minimum of four (4) stainless-steel bolts, or equivalent fasteners in a pattern that matches the existing signal. The Lane Use Signal shall be equipped with a waterproof conduit entry access plate through which the two (2) conductor signal plate will be attached and sealed. The conductors shall be terminated on the internal terminal block.

Prior to installation on the bridge, each Lane Control Signal will be tested to insure that the displays are active.

Once the Lane Use Signal goes into operation, the dimming operation shall be validated and adjustments shall be made by the contractor to correct any over-bright or under-bright conditions that may be detected during the normal 24-Hour operation of the signal. The engineer shall determine if the signals are operating within proper brightness thresholds.

Submittals:

In addition to general submittal requirements specified elsewhere, the Contractor shall submit the following documentation and samples:

- Functional block diagrams, wiring diagrams, and point-to-point wiring details, as applicable.
- Product and data cut sheets, installation manuals, equipment description, system configuration options and features, and accessories.
- Detailed shop drawings, wiring diagrams, and equipment installation drawings indicating supports and appurtenances required for proper installation.
- Warranty certifications
- The Contractor shall submit working drawings detailing the support of the existing controller cabinet that is located on the sidewalk that is being removed and replaced under this project.

Delivery, Storage, and Handling:

- All materials shall be delivered in the manufacturer's original protective packages with all Manufacturers paperwork and warranty information.
- All materials shall be stored in their protective packaging and protected against soiling, physical damage, or wetting before installation.
- All equipment shall be protected during transportation and until installation against damage and stains.

- All equipment and materials shall be stored in a clean, dry location free from construction dust, precipitation and excess moisture.
- The contractor shall replace all damaged materials and equipment, as determined by the Engineer, at no cost to the Department.

Protection and Clearing:

Protect finished surfaces from damage during fabrication, shipping, storage, testing and transfer to the site.

The Contractor shall submit working drawings detailing the support of the existing controller cabinet that is located on the sidewalk that is being removed under this project and how the associated conduit connections and cables will be maintained.

Upon completion of construction and removal of the six temporary signal lights the permanent (existing) signal lights shall be returned to their original locations, cleaned, connected and readied for operation. The Contractor shall demonstrate that all re-installed signal lights operate as required. The State shall inspect the permanent signal installation prior to acceptance.

Method of Measurement:

This work will be measured for payment as a lump sum.

Basis of Payment:

The work to be performed under this specification shall be paid at the Contract lump sum price for Arrigoni Bridge Lane Use Control Signals. This price shall include supplying six new Lane Use Control Signals for use on the bridge, installing and relocating the new and existing signals as required, all materials required for the temporary support of the existing Controller Cabinet, restoration of the system to preconstruction condition when all lanes are open to traffic, connections, splicing, delivery, storage, loading, unloading, and all labor, equipment, materials, cables, and incidental items required to satisfy these specifications.

The six lane use signals supplied by the Contractor will become the property of the State. This work will also include the operation and maintenance of the system for the life of the project. If any part of the system is damaged or lost during the contractor's control of the system, all repairs or replacements shall be made at the Contractor's expense.

Payment will be as follows: 25% of the lump sum bid price will be paid at the start of stage 1 construction, 25% of the lump sum bid price will be paid at the start of stage 2 construction, 25% of the lump sum bid price will be paid at the start of stage 3 construction, the last 25% will be paid when the system is restored to preconstruction

condition when all lanes are open to traffic.

Pay Item

Pay Unit

Lane Use Control Signal

l.s.

ITEM #1106001A – 1 WAY PEDESTRIAN SIGNAL POLE MOUNTED

ITEM #1106003A – 1 WAY PEDESTRIAN SIGNAL PEDESTAL MOUNTED

Section 11.06.02 Pedestrian Signal, Materials

Section M.16.07 C. Optical Unit

Delete 2. LED: and replace with the following:

General

- Meet requirements of current MUTCD Section 4E.
- Meet current ITE specifications for Pedestrian Traffic Control Signal Indications - (PTCSI) Part 2: Light Emitting Diode (LED).
- Meet CT DOT, 2008 - 2010 Functional Specifications for Traffic Control Equipment; Section 5D, LED Pedestrian Signal with Countdown Timer.
- Meet EPA Energy Star® requirements for LED Pedestrian Signal Modules.

Operational

- Countdown display only during the flashing Pedestrian Clearance (Ped Clr) Interval. Timer goes blank at end of flashing ped clr even if countdown has not reached zero.

Physical

- Sealed optical module to prevent entrance of moisture and dust.
- Self-contained optical module, including necessary power supplies.
- Designed to securely fit into standard housing without the use of special tools or modifications to the housing.
- Identification information on module: manufacturer's name, model number, serial number, and date code.

Optical

- Multiple LED sources; capable of partial loss of LED's without loss of symbol or countdown message.
- Two complete self contained optical systems. One to display the walking person symbol (walk) and the hand symbol (don't walk). One to display the countdown timer digits.
- Visual Image similar to incandescent display; smooth, non-pixelated.
- Symbol and countdown digit size as shown on the plan.
- Solid hand/person symbol; outline display not allowed.
- Overlaid hand/person symbols and countdown digits arranged side by side.
- Countdown digit display color: Portland Orange in accordance with ITE requirements.
- Countdown digits comprised of two seven segments, each in a figure 8 pattern.
- Photometric Requirements: Luminance, Uniformity, and Distribution in accordance with ITE requirements.
- Color Uniformity in accordance with ITE requirements.
- Blank-Out design; symbols and digits illegible even in direct sunlight when not illuminated.

Electrical

- Operating voltage: 89 VAC to 135 VAC.
- Low Voltage Turn-Off: 35 VAC.
- Turn-On and Turn-Off times in accordance with ITE specifications.
- Combined Hand – Countdown Digits wattage: ≥ 20 Watts.
- Input impedance at 60 Hertz sufficient to satisfy Malfunction Management Unit (MMU) requirements.
- Two separate power supplies. One to power the walking person symbol. One to power the hand symbol and the countdown digits.
- Meet Federal Communication Commission (FCC) regulations concerning electronic noise.
- Filtered and protected against electrical transients and surges.

Warranty

- Five years from date ownership is accepted.

Section M.16.07 F. Painting:

Remove the 2nd and 3rd sentences referring to the color.

Third coat: Replace with the following:

The housing, housing door, and all brackets and hardware shall be painted black by the manufacturer. The color shall be No. 27038, Federal Standard No. 595.

The inside and outside of the visor shall have a dull black finish to minimize light reflection and to increase contrast between the signal indication and its background. The dull black finish shall meet Federal Specification TT-E-527.

ITEM #1107011A - ACCESSIBLE PEDESTRIAN SIGNAL AND DETECTOR (TYPE A)

Description:

Furnish and install an Accessible Pedestrian Signal and Detector (APS&D). The APS&D provides audio and tactile information to augment the visual pedestrian signal.

Type A provides a low frequency percussive tone during the walk interval and is used where there is an exclusive pedestrian phase or ≥ 10 foot separation between APS&Ds.

Material:

A. General:

- Conform to applicable sections of the current MUTCD Chapter 4E, Pedestrian Control Features as specified herein.
- All features fully operational when the traffic signal is in colors mode.
- All features non-operational when the traffic signal is in flash mode.
- Interchangeable with a non-accessible type pedestrian pushbutton with no modifications to the Controller Assembly (CA) or Controller Unit.
- Audible transducer integral with the APS&D housing, adjacent to the pushbutton.
- Operation programming method: Either or combination of:
 - Mechanically by dip switches or circuit board jumpers
 - Infrared remote-control hand-held device

B. Electrical:

- Metallic components either grounded or insulated to preclude an electrical hazard to pedestrians under all weather conditions.
- All features powered by the 110VAC Walk signal and the 110VAC Don't Walk signal so that additional conductors from the CA are not needed.

C. Audible Pushbutton Locator Tone

- Frequency: repeating tone at one (1) second intervals
- Tone duration: ≤ 0.15 seconds
- Volume:
 - Minimum setting of zero
 - Manually adjustable initial setting
 - Automatically adjusted after initial setting. Volume increased in response to a temporary increase in ambient noise and subsequently decreased with a decrease in ambient noise.
 - Maximum volume: 100 dBA which is the approximate sound pressure of a gasoline powered lawn mower nearby.
 - Automatic volume adjustment independent of other APS&Ds at the intersection.
 - May be disabled without affecting operation of other features.
- Silent only during walk interval. Active all other times.

D. Vibrotactile Arrow Pushbutton

- Pushbutton contained in a circular assembly which fits inside the housing and is attached to the housing with 4 screws.
- Actuation of pushbutton initiates speech message "Wait".
- ADA compliant: Size: ≥ 2.0 " (50) diameter, Actuation force: ≤ 5 ft-lb (22.2 N)

- Shape: Circular, raised slightly above housing so that it may be actuated with the back of a hand
- Tamper-proof, vandal-proof, weatherproof, freeze-proof, impact-resistant design and construction.
- Operation: Vibrates only during the walk interval (when the walk indication is displayed).
- Tactile Arrow:
 - Attached to surface of the button assembly by a tamperproof method.
 - Raised slightly above surface of pushbutton, minimum 0.125" (0.3)
 - Size: Length \geq 1.5" (38), Height \geq 1.0" (25)
 - Color: Sharp contrast to background color of pushbutton and housing

E. Audible Walk Interval

1. General:

- Operation independent of other APS&Ds at intersection.
- Active only during the walk interval (when the walk indication is displayed).
- Volume:
 - Minimum setting of zero
 - Manually adjustable initial setting
 - Automatically adjusted after initial setting. Volume increased in response to a temporary increase in ambient noise and subsequently decreased with a decrease in ambient noise.
 - Automatic volume adjustment independent of other APS&Ds at the intersection.
 - Maximum volume: 100 dBA which is the approximate sound pressure of a gasoline powered lawn mower nearby.
- Duration:
 - Default method: Automatically set by the duration of the visual walk signal display.
 - When selected: Manually set when rest-in-walk is used for a concurrent pedestrian movement.
- Audible sounds that mimic any bird call are not allowed.

2. Type A, Percussive Tone:

- Repeating tone at eight (8) to ten (10) ticks per second.
- Tone frequency: Multiple frequencies with a dominant component at 880 Hz which creates a "tick - tick - tick..." sound.

F. Pushbutton Housing/Sign Frame/Sign

- One piece die cast aluminum meeting requirements of ASTM B85.
- Sign frame designed to accept 9" x 15" (230 x 380) four-hole advisory sign.
- Flat back to facilitate surface mount.
- Available brackets to either pedestal top-mount or pole side-mount on pole diameter range of 3½" (89) to 15" (380).
- Available brackets to allow mounting two (2) APS&Ds to the same 3½" (89) pole, facing \geq 60 degrees apart, at the same height.
- Available extension bracket of a size indicated on the plan – 18" maximum.
- Wire entrance through the rear.
- Stainless steel mounting hardware.
- Color: The color shall be black No. 27038, Federal Standard No. 595.
- Finish: Housing/Frame and all mounting brackets either:
 1. Painted with 3 coats of infrared oven-baked paint before assembly.
 - Primer: Baked iron oxide which meets or exceeds FS TT-P-636.
 - Second coat: Exterior-baking enamel, light gray, which meets or exceeds FS TT-E-527.

- Third coat: Exterior-baking enamel, which meets or exceeds FS TT-E-489.
- 2. Electrostatic powder coated after chemically cleaned.
- Sign: CT DOT Sign No. 31-0856

Construction Methods:

Install the APS&D according to the manufacturer’s instructions. Position the ASP&D so the plane of the sign face is parallel to the crossing (sign is facing perpendicular) and the arrow is pointing in the same direction as the crossing, not necessarily at the ramp. Notify the Engineer if there is any discrepancy or ambiguity between the plans and field conditions that prevent placement of the ASP&D as shown on the plan. Set the minimum sound levels of the locator tone and the audible walk indication when there is little or no ambient noise as in night time operation. Set the volume of audible walk indications and pushbutton locator tones to a maximum of 5dBA louder than ambient sound. The locator tone should be audible 6’ to 12’ (1.8 m to 3.6 m) from the pushbutton or to the building line, whichever is less. Confirm the volume of both audible walk indication and the locator tone increases with an increase in ambient sound and subsequently decreases when the ambient noise decreases.

If programming method is remote, by an infrared hand-held device, provide one device and operation manual for each intersection where APS&D is installed.

Method of Measurement:

This work is measured by the number of APS&Ds of the type specified, installed, tested, fully operational, and accepted.

Basis of Payment:

Payment for this work is based on the installation, inspection, successful completion of the 30 day test period, and final acceptance of the Accessible Pedestrian Signal and Detector of the type specified. Payment includes the sign, mounting brackets for adjacent buttons on the same structure, extension brackets, all necessary cable, all incidental materials, labor, tools, and equipment necessary to complete the installation. Payment also includes the warrantee, installation manual, and operation manual.

If programming method is remote by an infrared hand-held device, the total bid price of all APS&Ds includes one remote programming device and accompanying operation manual for each intersection where APS&D is installed.

Pay Item	Pay Unit
Accessible Pedestrian Signal and Detector (Type A)	Each

ITEM #1108724A – PHASE SELECTOR

ITEM #1112410A – DETECTOR (TYPE A)

ITEM #1112470A – PRE-EMPTION SYSTEM CHASSIS

ITEM #1113550A – DETECTOR CABLE (OPTICAL)

SYSTEM DESCRIPTION:

The emergency vehicle traffic signal priority control system shall enable designated vehicles to remotely cause the traffic signal controller to advance to and/or hold a desired traffic signal display by using existing controller functions. The control shall be activated at a minimum distance of 1,800 feet (548.6m) along an unobstructed "line of sight" path. The control shall not terminate until the vehicle is within 40 feet (12.2m) of the detector or at the intersection.

The system shall consist of the following components:

- A. Phase Selector (minimum 2 channel) which shall cause the signal controller to advance to and/or hold the desired traffic signal display for the emergency vehicle. A pre-emption system chassis shall house two phase selectors.
- B. Optical Detector which shall be mounted on or near a traffic signal and shall receive the optical energy signals generated by the Vehicle Emitter.

Detector (Type A), 1 Direction, 1 Channel

- C. Detector Cable (Optical).

System Operation:

- A. The operating sequence shall be initiated when the optical detector receives the required optical energy signal from the Emitter.
- B. The phase selector shall cause the traffic signal controller to advance to and/or hold the desired traffic signal display for the emergency vehicle.
- C. The phase selector shall cause the controller to advance to and/or hold the desired traffic signal display even if the optical energy signals cease before the desired display is obtained.
- D. The phase selector shall allow the traffic signal controller to resume normal operation within ten seconds after optical energy signals cease if the optical energy signals cease after the desired traffic signal display is obtained.

- E. The phase selector shall not respond to optical energy signals from an emergency vehicle if it is already processing optical energy signals from another emergency vehicle.

System Components:

A. Optical Detector:

The optical detector receives the high intensity optical pulses produced by the emitter. These optical energy pulses are transformed by the detector into appropriate electrical signals which are transmitted to the phase selector. The optical detector is mounted at or near the intersection in a location which permits an unobstructed line of sight to vehicular approaches. The units may be mounted on signal span wires, mast arms or other appropriate structures.

1. Shall be of solid state construction.
2. Shall operate over an ambient temperature range of minus 30^o F. to plus 165^o F. (minus 34^o C to plus 74^o C)
3. Shall have internal circuitry potted in a semi-flexible compound to ensure moisture resistance.
4. Shall operate in 5 to 95 % humidity.
5. Shall have a cone of detection of not more than 13 degrees. The detector and/or phase selector shall not sense a pre-emption signal from an emitter outside this cone.

B. Phase Selector:

The phase selector supplies power to and receives electrical signals from the optical detector. When detector signals are recognized as a valid call, the phase selector causes the signal controller to advance to and/or hold the desired traffic signal display. This is accomplished by activating the pre-empt input to the controller.

The phase selector is capable of assigning priority traffic movement to one of two channels on a first-come, first-serve basis. Each channel is connected to select a particular traffic movement from those normally available within the controller. Once a call is recognized, "commit to green" circuitry in the phase selector functions so that the desired green indication will be obtained even if optical communication is lost. After serving a priority traffic demand, the phase selector will release the controller to follow normal sequence operation.

1. Shall include an internal power supply to supply power to the optical detectors.
2. Shall have minimum two-channel operation with the capability of interfacing with an additional phase selector for expansion of channels of operation.
3. Shall have adjustable detector range controls for each channel of operation, from 40 feet (12m) to 1800 feet (548m).

4. Shall have solid state indicator lights for power on and channel called.
5. Shall operate over an ambient temperature range of minus 30⁰ F. to plus 165⁰ F.
(minus 34⁰ C to plus 74⁰ C)
6. Shall operate in 5 to 95 % humidity.

C. Pre -Emption System Chassis:

1. Card cage/slot shall provide all the necessary hardware and harnessing required to allow simple wiring of phase selector to detector outputs and controller inputs..
2. Shall have harness to carry 115VAC and card outputs.
3. Shall include terminal block/strip for connecting the detectors.

D. Detector Cable (Optical):

1. 3-Conductor cable with shield and ground wire.
2. AWG #20 (7x28) stranded.
3. Individually tinned copper strands.
4. Conductor insulation: 600 volt, 167⁰ F. (75 deg. C).
5. 1 Conductor-yellow; 1 Conductor-blue; 1 Conductor-orange.
6. Aluminized mylar shield tape or equivalent.
7. AWG #20 (7x28) stranded uninsulated drain wire
8. DC resistance not to exceed 11.0 ohms per 1000 feet (305m).
9. Capacitance from one conductor to other two conductors and shield not to exceed 48 pf/ft. (157pf/m).
10. Jacket: 600 volts, 176⁰ F. (80 deg. C), minimum average wall thickness – 0.045” (1.14mm).
11. Finished O.D.: 0.3” (7.62mm) max.

System Interface:

System shall be capable of operating in a computerized traffic management system when appropriate interfacing is provided by the computer supplier.

General:

The Contractor shall furnish the manufacturer the phasing diagrams indicating controller sequence and timing.

The Contractor shall secure from the manufacturer a guarantee for the equipment for a period of sixty (60) months, which time shall commence from the date of delivery. Manufacturer shall certify upon request that all materials furnished will conform to this specification. The manufacturer or his designated representative shall be responsible for determining and setting all required range and emitter intensity for the emergency vehicle operation.

Construction Methods:

All equipment except the vehicle emitter assembly shall be installed and wired in a neat and orderly manner in conformance with the manufacturers' instructions.

Traffic signals owned and maintained by the State that have optical pre-emption equipment owned and maintained by the town shall have an Auxiliary Equipment Cabinet (AEC) attached to the controller cabinet. The optical pre-emption equipment shall be housed in the AEC. Traffic signals owned and maintained by the town do not require an AEC to house the pre-emption equipment.

Detector cables shall be continuous with no splices between the optical detector and the AEC.

Detector locations shown on the plan are for illustration purposes only. Exact location shall be determined by the contractor or the designated representative for the best possible line of sight.

If not present in an existing traffic controller cabinet, the following items shall be installed and connected, in conformance with the current Functional Specifications for Traffic Control Equipment, "D" Cabinet Requirements (Pre-emption Type):

- Controller "D" harness and adapter.
- Pre-emption termination panel with terminal block and relay bases.
- Pre-emption disconnect switch, mounted on the emergency switch panel (on inside of cabinet door).
- Pre-emption test buttons, mounted on the pre-emption termination panel.

All connections from the phase selector to the "D" harness and to the cabinet wiring shall be made at the termination panel. The termination panel shall have AC+ Lights, AC-, and a switched logic ground. The switched logic ground feeds all the pre-empt inputs to the phase selector. When switched off by the pre-emption disconnect switch, the traffic controller shall not be affected by pre-empt calls from the optical pre-emption system. A minimum of two test buttons shall be provided. If there are more than two pre-empt runs, a button for each shall be installed. A chart or print out indicating the program steps and settings shall be provided along with the revised cabinet wiring diagrams.

Test the Pre-emption System at the semi-final inspection According to the following Guidelines:

1. Notify the system owner/user, such as the municipal fire chief or public works director, of the scheduled inspection
2. Request a fire department representative and an emergency vehicle, which has an emitter to conduct the test. If not available, the contractor shall provide an emitter.
3. In the presence of the Engineer and the municipal representative, test each pre-empted approach with the emergency vehicle. Test the following items of the system:
 - * Confirm that the emitter activates the phase selector and the phase selector activates the correct pre-emption input to the controller.

- * Confirm adequate range. The traffic signal must be pre-empted to green sufficiently in advance of the emergency vehicle arrival. The vehicle emitter shall initiate pre-emption at a minimum distance of 1800 FT. (548.6m).
 - * Confirm there are no false calls. Keep the emitter active as the emergency vehicle passes through the intersection. No other optical detectors shall sense the strobe.
4. Document the test. Provide the Engineer and, upon request, the municipality copies of the test results.

If a malfunction is found or the system needs adjustment (such as range or detector location), schedule a follow-up test. Repeat the above steps for all approaches that did not pass.

All adjustments such as phase selector range, sensitivity, detector placement, shall be made at the intersection by the contractor so that the optical pre-emption operates correctly with other major manufacturers' equipment currently owned by the town.

Method of Measurement:

Optical Detectors, Phase Selectors, System Chassis will be measured for payment by the number of each supplied, installed and accepted. Detector Cable (Optical) will be measured by the number of linear feet (meters) supplied, installed and accepted.

Basis of Payment:

Payment for Optical Detectors, Phase Selector, System Chassis and Detector Cable (Optical) will include the item unit cost, including all manufacturer's required mounting hardware and the cost of installation and supervision by the manufacturer or his designated representative, including travel and subsistence, and all materials, equipment and labor incidental thereto. Payment for termination panel, "D" harness, test buttons, program chart (or print out) and revised cabinet wiring diagrams shall be included in the item PRE-EMPTION SYSTEM CHASSIS.

<u>Pay Items</u>	<u>Pay Units</u>
Detector (TYPE A)	Ea.
Phase Selector	Ea.
Detector Cable (Optical)	L.F. (m)
Pre-Emption System Chassis	Ea.

ITEM #1108115A – FULL ACTUATED CONTROLLER 8 PHASE

Article 11.08.01 - Description: Delete the second paragraph and replace with the following:

This item shall consist of furnishing and installing an actuated controller, which shall be a completely digital solid state unit, for controlling the operation of the traffic signals.

The controller shall be completely furnished with the number of phases called for in the item. The cabinet to house the controller shall be completely wired and all sub-bases shall be complete with load switches and flash relays as specified in the **Functional Specifications For Traffic Control Equipment**. The cabinet shall also have all necessary auxiliary equipment required to provide the sequence and timing indicated on the plans. A time switch shall be installed in each cabinet.

Article 11.08.03 – Construction Methods: Delete the entire second paragraph.

Article M.16.09 - Controllers: Add the following sub-articles:

2. Actuated Controllers: The purpose of this sub-article is to set forth minimum design and operating requirements for the materials and components for a digitally timed actuated controller.

Ventilation:

For cabinets that will be painted other than Department-approved gray, the cabinet ventilation shall include two intakes, exhausts, filtrations, two fans, and one thermostat assembly. Each electric fan shall be equipped with ball or roller bearings and with a capacity of at least 100 cfm. The fans shall be mounted inside the front top of the cabinet ventilation holes. The fans shall be controlled by one manually adjustable thermostat.

The Connecticut Department of Transportation Functional Specifications for Traffic Control Equipment, current edition governs the material for the Controller Assembly. The Functional Specifications are advertised biennial for vendors to provide equipment to the State on a low bid basis. All underlined text indicates an addition or revision to these specifications from the previous version. The Functional Specifications are available on the Departments website.

The following sections of the **Notice to Bidders**, pages 1 - 10, shall apply to contract supplied traffic controllers: 12, 15, 16, 17, 18, & 19.

Item 1108115A – FULL ACTUATED CONTROLLER 8 PHASE shall conform to the requirements of Section 1, pages 11 – 94. The Controller Unit (CU) shall conform to the requirements of Item 1D1, CONTROLLER (PRE-EMPTION TYPE), pages 29 – 31. All cabinets shall conform to the specifications of the “D” CABINET REQUIREMENTS, pages 78 – 84.

Controllers in a closed loop system shall conform to the requirements of Section 27, INTERNAL CLOSED LOOP SYSTEM FOR EXISTING NAZTEC SYSTEM, pages 162 – 185, in addition to the above requirements.

The solid state time switch shall conform to Section 13. FOUR CIRCUIT SOLID STATE TIME CLOCK WITH TIME BASE COORDINATION OPTION TC/TBC, pages 140 - 143.

Traffic signal equipment which has not been previously approved to meet the requirements of the Functional Specifications for the above items, will not be approved for use on this contract.

Several parts of Item 1 of the Functional Specifications do not apply to contract supplied and developer supplied traffic controllers. The specifications which are to be disregarded are listed below.

- Item 1A-1 - Controller, Two Phase Microprocessor Keyboard Entry
 - Type 6 Conflict Monitor
- Item 1A-2 - Two Phase Type "A" Cabinet

Supplemental specifications listed below, have been added for material and controller operations which the Department of Transportation does not include in the Functional Specifications for Traffic Control Equipment.

- U.C.F. Time Switch Flash Command Procedure
- Time Clock/Time Base Installation Requirements
- 24 Volt Relay Type A
- 110 Volt Relay Type F
- Type G
- Time Delay Relay
- Non-Actuated Advance Green Phase
- Actuated Advance Green Phase
- Non-Actuated Clearance / Lag Green Phase
- Actuated Clearance / Lag Green Phase
- Flashing Stop Ahead Sign
- Max II Actuation By Pedestrian Call

UNIFORM CODE FLASH COMMAND PROCEDURE

1. Activate the **MINIMUM RECALL** input to the controller to ensure cycling prior to transferring to flashing operation.
2. Omit all non-actuated and actuated artery advance phases.
3. Omit phases 1 & 5 of all quad sequences.
4. Activate the **STOP TIME** input to the controller, upon entering flash, to prevent cycling.
5. Transfer to flash at the end of the last side street all red condition (at the point the artery **ON** output becomes active).
6. Special technical notes on the intersection plan supercede the above requirements.

TC/TBC INSTALLATION REQUIREMENTS

The following requirements are to be observed when engineering the installation of TC/TBC:

1.
 - a. Circuit 1 shall be designated FLASH and be reserved for night flash command.
 - b. Circuit 2 shall be designated MAX 2 and be reserved for Max 2 command.
 - c. Circuit 3 shall be designated COORD and shall select coordinated operation of the intersection.
 - d. Circuit 4 shall be the yield, and force off command to the controller.
2. All clock outputs shall be active to select the function specified. For example; If the TC/TBC were removed for repair, no inputs would be applied to the controller. The intersection will then operate non-coordinated, in Max 1. Programming the TC/TBC without cycle and offset is not an acceptable method to create a non-coordinated operation. Refer to the typical hookup diagram.
3. All TC/TBC clock installations shall be wired as detailed in figure 1. This method is used for both full and semi actuated operation.
4. Midnight resync shall occur at 12:00 AM.
5. A program card shall be completed indicating all input steps and settings. Four copies shall be provided. One copy left in the cabinet. Three delivered to the engineer along with the cabinet wiring diagrams.

TIME CLOCK / TIME BASE COORDINATION

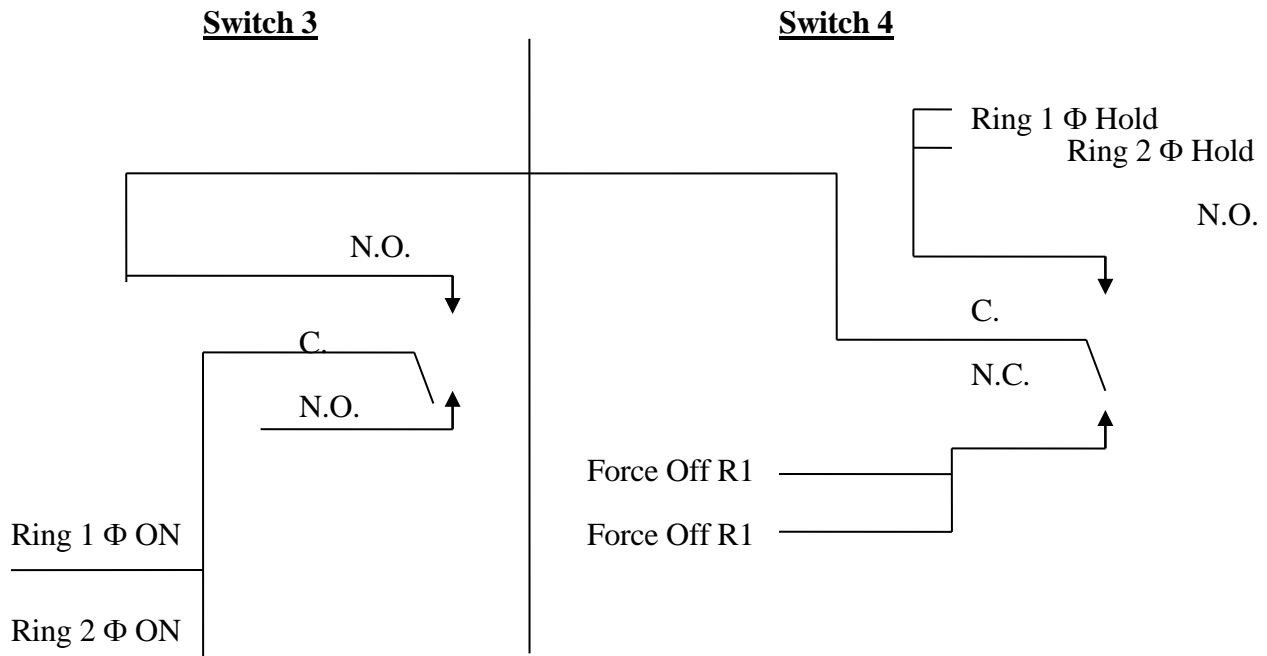


FIG. 1

24 VOLT RELAY

All 24 Volt relays shall meet the requirements of one of the following two types. Diodes shall be installed across the coils of all direct current relays to shunt the reverse voltage generated when the coil de-energizes. All diodes shall be general purpose ECG 125 1000prv @ 25A or equivalent, rated at least .5 amp forward biased. Diodes shall be external to the relay, not enclosed in the dust cover.

TYPE A: Midland Ross, Midtex 155-92 or equivalent.

DESCRIPTION:

This relay shall be enclosed in a clear polycarbonate removable dust cover. It shall have a mechanical life of more than 100,000 operations at rated load.

CONTACTS:

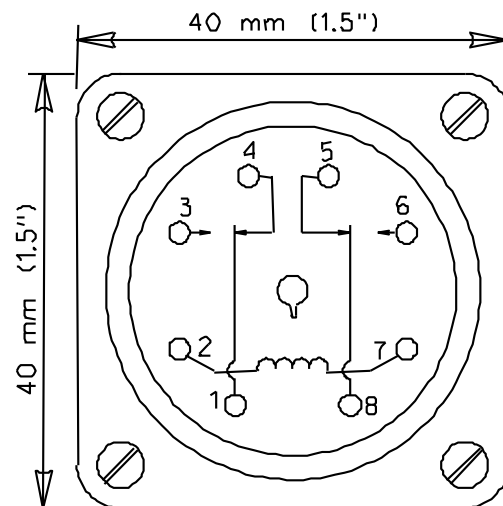
The contacts shall be 2 form C (D.P.D.T), U.L. rated at 5 amps 120 volts A.C. The contacts shall be pure fine silver (gold flash). There shall be no tungsten (lamp) load on the contacts of this relay.

COIL: The coil shall operate on 24 V.D.C. and have no less than 450 OHMS impedance.

SIZE: The relay shall be no larger than 65mm(2.5") H x 40mm(1.5") L x 40mm(1.5") W.

BASE: This relay shall have an eight pin octal plug-in base with the pin designation shown below:

1. Common (1)
2. Coil
3. Normally open (1)
4. Normally closed (1)
5. N.C. (2)
6. N.O. (2)
7. Coil (2)
8. Comm.



Bottom View And Wiring Diagram

SOCKET: The socket shall be a closed back, screw terminal type. The front mounted screws shall be 6-32 capable of accepting #14 AWG wire.

110 VOLT RELAY

All 110 volt relays shall meet the requirements of one of the following two types. Across the coil of each relay there shall be a molded suppressor rated at .1uf - 47 ohm @ 600V to suppress electrical noise created by the energization / de-energization of the relay.

TYPE F: Midland Ross, Midtex 136-62T3A1 or equivalent

DESCRIPTION:

Relays of this type shall function as flash transfer, power switching and signal drive. Other uses are acceptable, however, type G relays cannot be used for the above applications.

CONTACTS:

The contacts shall be in the D.P.D.T. form and consist of 10mm(3/8") diameter silver cadmium oxide, rated at 20 Amps @ 117 VAC resistive.

COIL:

The coil shall operate on 110 VAC. No semi-conductors will be allowed in the coil circuit of this relay.

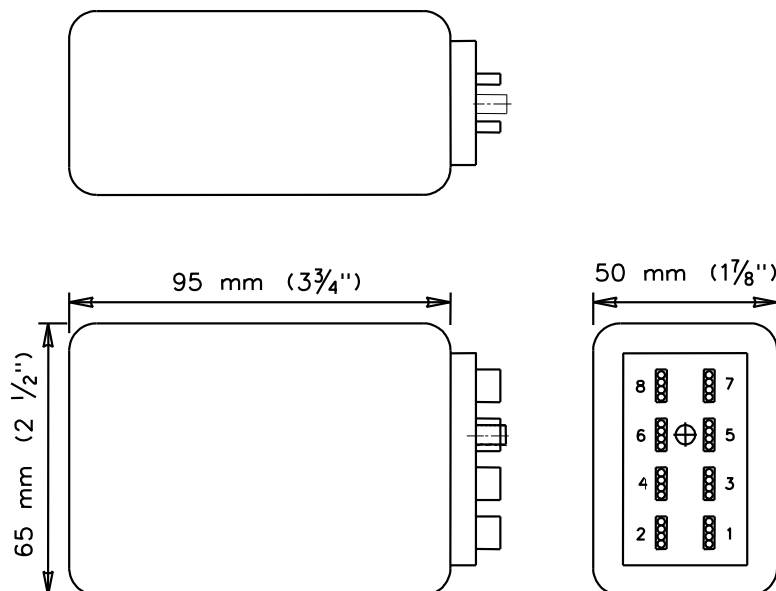
SIZE:

The relay shall be enclosed in a clear plastic dust cover. The overall dimensions shall be no larger than 63mm(2 1/2") x 94mm(3 3/4") x 47mm(1 7/8") as illustrated below.

BASE:

This relay shall have an eight blade plug-in base, Ventron Beau Plug P-5408 or equivalent with the pin designations as shown below:

1. Coil
2. Coil
3. N.C. 1
4. N.C. 2
5. Comm. 1
6. Comm. 2
7. N.O. 1
8. N.O. 2



SOCKET:

The socket shall be Ventron Beau Plug S-5408 or equivalent, contacts rated at 15 Amps @ 1750 VRMS.

TYPE G: Magnecraft, W 88 ACXP-8 or equivalent

DESCRIPTION:

Relays of this type shall function in low current switching applications such as interconnect interface or pre-emption circuits. A clear polycarbonate plastic enclosure shall cover the relay mechanism.

CONTACTS:

The contacts shall be in the D.P.D.T. form and consist of 5mm (3/16") diameter gold flashed, silver alloy, rated at 10 Amps @ 120 VAC resistive.

COIL:

The coil shall operate on 120 Volts AC and require a nominal 3 VA.

SIZE:

Height, length and width dimensions shall be the same as the 24 volt relay Type A: 35mm (1 3/8") x 60mm (2 3/8") x 35mm (1 3/8").

BASE:

The base shall be an octal plug with the pin designations the same as the 24 volt relay Type A.

SOCKET:

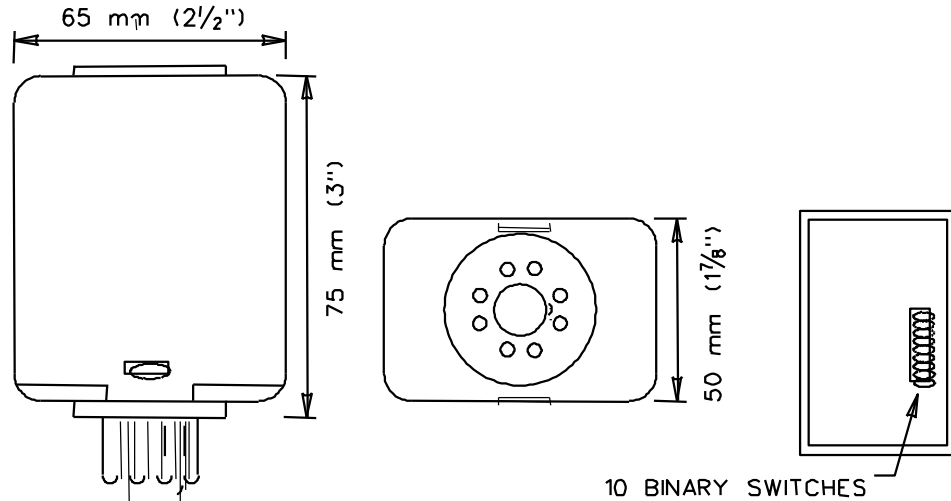
The socket shall be the same as that for the 24 volt relay Type A.

TIME DELAY RELAY

120 VAC SSAC TDM120A or equivalent
24 VDC SSAC TDM24DL or equivalent

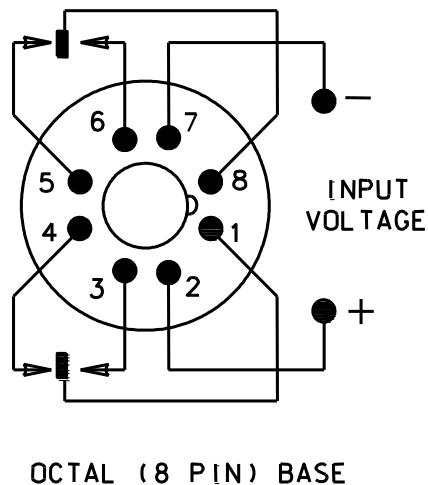
DESCRIPTION:

The time delay relays shall be self enclosed, plug-in, delay on operate type. They shall be digitally timed and adjustable by the use of dip switches located on the top of the case. The timing range shall be 1 to 1023 seconds in 1 second intervals. The time delay relays shall have an internal double pole double throw relay with form "C" contacts rated at 10 amps 120 volts AC. They shall operate accurately in a temperature range of -20 to +65 degrees C. A 120 volt AC input shall initiate timing of the 120 VAC TDR and a 24 VDC input shall initiate timing of the 24 VDC TDR. Removal of the input voltage shall reset the timer. Maximum dimensions of the case shall be as shown below.



SOCKET:

The socket shall be a standard octal base (8 pin) with screw terminal connectors. The pin designation shall be as shown below.

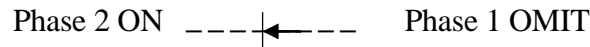


NON-ACTUATED ADVANCE GREEN PHASE

Where the timing and sequence indicates an advance green phase that always precedes the phase in recall (usually phase 2), and that either is fixed timed or is to be extended only, the following guidelines shall be in effect:

1. The parent phase ON output shall be diode connected to the advance phase OMIT input.
2. If the advance phase is to be extendable, it shall be in minimum recall. If the advance phase is fixed timed, it shall be in maximum recall. A different advance time may be selected by switching to maximum 2.

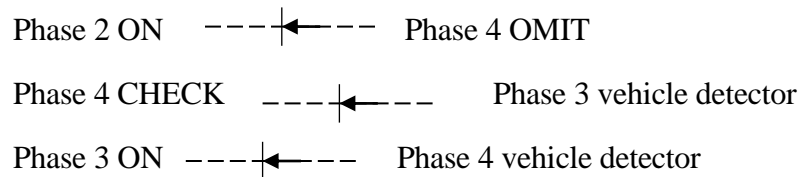
Example: Phase 1 is the advance phase (extendable), in minimum recall.
Phase 2 is the artery, in recall.
Phase 4 is the minor street, in non-lock.



Where the timing and sequence indicates an advance phase that is fixed timed (not extendable), and that always precedes either a phase other than phase 2 or a phase not in recall, the following guidelines shall be in effect:

1. The recall phase (usually Phase 2) ON output shall be diode connected to the advance phase's, parent phase OMIT input.
2. The parent phase CHECK output shall be diode connected to the advance phase vehicle detector input.
3. The advance phase ON output shall be diode connected to the following parent phase vehicle detector input. This is to insure a green indication on the parent phase.
4. The advance phase shall be in the non-lock mode. The advance time shall be selected from the maximum interval.

Example: Phase 2 is the artery, in recall.
Phase 3 is the advance for phase 4, in non-lock mode.
Phase 4 (parent phase) is the minor street, in non-lock mode.

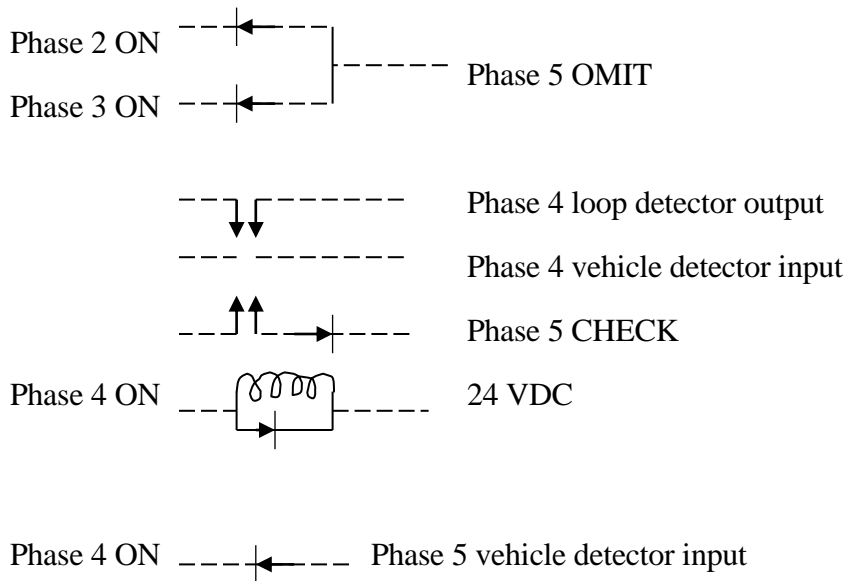


ACTUATED ADVANCE GREEN

Where the timing and sequence indicates an advance green phase that is to be extended only, and is to always precede either a phase other than phase 2 or a phase not in recall, the following guidelines shall be in effect:

1. The phase ON outputs of all phases that could precede the advance phase, shall be diode connected to the parent phase OMIT input.
2. The parent phase CHECK output shall be diode connected, through the normally closed contacts of a relay, to the advance phase vehicle detector input. The advance phase loop detector output shall be connected to the normally open contacts.
3. The relay coil shall be energized by the advance phase ON output, which in turn will switch the vehicle detector input from the parent phase CHECK circuit to the loop detector.
4. The advance phase ON output shall be diode connected to the following parent phase vehicle detector input. This is to insure a green indication from the parent phase.
5. The advance phase shall be in the non-lock mode.

Example: Phase 2 is the artery, in recall.
Phase 3 is the pedestrian phase.
Phase 4 is the advance for phase 5, in non-lock.
Phase 5 (parent phase) is the minor street, in non-lock.



The 24 volt relay shall be Type C as previously described in these specifications.

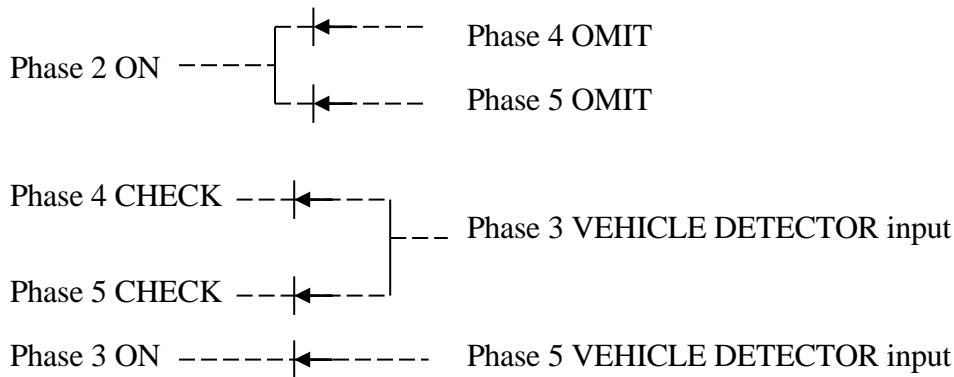
NON-ACTUATED CLEARANCE PHASE

NON-ACTUATED LAG GREEN PHASE

Where the timing and sequence indicates a non-actuated clearance phase or a lagging green phase that always follows the phase in recall, the following guidelines shall be in effect:

1. The parent phase ON output shall be diode connected to all appropriate phase OMIT inputs except the clearance phase.
2. The remaining actuated phases shall have their CHECK outputs diode connected to the clearance phase vehicle detector input.
3. The clearance phase ON output shall be diode connected to the following phases vehicle detector input (if the phase is in non-lock mode). This will prevent the controller from returning to the parent phase from the clearance phase without servicing the minor street.
4. The clearance phase shall be in the non-lock mode.
5. The clearance, or lag green time shall be selected from the maximum interval.

Example: Phase 2 is the artery, in recall.
Phase 3 is the clearance phase, in non-lock.
Phase 4 is the pedestrian phase.
Phase 5 is the minor street, in non-lock.



Where the timing and sequence shows a non-actuated clearance phase or lagging green phase following either a phase other than phase 2 or a phase not in recall, the following guidelines shall be in effect:

1. The parent phase ON output shall be diode connected to the following clearance phase vehicle detector input. This insures the clearance phase will always follow the parent phase.
2. The clearance phase shall be in the non-lock mode.
3. The clearance, or lag green time shall be selected from the minimum green interval.



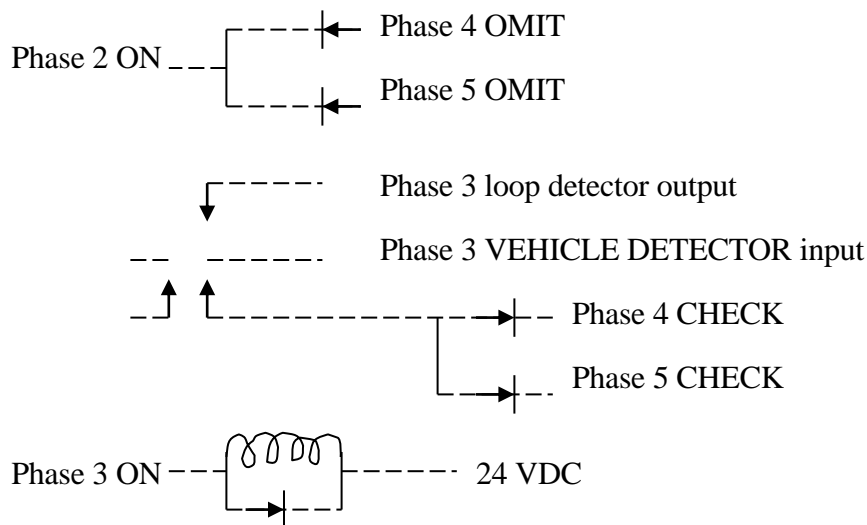
ACTUATED CLEARANCE PHASE

ACTUATED LAG GREEN PHASE

Where the timing and sequence indicates an actuated lagging green phase that is to be extended only, and always follows another phase, the following guidelines shall be in effect:

1. The parent phase (usually phase 2) ON output shall be diode connected to the phase OMIT inputs of all phases that could follow the lag phase.
2. The CHECK outputs of all phases that could follow the lag phase shall be diode connected, through the normally closed contacts of a relay, to the lag phase vehicle detector input. The lag phase loop detector output shall be connected to the normally open contacts.
3. The relay coil shall be energized by the lag phase ON output which in turn will switch the phase detector input from the CHECK circuits to the loop detector.
4. The lag phase shall be in the non-lock mode.

Example: Phase 2 (parent phase) is the artery, in recall.
Phase 3 is the lag phase, in non-lock.
Phase 4 is the pedestrian phase.
Phase 5 is the minor street, in non-lock.



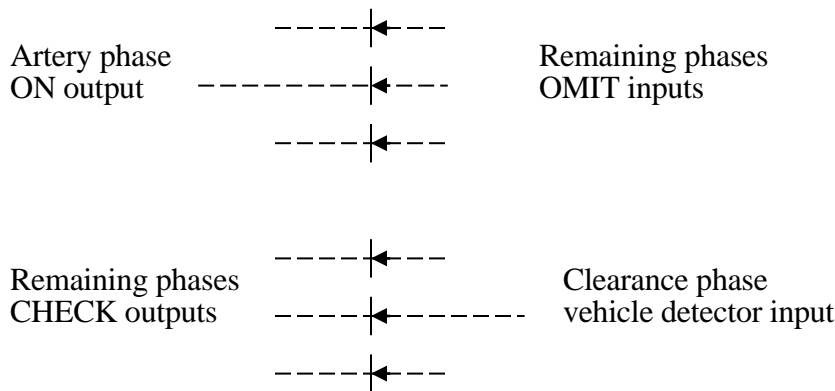
The 24 VDC relay shall be Type C as previously described in these specifications.

FLASHING STOP AHEAD SIGN

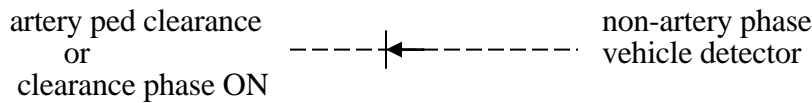
Where the timing and sequence indicates a flashing stop ahead sign, the clearance interval following the phase that the sign is off shall be timed by the following method.

The following phase shall be used for the clearance time. These phases shall be overlapped. The green indication will be maintained by the overlap feature and the following phase green time will be the stop ahead sign clearance.

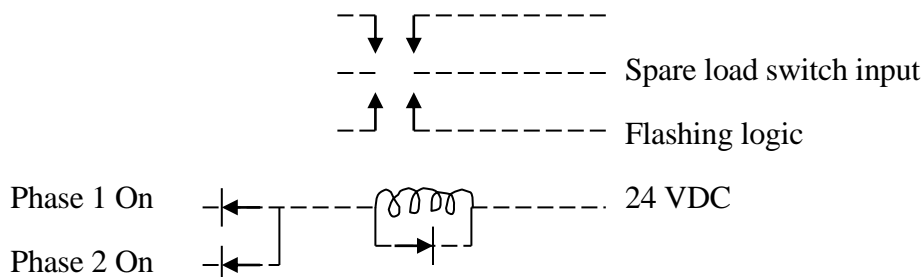
The artery phase ON output shall be diode connected to all other phase OMIT inputs except the clearance phase and the artery phase. The CHECK outputs from the remaining phases (as needed) shall be diode connected to the sign clearance phase vehicle detector input. The clearance phase shall be in the non-lock mode.



If the non-artery phases are in the non-lock mode, a call must be forced to the non-artery phase once the controller leaves the artery Hold interval (either artery walk or artery green). This prevents a false "Stop Ahead" indication if a vehicle turns right on red during the flashing sign clearance interval.



Unless otherwise shown on the plans, the 110 VAC flash power shall be from a spare load switch in the controller cabinet. The load switch input shall be driven with the flashing logic output from the controller. The flashing logic output shall be disconnected from the load switch during the intervals the sign is inactive.



Typical drive circuit for "WHEN FLASHING STOP AHEAD" sign

TIME BASE COORDINATION MAX II ACTUATION BY PEDESTRIAN CALL

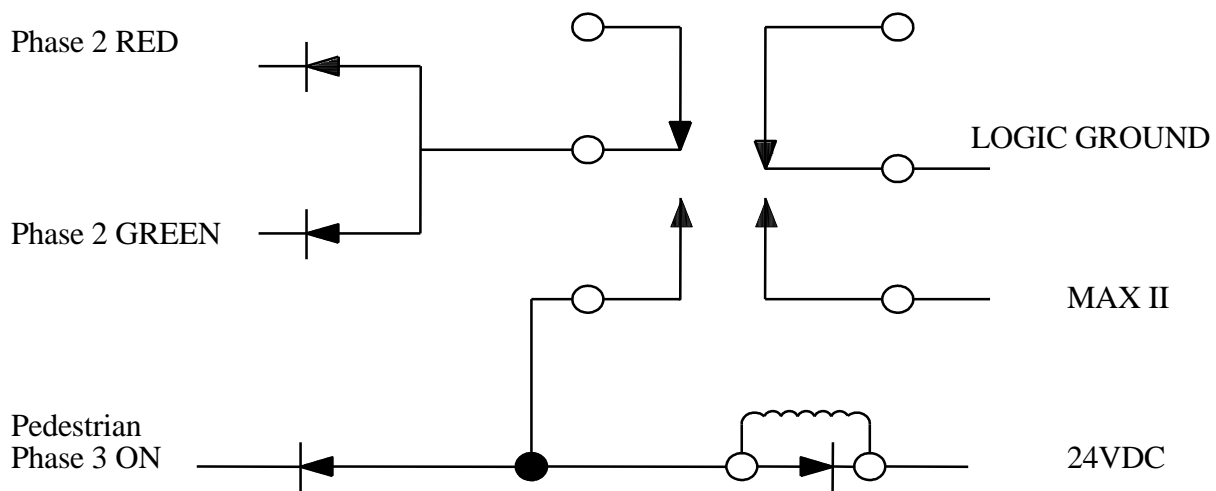
When the sum of the split times, including the walk and don't walk, exceed the background cycle length, the designer may choose to either allow a double cycle of the background timer or reduce the phase timings when the ped phase is called. Reduction of the phase timing by switching to MAX 2 avoids double cycling.

Where indicated on the plans the exclusive pedestrian phase will call MAX II. The minor movement max 2 times are set low so that the total phase times do not exceed the coordination cycle length.

Install a 24 volt relay connected to the inputs and outputs as shown on the following schematic.

Operation: When the controller advances to the exclusive pedestrian phase, the relay is actuated and latched. MAX II timing is selected for one complete cycle, until the relay is unlatched by the artery yellow (absence of red or green).

Example: Phase 2 is the artery. Phase 3 is the exclusive pedestrian phase.



ITEM #1111201A – TEMPORARY DETECTION (SITE NO. 1)

ITEM #1111202A – TEMPORARY DETECTION (SITE NO. 2)

Description:

Provide a Temporary Detection (TD) system at signalized intersections throughout the duration of construction, as noted on the contract plans or directed by the Engineer. TD is intended to provide an efficient traffic-responsive operation which will reduce unused time for motorists travelling through the intersection. A TD system shall consist of all material, such as pedestrian pushbutton, accessible pedestrian signal, conduit, handholes, cable, messenger, sawcut, loop amplifier, microwave detector, Video Image Detection System (VIDS), Self-Powered Vehicle Detector (SPVD), and any additional components needed to achieve an actuated traffic signal operation.

Sites:

- Site No. 1: Includes intersection no. 082-214 (Main Street and Washington Street).
- Site No. 2: Includes intersection No. 082-222 (Main Street and Rapallo Avenue/Grand Street) and intersection No. 082-241 (Main Street and Hartford Avenue).

Materials:

Material used for TD is either owned by the Contractor and in good working condition, or existing material that will be removed upon completion of the contract. Approval by the Engineer is needed prior to using existing material that will be incorporated into the permanent installation. New material that will become part of the permanent installation is not included or paid for under TD.

Construction Methods:

The work for this item includes furnishing, installation, relocating, realigning, and maintaining the necessary detection systems as to provide vehicle and pedestrian detection during each phase of construction. If not shown on the plan, program the TD modes (pulse or presence) as the existing detectors or as directed by the Engineer. If the TD method is not specified elsewhere in the Contract, (loops, SPVD, microwave, VIDS, pushbutton, or other) it may be the Contractor's choice. The method chosen for TD must be indicated on the TD Plan submission.

The traffic signal plan-of-record, if not in the controller cabinet will be provided upon request. Ensure the controller phase mode (recall, lock, non-lock) and phase timing are correct for the TD. Adjust these settings as needed or as directed by the Engineer.

At least 30 days prior to implementation of each phase of construction submit a TD proposal to the Engineer for approval. Submit the TD proposal at the same time as the Temporary Signalization plan. Indicate the following information for each intersection approach:

- Phase Mode

- Temporary Detection Method
- Area of Detection
- Detector Mode

Submit the proposed temporary phase timing settings and the TD installation schedule with the TD proposal. See the example below.

Example Proposed Temporary Detection and Timing

Site 1

Warren, Rt. 45 at Rt. 341, Location #149-201

Approach	Phase	Phase Mode	TD Method	Area of Detection	Det Mode
<i>Rt. 45 NB</i>	<i>2</i>	<i>Min Recall</i>	<i>VIDS</i>	<i>150' from Stop Bar</i>	<i>Presence</i>
<i>Rt. 45 SB</i>	<i>2</i>	<i>Min Recall</i>	<i>SPVD</i>	<i>150' from Stop Bar</i>	<i>Pulse</i>
<i>Rt. 341</i>	<i>4</i>	<i>Lock</i>	<i>Microwave</i>	<i>30' from Stop Bar</i>	<i>Pulse</i>
<i>Rt. 341</i>	<i>4</i>	<i>Lock</i>	<i>Pushbutton</i>	<i>At SE & SW corners</i>	<i>n/a</i>

Temporary Phase Timing Settings:

Phase	Min	Ped	Ped Clr	Ext	Max 1	Max2	Yel	Red
<i>2</i>	<i>20</i>	<i>0</i>	<i>0</i>	<i>6</i>	<i>45</i>	<i>60</i>	<i>4</i>	<i>1</i>
<i>4</i>	<i>14</i>	<i>7</i>	<i>9</i>	<i>3</i>	<i>27</i>	<i>35</i>	<i>3</i>	<i>1</i>

Scheduled TD: *July 4, 2011* Site 2

Scotland, Rt. 14 at Rt. 97, Location #123-201

Approach	Phase	Phase Mode	TD Method	Area of Detection	Det Mode
<i>Rt. 15 WB Left Turn</i>	<i>1</i>	<i>Non-Lock</i>	<i>VIDS</i>	<i>5' in front to 10' Behind Stop Bar</i>	<i>Presence</i>
<i>Rt. 14 EB</i>	<i>2</i>	<i>Min Recall</i>	<i>Existing Loop</i>	<i>150' from Stop Bar</i>	<i>Pulse</i>
<i>Ped Phase</i>	<i>3</i>	<i>Non-Lock</i>	<i>Pushbutton</i>	<i>At all corners</i>	<i>n/a</i>
<i>Rt. 14 WB</i>	<i>6</i>	<i>Min Recall</i>	<i>VIDS</i>	<i>150' from Stop Bar</i>	<i>Presence</i>
<i>Rt. 97</i>	<i>4</i>	<i>Lock</i>	<i>Loop, Pre-formed</i>	<i>20' from Stop Bar</i>	<i>Pulse</i>

Temporary Phase Timing Settings:

Phase	Min	Ped	Ped Clr	Ext	Max 1	Max2	Yel	Red
<i>1</i>	<i>5</i>	<i>0</i>	<i>0</i>	<i>2</i>	<i>12</i>	<i>18</i>	<i>3</i>	<i>1</i>
<i>2 & 6</i>	<i>24</i>	<i>0</i>	<i>4</i>	<i>4</i>	<i>26</i>	<i>36</i>	<i>4</i>	<i>1</i>
<i>3</i>	<i>16</i>	<i>7</i>	<i>9</i>	<i>0</i>	<i>16</i>	<i>16</i>	<i>4</i>	<i>1</i>
<i>4</i>	<i>14</i>	<i>7</i>	<i>9</i>	<i>3</i>	<i>27</i>	<i>35</i>	<i>3</i>	<i>1</i>

Scheduled TD: *July 4, 2011*

When at any time during construction the existing vehicle or pushbutton detection becomes damaged, removed, or disconnected, install TD to actuate the affected approaches. Install and make TD operational prior to removing existing detection. TD must be operational throughout all construction phases.

Provide a list of telephone numbers of personnel who will be responsible for the TD to the Engineer. If the TD malfunctions or is damaged, notify the Engineer and place the associated phase on max recall. Respond to TD malfunctions by having a qualified representative at the site within three (3) hours. Restore detection to the condition prior to the malfunction within twenty-four (24) hours.

If the Engineer determines that the nature of a malfunction requires immediate attention and the Contractor does not respond within three (3) hours following the initial contact, then an alternative maintenance service will be called to restore TD. Expenses incurred by the State for alternative service will be deducted from monies due to the Contractor with a minimum deduction of \$500.00 for each service call. The alternate maintenance service may be the traffic signal owner or another qualified Contractor.

TD shall be terminated when the detection is no longer required. This may be either when the temporary signal is taken out of service or when the permanent detectors are in place and fully operational.

Any material and equipment supplied by the Contractor specifically for TD shall remain the Contractor's property. Existing material not designated as scrap or salvage shall become the property of the Contractor. Return and deliver to the owner all existing equipment used as TD that is removed and designated as salvage.

Method of Measurement:

Temporary Signalization (TS) shall be measured for payment as follows:

Fifty percent (50%) will be paid when Temporary Detection is initially set up, approved, and becomes fully operational.

Fifty percent (50%) will be paid when Temporary Detection terminates and all temporary equipment is removed to the satisfaction of the Engineer.

Basis of Payment:

This work will be paid at the contract Lump Sum price for "Temporary Detection (Site No.)". The price includes furnishing, installing, relocating, realigning, maintaining, and removing, the necessary detection systems and all incidental material, labor, tools, and equipment. This price also includes any detector mode setting changes, timing or program modifications to the controller that are associated with TD. All Contractor supplied material that will remain the Contractor's property will be included in the contract Lump Sum price for "Temporary Detection (Site No.)". Any items installed for TD that will become part of the permanent installation will not be paid for under this item but are paid for under the bid item for that work.

<u>Pay Item</u>	<u>Pay Unit</u>
Temporary Detection (Site No.)	L. S.

ITEM #1112241A – FIBER OPTIC CABLE SPLICE ENCLOSURE

Description:

This Item shall consist of furnishing and installing splice enclosures to interconnect optical fibers between two or more fiber optic cable segments.

Materials:

A. Applicable Publications

1. Publications listed below form a part of these specifications 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. TIA-526-3-89 Fiber Optic Terminal Equipment Receiver Sensitivity and Maximum Receiver Input.
 - b. TIA-455-32A-90/Fiber Optic Circuit Discontinuity.
 - c. EIA-310-C Racks, Panels, and Associated Equipment.
 - d. EIA-359-A Colors for Color Identification and Coding.
 - e. EIA-TIA-455-A Standard Test Procedures for Fiber Optic Fibers, Cable Transducer Sensors, Connecting and Terminating Devices and Other Fiber Optic Components.
 - f. EIA-455-6B Cable Retention Test Procedure for Fiber Optic Cable Interconnecting Devices.
 - g. TIA/EIA-598-A Optical Fiber Cable Color Coding.

B. Fiber Optic Splice Enclosure

1. The Splice Enclosures shall accommodate from a minimum of 72 to 168 fiber splices. Each splice enclosure shall have a splice tray organizer capable of holding a minimum of 12 to 18 splice trays. The organizer shall provide access to and removal of individual splice trays and permit selective splicing to allow one or more fibers to be cut and spliced to branch cable(s) without disrupting other fibers.
2. The Contractor shall install Splice Enclosures of a capacity that they are capable of handling of 36 fibers more than the current fiber count at any given splice location as shown on the Drawings.
3. The Splice Enclosure shall fit within the space allocated for it as shown on the plans and to operate within the environment in which it is to be installed.

4. The Splice Enclosure shall protect the fiber optic cable splices from mechanical damage, shall provide strain relief for the cable, and shall be resistant to salt corrosion. The enclosure shall be waterproof and airtight, and shall be manufactured of non-corroding materials.
5. The Splice Enclosure shall be designed for a temperature range of -30° C (-22° F) to +70° C (158° F). The splice enclosure shall be capable of performing in a cable vault or pull box, environment where total and continuous submersion in water is to be expected.
6. All materials in the enclosures shall be non-reactive and shall not support galvanic cell action. The outer enclosure shall be compatible with the other enclosure components, splice trays, and cables. The end plate shall consist of two sections and shall have the capacity for a minimum of two cable entries on each end.
7. All Splice Enclosures shall employ re-usable sealing materials allowing multiple re-entrances without replacing any component. Access to the splice enclosures shall be accomplished without the use of special tools or devices. The splice enclosure shall employ a latching mechanism for entrance to the internal components of the enclosure.
8. All environmentally exposed components of the Splice Enclosures shall be UV light resistant.
9. All splice trays shall be lined to provide a contrasting a contrasting background for splicing colored fibers or as approved by the Engineer. The splice trays shall include clear snap-on covers and tie wraps to secure the buffer or transport tubes to the tray. The splice trays shall be of adequate size to prevent induced attenuation due to fiber bending.
10. Each splice tray shall be capable of accommodating a minimum of 12 fusion splices for the single mode fiber cable of the type selected.
11. The splice tray shall have features that retain the fiber loops and control the bend radius. The splice tray cover shall be clear plastic to allow for inspection of the fibers without opening the tray.
12. Vinyl markers shall be supplied to identify each fiber to be spliced within the enclosure. Each splice shall be individually mounted and mechanically protected on the splice tray.

C. Cable Racking Hardware

1. Cable racking hardware shall be made of a high performance polymer: Each splice enclosure shall be supported in the pullbox by a medium duty rack capable

of supporting a minimum load of 100 lbs (445 N). Racks shall not be less than 6 inches (150mm) in length. Medium duty racks shall have 4 inch (100mm) arms minimum. At splice points, the pullbox shall have a horizontal rack capable of supporting, and holding securely in place, a splice closure.

D. Warranty

1. All equipment supplied for this shall be warranted for parts 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.

Construction Methods:

A. Installation

1. Splice Enclosures shall be installed as shown in the Drawings or as directed by the Engineer. Unless otherwise specified, outdoor type Splice Enclosures shall be installed within vaults or pull boxes located adjacent to CCTV cameras and at fiber optic cable reel-end splice locations as shown on the Drawings.
2. The installations shall include all required components including sealing kits, cable racking hardware and mounting hardware to achieve an environmentally secure permanent installation.
3. The Contractor shall supply all materials, tools, equipment and labor including but not limited to fan out kits, connectors, trays, splice enclosures, and any other incidentals necessary to complete the installation of the fiber optic cable splice enclosure.
4. The Splice Enclosure shall be secured to the interior of the cavity of the vault or pullbox on cable racking hardware using tie-wraps.
5. The Outdoor Splice Enclosure shall be mounted in such position to allow the cable to enter and exit the enclosure without exceeding the cables minimum bending radius. Sufficient cable shall be coiled in the vault or pull box to allow the Splice Enclosure to be removed from the vault for current and future splicing and cable repairs. The Contractor shall install mounting hardware within the pullbox or splice location to support the splice enclosure and the splice enclosure shall be securely fastened in place. In no cases shall the splice Enclosure be allowed to rest on the bottom of the pullbox or vault.
6. After the splice trays are placed inside the enclosure, the enclosure shall be sealed using a procedure recommended by the manufacturer that will provide a waterproof environment for the splices. Encapsulant shall be used to ensure water

resistance. The individual fibers shall be looped one full turn within the Splice Enclosure to avoid micro bending.

7. Care shall be taken at the cable entry points to ensure a tight salt resistant and waterproof seal is made which will not leak upon aging. It is acceptable to have multiple cables enter the fiber optic cable Splice Enclosure through one port as long as all spaces between the cables are adequately sealed.
8. All splices shall be protected with a thermal shrink sleeve and shall be labeled in the splice tray with permanent vinyl markers. Butt ends shall also be labeled to identify the destination of the fiber.
9. The splices shall be fabricated using modern, high quality fusion type splicing equipment. All splicing equipment shall be in good working order, properly calibrated, and meeting all industry standards and safety regulations. Cable preparation, Enclosure installation, and splicing shall be accomplished in accordance with accepted and approved industry standards.
10. Optical fibers shall be spliced as noted on the plans using the fusion type and the maximum splice loss shall not exceed 0.10 dB per splice in each direction. The Contractor shall test all splices for signal loss.
11. Each splice shall be tested for tensile strength by applying a force of not less than 7 oz. (200 grams).
12. All splices shall be arranged neatly in splice trays, supported and protected with a suitable splice protector.
13. Only the fibers required to be spliced to Drop Cables at the CCTV Camera and Mini-Hub locations shall be severed and spliced. Where required, the buffer tube splitting tool recommended by the manufacturer shall be used to open the correct buffer tube. Unsevered fibers in an open buffer tube shall be coiled in the splice tray. When buffer tubes do not need to be opened, at least 4.0 m of unopened buffer tubes shall be coiled in the fiber optic Splice Enclosure.
14. Drop cable entrances to the splice enclosures shall adhere to the manufacturer's recommendations for the type of cable.
15. In order to reduce the overall number of splices required, the cable shall be installed in the maximum continuous reel length provided by the manufacturer, or as shown on the plans, or as approved by the Engineer. Factory splices will not be permitted. Prior to ordering the fiber optic cable, the Contractor shall be required to submit a detailed cable layout plan showing the proposed reel lengths and splice points.

16. Fiber identification shall be in accordance with the tables and schedules provided in the Contract Drawings.
17. Upon completion of the splicing operation, all waste material shall be deposited in suitable containers, removed from the job site, and disposed of in an environmentally acceptable manner.

B. Submittals

1. Submit:
 - a. Functional block diagrams, cable diagrams, and point to point cabling details.
 - b. Product data, installation manuals, materials, system configuration options and features, and accessories.
 - c. Shop Drawings shall be completely dimensioned and shall indicate the intended installation method and details.
 - d. Specifications for all assemblies and subassemblies (eg. High Density Frames, Splice Housings, Connector Panels, Underground Splice Enclosures and associated Splice Trays).
 - e. Installation and maintenance manuals for all equipment.

C. Testing

1. Testing shall be performed to demonstrate that all furnished and installed equipment complies with the requirements of each item, and shall be conducted using Manufacturer recommended procedures, materials and test equipment.

D. 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.

Method of Measurement:

Work under these items shall be measured for payment by the actual number of "Fiber Optic Cable Splice Enclosures" of the type specified, installed, tested, operating and accepted in place.

Basis of Payment:

The work to be done under this item shall be paid at the Contract Price each for “Fiber Optic Cable Splice Enclosure” which price shall include all materials, hardware, termination panels, labor, cables, connectors, tools, equipment and incidentals necessary to complete this work.

The Contractor shall note that the required racking in the pullboxes and the vaults is included in the splice enclosure item.

Pay Item

Pay Unit

Fiber Optic Cable Splice Enclosure

ea.

ITEM #1112252A – EQUIPMENT OPERATIONS (ESTIMATED COST)

Description:

The purpose of this item is to provide the necessary services required to maintain the Incident Management System (IMS) equipment existing and newly installed, operating to the manufacturer's specifications, so as to provide a means to monitor, detect and manage incidents as they occur on the highway. The work included in this item for the existing IMS equipment will commence upon receiving the Notice to Proceed for this contract. The work included in this item for newly installed IMS equipment will commence upon completion of the 30 Day Operational Test

Materials:

All materials utilized to maintain and repair the Incident Management System (IMS) shall be in conformance with the specifications of this project or shall be in conformance with the specifications of the Procurement Contract, or as recommended by the manufacturer. The existing or newly installed IMS equipment shall include but not be limited to the operation of the CCTV Cameras, Traffic Management System Cabinets (TMSC), Traffic Flow Monitors (TFM) and Variable Message Signs (VMS).

The Contractor shall provide all the cables, connectors, tools, replacement equipment and labor necessary to successfully maintain the equipment.

The Contractor shall be able to use replacement parts available from the State of Connecticut inventory in order to expedite the repair process. As soon as possible and to the State's satisfaction, the Contractor shall provide replacement equipment to be re-entered into the State's inventory.

The Contractor shall provide documentation certifying the manufacturer's repair or replacement of the spare equipment upon return of the equipment to the Department.

Construction Methods:

Certification:

The Contractor shall provide the State with evidence satisfactory to the State that they fully understand the purpose for which the equipment is intended, and they are qualified and capable of fulfilling all provisions of this item. The Contractor as well as individual personnel performing this work shall be certified by all manufacturers of the equipment to be maintained as being capable of maintaining the equipment and also capable of obtaining and installing the necessary spare parts to keep the system on-line. The Contractor, prior to the commencement of the start of the equipment operations, shall be required to submit training certificates for all of the pertinent equipment.

Response Time:

The Contractor shall service and maintain the newly installed IMS equipment at the conclusion of the 30 Day Operational Test for each installation and the existing IMS equipment from the contract Notice to Proceed as allowed by the Engineer. All IMS equipment shall be serviced and maintained on a twenty-four (24) hour a day, seven days a week basis. The Contractor shall provide a suitable means of communication between them and the Highway Operations Center (HOC). This shall include a twenty-four (24) hour telephone number, a fax number for emergency purposes and a fax number for daily communications and log activities. Repairs shall commence not more than 8 hours after notification and shall be completed within 24 hours of notification.

The Contractor shall keep a neat and accurate log book of all the malfunctions reported with the date and time that the information was received and the nature of the problem. The log book shall be submitted to the Engineer monthly or upon request by the Engineer. The Contractor shall include in the log book the time that each unit is checked for proper operation, the condition of each unit checked, and the date and time each unit was restored to proper operation or replaced.

Work performed under this item shall conform to the latest National Electrical Code standards, local electrical codes, and Department of Transportation installation requirements. The Contractor shall conform to these requirements as specified herein.

Any IMS equipment that has been damaged through the Contractors own actions shall be repaired and/or replaced by the Contractor at no cost to the State.

Method of Measurement:

This item shall be measured for payment as provided under Article 1.09.04 – Extra and Cost Plus Work.

The sum of money shown on the estimate and in the itemized proposal as “Estimated Cost” for this work will be considered the price bid even though payment will be made only for actual work performed. The estimated cost figure is not to be altered in any manner by the bidder. Should the bidder alter the amount shown, the altered figures will be disregarded and the original price will be used to determine the total amount bid for the contract.

Basis of Payment:

This work will be paid on a cost-plus basis according to Article 1.09.04 – Extra and Cost Plus Work. Warranties in effect for newly installed equipment associated with CCTV Cameras, Traffic Management System Cabinets (TMSC), Traffic Flow Monitors (TFM) and Variable Message Signs (VMS) operation shall be honored by the suppliers of the equipment. Contractor or sub-contractor will be responsible for securing warranted equipment and installation. There will be no payment for materials included under a manufacturers warrantee. Labor costs only will be reimbursed on a cost plus basis.

If warranties have expired, any equipment and labor that must be repaired will be paid on a cost plus basis.

Pay Item

Pay Unit

Equipment Operations (Estimated Cost)

est.

ITEM #1112284A – VEHICLE DETECTION MONITOR

Description:

Furnish and install a Vehicle Detection Monitor with stand in the Controller Cabinet.

Materials:

All hardware shall be new, corrosion-resistant. All equipment shall be current production.

Physical:

- Compact and easily accessible stand-mounted LCD/ LED Flat Panel Display.
- Diagonal screen size minimum 10 inches and maximum 15 inches.
- Withstand temperatures ranging from -4 to 140°F (-20 to 60°C).
- Operating humidity: 10-90% non-condensing.

Functional:

- Compatible with Color or Monochrome Detection systems.
- Industrial-grade video panel.
- ANSI contrast ratio of 300:1 minimum.
- Minimum brightness level: 400 candelas per square meter (400 lux).
- Native resolutions: 1024 (horizontal) x 768 (vertical).
- Support both National Television Standards Committee (NTSC) and Phase Alternating Line (PAL) video formats with auto-sensing.
- Minimum viewing angle: 140 degrees horizontally, 120 degrees vertically.
- On-Screen Display (OSD) controls brightness, contrast, color as well as horizontal and vertical positioning.
- Compatible with video detection processor output. Use appropriate converters/ adapters if necessary.
- Operable on 110 VAC or 220 VAC, 50 or 60 Hz.
- FCC, Voluntary Control Council for Interference (VCCI), Electromagnetic Compatibility (EMC), Consumer Electronics (CE) approved, UL listed and Energy Star efficient.
- MTBF Rating: 50,000 hours minimum.

Warranties and Guarantees:

Provide warranties and guarantees to the **Department of Transportation Office of Maintenance** in accordance with Article 1.06.08 of the Standard Specifications. Warranties for all equipment furnished as part of this Contract are to cover a period of 24 months following successful completion of the entire intersection acceptance test.

Method of Measurement:

The Vehicle Detection Monitor will be measured for payment as the number of units furnished, installed, operational and accepted.

Basis of Payment:

This work will be paid at the Contract unit price for each accepted "Vehicle Detection Monitor," which price shall include the Vehicle Detection Monitor, stand, documentation, warranty, labor, tools and equipment incidental thereto.

Pay Item	Pay Unit
Vehicle Detection Monitor	EA.

ITEM #1111600A – EXTENSION BRACKET

ITEM #1112286A – 360 DEGREE CAMERA ASSEMBLY

ITEM #1112287A – 360 DEGREE VIDEO DETECTION PROCESSOR

ITEM #1113725A – 23 AWG 4 TWISTED PAIR CATEGORY 6 CABLE

Description:

Furnish and install a 360 Degree Video Image Detection System (360VIDS) as shown on the plans or as directed by the Engineer. The 360VIDS consists of a 360 Degree Camera Assembly (360CA), 360 Degree Video Detection Processor (360VDP) and 23 AWG 4 Twisted Pair Category 6 Cable. The Extension Bracket will be included on a case-by-case basis.

Materials:

All hardware shall be new, corrosion resistant. All equipment shall be current production.

360 Degree Camera Assembly:

Camera:

- No-aim, no-focus camera
- Downward facing lens and camera shroud
- Single Power Over Ethernet (POE) connection for power and data collection.
- Color image camera with 360 degree point of view (POV)
- Active picture elements (pixels): 2560 (H) x 1920 (V), minimum.
- Signal to noise ratio : 55dB
- Heated camera
- IP addressable

Camera Enclosure:

- Tamper proof constructed of painted or powder coated aluminum of at least 0.25 inch (6.35-mm) thickness.
- IP66-rated camera housing.

Camera Mounting Hardware:

- Swivel bracket for dual plane adjustment for leveling
- Quick connect junction box
- Hybrid terminal junction box with surge.
- Astro-Brac banded bracket
- 34 inch to 78 inch 90 degree mounting arm pole.

Extension Bracket:

- Single arm [8' (2.5m) or less], or Truss type [8' (2.5m) or greater].
- Length shown on plan.

- Clamp-on attachment to pole shaft 1' (300mm) from top of pole.
- Designed to support minimum 30 lbs. (13.6 Kg), 2 sq. ft. (.2 sq. M) end load with minimal movement from wind.
- Schedule 40, 2" IPS galvanized pipe.
- Heavy duty galvanized finish
- Refer to detail drawing contained herein.

360 Degree Video Detection Processor:

Functional:

- Connectivity: Local Area Network (LAN), Wide Area Network (WAN), Camera interfaces.
- NEMA TS1/ TS2, Type 170 and 2070 ATC compatible
- Four (4) USB 3.0 expansion ports.
- Front panel LED indicators displays calls and light states.
- Twenty-four (24) optically isolated I/O interface.
- Two (2) camera ports – Up to two (2) 360 Degree Camera Assembly; or one (1) 360 Degree Camera Assembly and four (4) IP video detection camera assembly (IPVDCA) or thermal cameras; or eight (8) IPVDCA or thermal cameras.
- Phase and detection display.
- Wi-Fi capable
- Power – 110/220 VAC 50/60 Hz
- Point and click zone drawing feature
- Digital flattening of image
- Omni-directional vehicle tracking
- Virtual pan-tilt-zoom
- Zone level visibility monitoring.
- Monitor phases and loops, generates calls to controllers.
- Support MJPEG video output
- Environmental : -29F to +165F (-34C to +74C), 0-95% non-condensing
- Fail-safe in the event of loss of video from 360CA or loss of power to 360VDP.
- Shall be capable of configuring and adjusting the detection zone with the cabinet mounted VDM.
- Shall collect traffic data such as counts, turning movements, speed, and vehicle classification.
- Storage required to support collection of data.
- Support ability to transmit collected traffic data and alarm events from field devices to remote desktop pc

Application Software:

- Shall be provided at no additional cost
- Shall be capable of searching the network for other 360VDP
- Shall be compatible with Windows operating system supported by the Department.

- Shall maintain an historical log of all configurations when site is modified
- Shall be capable Point and click zone drawing
- Shall feature digital flattening of image
- Shall feature the ability to digitally pan, tilt, and zoom within the camera assembly's field of view without movement of the camera.
- Detection zone data stored in non-volatile memory so that after recovery from power interruption, all parameters are returned to latest settings.
- Shall support the import and export of program database from notebook PC or remote desktop PC. The program database shall also be allowed to be transferred through a USB flash drive.
- Shall be capable of superimposing detection zone on real time video image from selected camera with time stamping capabilities.
- Shall be capable of monitoring real time video and adjusting zones in field or remotely while 360VDP is actuating the traffic controller.
- Shall provide visual confirmation of detection by highlighting detection zone symbols.
- Shall support quad view video monitoring.
- Shall be capable of syncing with a cloud network resource to allow for program database and collected traffic data backup.
- Shall maintain a database of current and historical traffic data, and allow users to run reports against the data to include traffic counts, turning movements, speed, vehicle classification, red/green occupancy, and cycle lengths.
- Shall be capable of displaying data in a graph or chart format.
- Shall be capable of selecting data collection resolution in at least 15, 30, and 60-minute intervals through software.
- Shall provide a means by which alerts can be configured to be delivered to different individuals via email
- Report output formats shall include at minimum PDF, rich text format, and Microsoft Excel formats.

Physical:

- Either shelf mounted, standalone design or modular card rack design.
- Aluminum card rack frame capable of accepting four (4) 360VDP modules.
- TS1 harness cable.
- Standard Ethernet and USB connectors for video input and video output.
- Female metal shell connector with latching clamp for NEMA TS 1 detector outputs and inputs.
- LED indications to monitor all detector outputs.
- Side or rear mounted connectors and controls are not allowed on stand alone units.
- NEMA FR-4 glassepoxy or equivalent circuit boards.

Ethernet Repeater:

- Utilize Ethernet repeater if CAT6 cable distance is over 300'.

Ethernet Switch:

- Power Over Ethernet (POE) switch
- Ports for up-to four (4) traditional or thermal cameras.
- Powder coated aluminum.
- Dual purpose LED port lights.
- RJ-45 CAT6 connectivity.
- Environmental: -29F to +165F (-34C to +74C).
- NEMA TS2 compliant.

Video Encoder:

- Power Over Ethernet (POE)
- Video: H.264 (MPEG-4 Part 10/AVC) Baseline and Main Profile
- Compression: Motion JPEG
- Resolutions: 176x120 to 720x576, 176x120 to 1536x1152 for quad view.
- Frame rate:
 - H.264: 25/30 (50/60 Hz) fps,
 - 15fps in quad view in full resolution,
 - Motion JPEG: 25/30 (50/60 Hz) fps,
 - 15fps in quad view in full resolution.
- Video Streaming: Multi-stream H.264 and Motion JPEG: One H.264 and one JPEG stream on each channel (8 streams in total) in full frame rate individually configured streams in max. resolution at 25/30 fps; more streams if identical or limited in frame rate/ resolution. Controllable frame rate and bandwidth; VBR/CBR H.264.
- Environmental: -40F to +167F (-40C to +75C), 10-95% non-condensing.
- NEMA TS2 compliant.

Ethernet Protection Module:

- Either shelf mounted or standalone design.
- Protect 360CA, IP video detection camera assembly, thermal cameras and 360VDP in the event of a surge or lightning.

Environmental:

- Comply with NEMA TS 2, Section 2 requirements for Controller Assembly.
- Pass following NEMA TS 2 tests and applicable test procedures.
 - Vibration: Section 3.13.3, Section 3.13.8.
 - Shock: Section 3.13.4, Section 3.13.9.
 - Transients, Temperature, Voltage and Humidity: Section 3.13.7.
 - Power Interruption: Section 3.13.10.

Peripherals:

- Separable Keypad & Joystick or Computer Mouse including all necessary cables for connectivity to 360VDP.

23 AWG 4 Twisted Pair Category 6 Cable:

- Supply the 360CA power and return the video signal to the 360VDP.
- Outdoor Aerial CAT6 cable with UV insulation.
- Rated for 48VDC
- 250MHZ, shielded, gel-filled (flooded core) direct burial grade.
- Shall be equipped with a drain wire.
- Terminate with compatible connector.
- Polyethylene insulation.
- Shall be installed continuous between the 360CA and 360VDP.
- Cable shall be installed according to TIA/EIA-568-B.
- Other type cable may be substituted at the request of the 360VDP manufacturer.

Documentation: (360VDP, VDM and 360CA)

Provide to the **Department of Transportation Office of Maintenance** three (3) copies of equipment manuals furnished by the manufacturer, which includes the following:

- Installation and operation procedures.
- Performance specifications (functions, electrical, mechanical and environmental) of the unit.
- Schematic diagrams (point to point wiring).
- Pictorial of component layout on circuit board.
- List of replaceable parts including names of vendors for parts not identified by universal part numbers such as JEDEC/RETMA or EIA.
- Troubleshooting, diagnostic and maintenance procedures.
- Testing results of grounding, voltage, and cable length measurements as indicated on the installation best practice verification at the end of this document.

Site Survey:

Perform a site survey with the 360VDP manufacturer representative at all 360VIDS locations prior to installation. The purpose of the survey is to optimize the performance from the 360VIDS equipment when it is installed and insure that it will meet the accuracy requirements specified previously. Prior to installation, submit the results of this survey to the Engineer in a report, which lists all 360VIDS locations with any recommended changes to camera locations, mounting adjustments, camera lens adjustments, and desired detection zone locations.

Warranties and Guarantees: (360VDP and CA)

Provide warranties and guarantees to the **Department of Transportation Office of Maintenance** in accordance with Article 1.06.08 of the Standard Specifications. Warranties for all equipment furnished as part of this Contract are to cover a period of 36 months following successful completion of the entire intersection acceptance test.

Construction Methods:

Install 360VIDS equipment in accordance with the manufacturer instructions and recommendations to achieve the detection zones as shown in the plans and accuracy as described in these specifications. Refer to the “Installation Best Practices Guide” attached below to this specification. Note that all references to “Cat5e cable” in the attached “Installation Best Practices Guide” shall refer to “23 AWG 4 Twisted Pair Category 6 Cable” as specified above in this specification. The location of the 360CA shown on the plan may be revised as a result of the Site Survey. Peripherals are to be furnished and fully installed in an easily accessible position within the controller cabinet. Leave proper clearance(s) surrounding video monitor to allow for accessible connections and space to utilize surrounding equipment.

Method of Measurement:

The 360 degree Camera Assembly will be measured for payment as the number of 360 degree cameras furnished, installed operational and accepted.

The Extension Bracket will be measured for payment as the number of brackets furnished, installed and accepted.

The 360 degree Video Detection Processor will be measured for payment as the number of units including all additional work and materials listed in Basis of Payment, furnished, installed, operational and accepted.

23 AWG 4 Twisted Pair Category 6 Cable will be measured for payment as linear feet (meters), furnished, installed and accepted.

Basis of Payment:

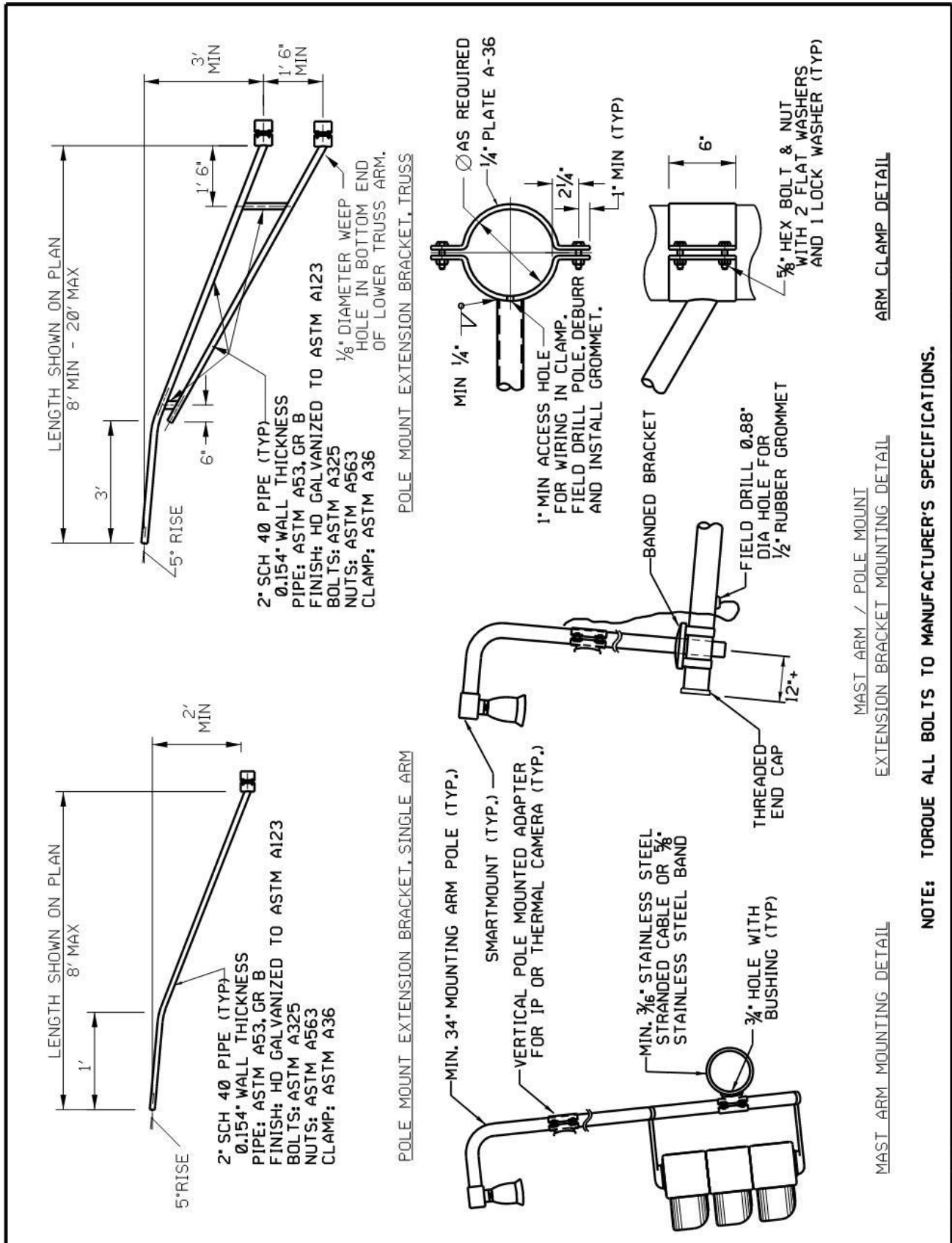
The unit bid price for 360 degree Camera Assembly includes the 360 degree camera, enclosure, brackets used to attach the 360CA to a support structure or extension bracket, documentation, warrantee, labor, tools and equipment necessary to provide the specified video signal to the 360VDP.

The unit bid price for Extension Bracket includes all labor, tools and equipment necessary to attach the bracket to a pole shaft.

The unit bid price for 360 degree Video Detection Processor includes the manufacturers’ site survey, unlimited number of any necessary 360VIDS configuration software and license, card rack frame, power supply, all miscellaneous hardware such as PC interface cable with connectors, necessary peripherals such as Ethernet repeater, Ethernet switch, video encoder, Ethernet protection module, documentation, warrantee, labor, tools and equipment necessary to make the 360VIDS fully operational.

The unit bid price for 23 AWG 4 Twisted Pair Category 6 Cable includes all connectors, labor, tools and equipment necessary to install the cable between the 360CA and the 360VDP.

<u>Pay Item</u>	<u>Pay Unit</u>
360 Degree Camera Assembly	Ea.
Extension Bracket	Ea.
360 Degree Video Detection Processor	Ea.
23 AWG 4 Twisted Pair Category 6 Cable	LF (M)



NOTE: TORQUE ALL BOLTS TO MANUFACTURER'S SPECIFICATIONS.

FILENAME: \$FILEL\$ MODEL: \$MODELNAME\$

GRIDSMART.

INSTALLATION GUIDE

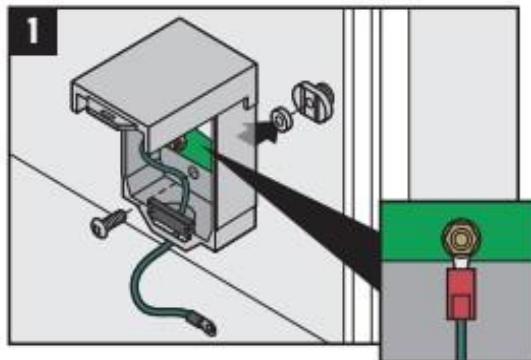
TOOLS AND ITEMS NEEDED

- 7/16" Wrench
- 1/2" Wrench
- 3/4" Wrench
- 1/4" Wrench
- 3/32" Wrench
- 17 mm Wrench
- Utility knife
- Phillips screwdriver
- Flat-head screwdriver
- 1/2" Drill bit
- 5/32" Allen wrench (included)
- Mounting bracket
- CAT5e test cable
- 24AWG Shielded CAT5e cable
- RJ-45 Crimper
- Laptop (with GRIDSMART Client installed)
- EXO Crimp frame
- Ground wire clamp (included)
- USB flash drive
- Cable tester
- Hand level
- DLG Di-120b Tester

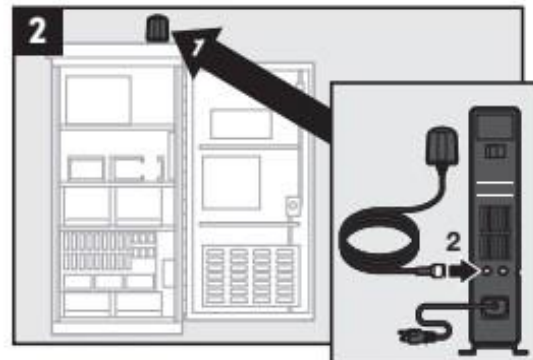


BEFORE INSTALLATION

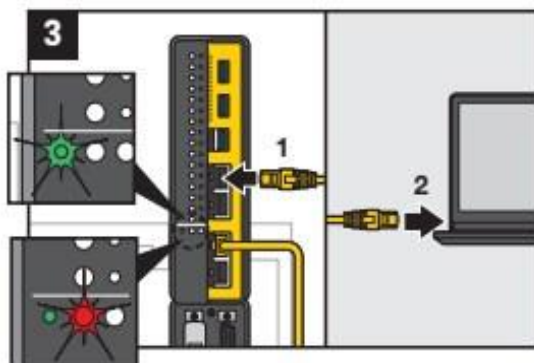
Helpful tip: On your laptop, verify that the GRIDSMART Client is updated to the latest software version. Download the latest update from GRIDSMARTCloud.com.



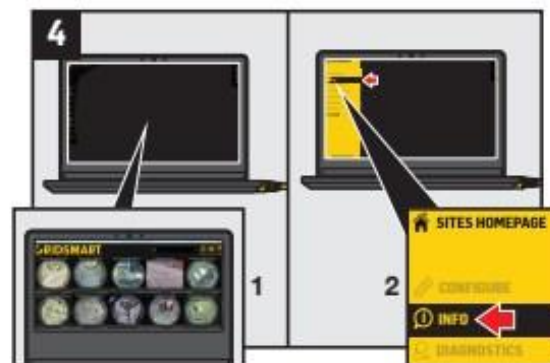
Install EPM onto cabinet DIN rail on opposite side from power distribution. Cut along rubber grommet "X". Connect 10AWG ground wire as close to ground rod as possible using ground wire clamp.



Mount Antenna to top of cabinet using 1/2" drill bit. Connect CELL Antenna lead to female connector on back of Processor.



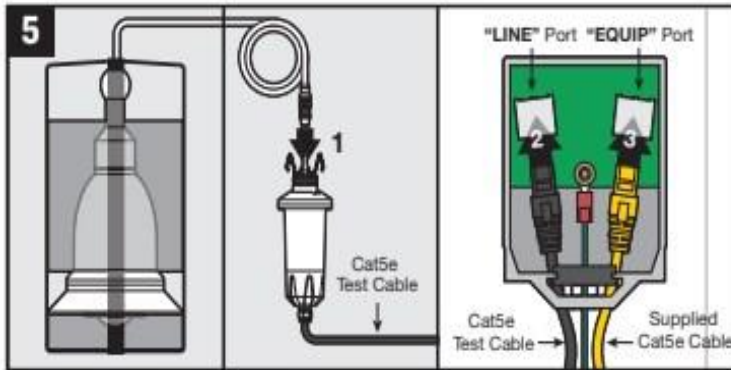
Connect Processor to power source and power on (status light turns green in 2-3 minutes). **DO NOT USE A GFCI TYPE OUTLET.** Connect laptop to "LAPTOP" port on Processor with a CAT5e cable.



Launch GRIDSMART Client on laptop. Select factory default site card. Select "Info", verify "Site Info" version.

NOTE: The Bell Camera has not yet been connected, so there will be no Camera image.

BEFORE INSTALLATION (continued)

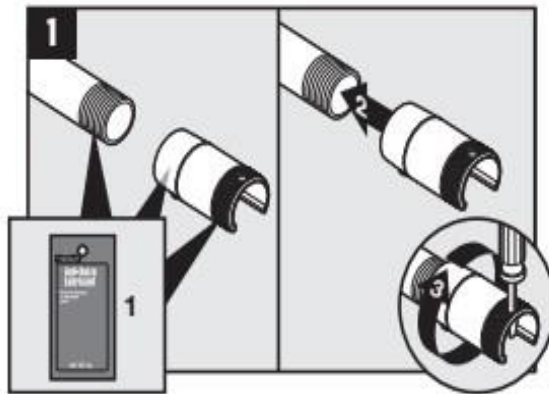


With Bell Camera in foam packaging, connect Camera cable to Junction Box upper connection. Connect one end of CAT5e test cable to Junction Box lower connection and remaining end to the EPM Module "LINE" port. Connect one end of supplied CAT5e cable to EPM Module "EQUIP" port and remaining end to Processor. Verify Bell Camera image. Camera status light turns green in 2-3 minutes.

After successful equipment test, disconnect cables to Junction Box, EPM, Processor and laptop. Leave cable connected to Bell Camera.

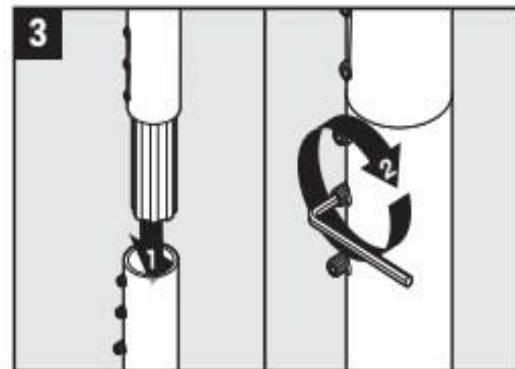
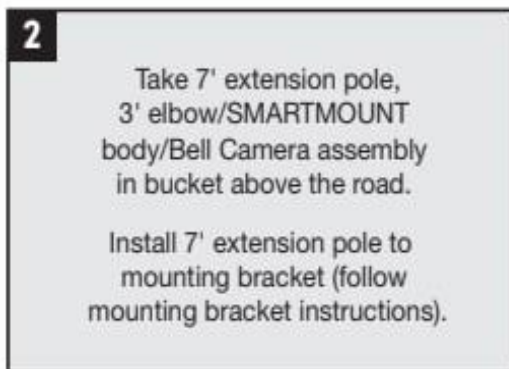
INSTALLATION

Helpful tip: Before proceeding, route 24 AWG gel-filled, shielded, burial grade CAT5e cable from traffic cabinet to the Bell Camera mounting location.



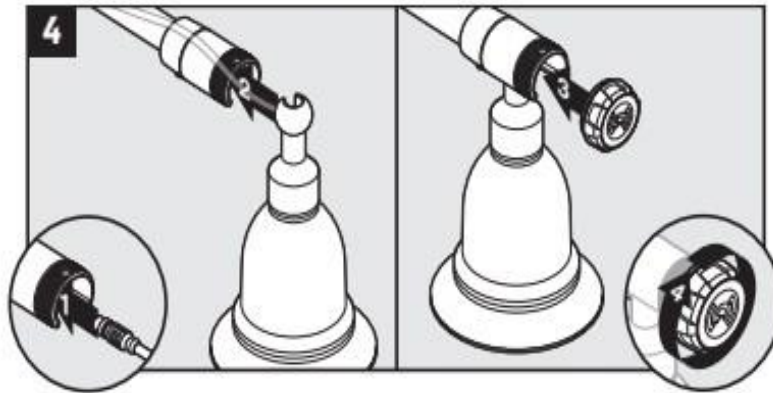
Apply anti-seize to 3' elbow and internal and external threads of SMARTMOUNT body. Install SMARTMOUNT body to upper end of 3' elbow turning clockwise to secure.

NOTE: SMARTMOUNT body opening must be facing down in final position. Tighten center set screw.



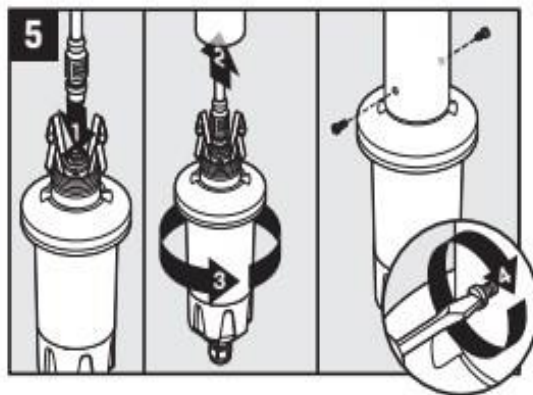
Insert 3' elbow connector into 7' extension using pole connector. Tighten screws with Allen wrench to secure.

INSTALLATION (continued)

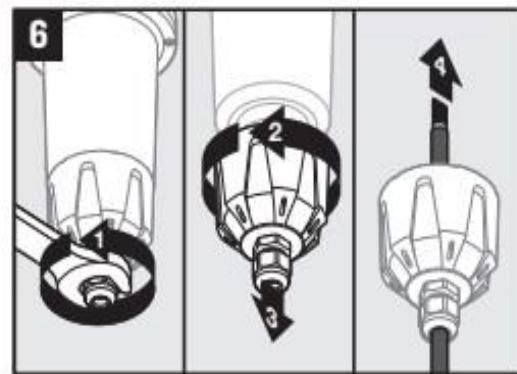


Feed Bell Camera cable through SMARTMOUNT body, 3' elbow and 7' pole extension. Slide Bell Camera ball joint into SMARTMOUNT body, being sure the ball joint opening is well aligned with body/pole opening so as not to damage cable.

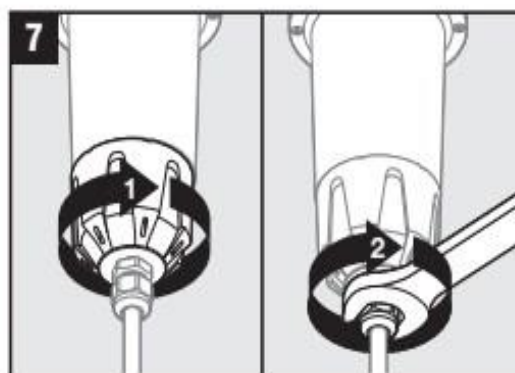
Secure Bell Camera to SMARTMOUNT body with cap. Turn cap clockwise to tighten.



Connect Bell Camera cable from 7' extension to junction box upper connection. Insert Junction Box (turning counter clockwise up to three times to prevent kinking or binding of cable) into 7' extension pole. Install Junction Box set screws to 7' extension pole to secure Junction Box. Tighten with flathead or hexhead screwdriver.

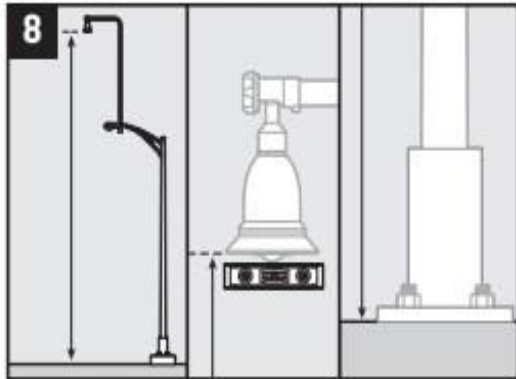


Using a 3/4" wrench, loosen cord grip from cap on bottom of Junction Box. Loosen cap and remove from Junction Box. Push unterminated field cable through cord grip and cap. **Do not tighten cord grip until step 7.** Terminate cable with RJ45, using standard 568B configuration color wiring.



Connect the RJ45 to receptacle and replace cap onto Junction Box (hand-tighten) until fully closed. Tighten cord grip using a 3/4" wrench, to 30 in-lbs max torque.

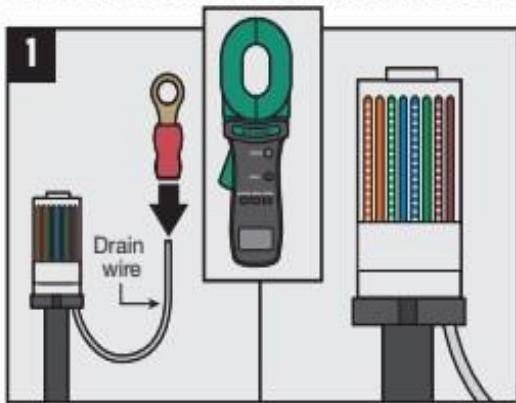
INSTALLATION (continued)



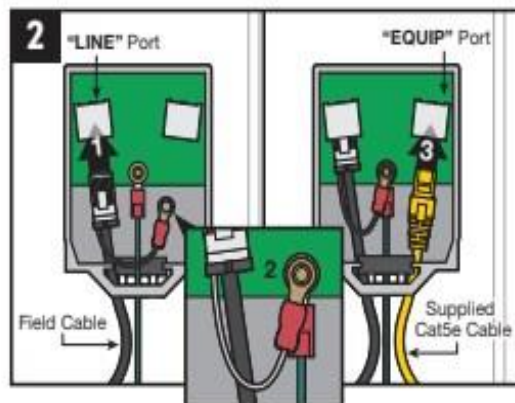
VERY IMPORTANT

Using a tape measure, measure height of Bell Camera. Record the height for use later to set up system. Orient the "G" logo away from area of consequence, level the Bell Camera and tighten the center set screw.

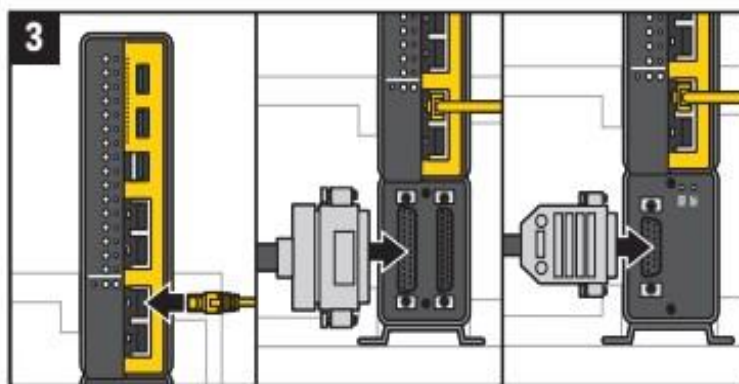
GROUNDING AND FINAL INSTALLATION



Crimp an RJ45 onto remaining end of field cable and verify with cable tester. Crimp the ring terminal to the CAT5e cable drain wire. Verify good crimp on drain wire ring terminal.



Connect field cable to EPM "LINE" port. Connect drain wire ring terminal to the EPM ground to eliminate signal noise and EMI. Connect supplied CAT5e cable EPM "EQUIP" port.



Connect supplied CAT5e to Processor "CAMERA" port. Reconnect the laptop to the "LAPTOP" port. Connect TS1, TS2 or ITS wiring harness to Processor.

1 CABINET GROUNDING

A proper cabinet ground helps mitigate interference from electrical noise at the intersection.

- The U.S. National Electrical Code (NEC) recommends a maximum of 25 ohms for touch safety and telecommunications; PLC industry standards require a maximum of 5.0 ohms for logic reference purposes.
- Use a clamp-on ground meter to verify the cabinet ground.
- GRIDSMART requires the Diligent Instruments DLG Di-120b Tester (<http://www.diligentinstruments.com/di-120.html>).
- If the ground reading is higher than the recommended NEC value, check the connection between the cabinet ground wire and the ground rod for corrosion; clean if corrosion is present. If you are in an area with poor grounds, you may need to add a ground rod to the grounding system to improve the ground.

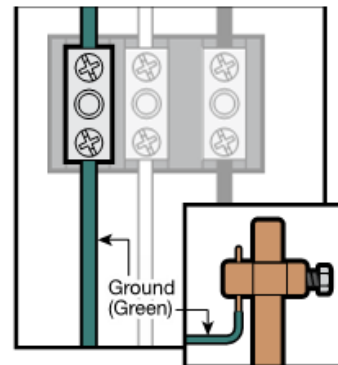
SPECIFICATION:	25 Ohms Max
MEASURED:	

2 AC POWER

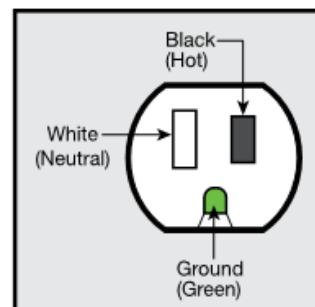
Plug the GRIDSMART Processor into an outlet on the filtered side of the cabinet power. Do not use GFCI type outlet.

- The outlet needs to be checked to verify that all three connections for the outlet are properly connected.
- Using a digital voltmeter (DVM), check the ac voltage from the line to the neutral and the line to ground. Both readings should be ~ 120/240VAC.

SPECIFICATION:	HOT/NEU: 120/240VAC HOT/GND: 120/240VAC
MEASURED:	HOT/NEU: HOT/GND:



DLG Di-120b Tester

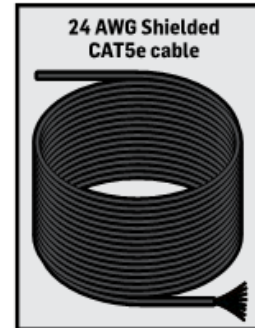


3 CABLE TYPE & LENGTH

All GRIDSMART installations require burial grade, shielded, gel filled, CAT5e cable with solid core 24 AWG conductors. The shield will protect the data signals from radiated noise which is present in most intersections. LED streetlights have been found to be very noisy electrically and as more streetlights are switched to LED lights, the level of radiated noise will increase. The cable that GRIDSMART supplies and requires for all installations is Vertical Cable part #059-487/S/CMXF.

- The maximum length that a segment of CAT5e can be is 300 feet. If the distance from the EPM to the camera is more than 300 feet, a repeater (RBA) must be used.
- When determining length of the cable, a cable tester that measures the length of the cable is required. Do not rely on sight distance or "walking off" the distance.
- Many times, there are service loops in the pull boxes and at the base of the pole, which will not be accounted for when you do not use a meter for measuring the cable length. GRIDSMART recommends the Triplet Real World Certifier (www.triplett.com/shop/real-world-certifier-rwc1000k/) for testing the cable. The tester will provide length measurements as well as cable quality measurements.

SPECIFICATION:	Cable Length: 300 Ft Max Real World Certification: 100 MB Min Cable Type: Vertical Cable part #059-487/S/CMXF
MEASURED:	Cable Length: Real World Certification: Cable Type:



Triplet Real World Certifier



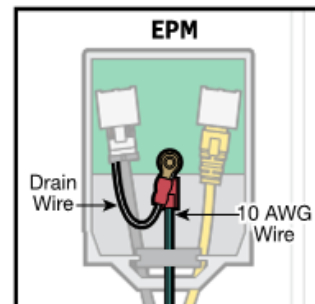
4 CONNECT DRAIN WIRE

The drain wire for the shielded CAT5e cable must be connected to the ground post in the EPM (Ethernet Protection Module). A crimp lug should be attached to the end of drain wire to attach it to the ground post. The drain should only be connected at the EPM end of the cable.

- If you are using an RBA, the drain must be spliced so the drain is continuous from the junction box to the EPM. A 10 AWG Wire is required to connect the EPM ground post to the traffic cabinet ground rod.
- Using a digital voltmeter, you should measure 0 Ohms between the EPM Ground Post and the traffic cabinet ground rod.

SPECIFICATION:	0 Ohms
MEASURED:	

Intersection:	
Camera Serial Number:	
GS₂ Processor Serial Number:	



ITEM #1112288A – IP VIDEO DETECTION CAMERA ASSEMBLY

Description: Furnish and install an IP (Internet Protocol) Video Detection Camera Assembly (IPVDCA) as shown on the plans or as directed by the Engineer. The IPVDCA consists of an IP Video Detection Camera, lens, enclosure, mounting hardware and equipment necessary to provide the specified video signal to the video detection processor.

Materials: All hardware shall be new, corrosion resistant. All equipment shall be current production.

IP Video Detection Camera Assembly:

Camera:

- Use appropriate CS-mount lens to provide adequate detection
- Single Power Over Ethernet (POE) connection for power and data collection
- Active picture elements (pixels): 2560 (H) x 1920 (V), minimum
- Heated camera
- IP addressable

Camera Enclosure:

- Tamper proof constructed of aluminum
- IP66-rated camera housing

Camera Mounting Hardware:

- Swivel bracket for dual plane adjustment for leveling
- Hybrid terminal junction box with surge
- Astro-Bracket banded bracket

Environmental:

- Comply with NEMA TS 2, Section 2 requirements for Controller Assembly
- Pass the following NEMA TS 2 tests and applicable test procedures
 - Vibration: Section 3.13.3, Section 3.13.8
 - Shock: Section 3.13.4, Section 3.13.9
 - Transients, Temperature, Voltage and Humidity: Section 3.13.7
 - Power Interruption: Section 3.13.10

Construction Methods:

Site Survey: Perform a Site Survey with the IPVDCA manufacturer’s representative for all IPVDCA locations prior to installation. The purpose of the Survey is to optimize the performance of the IPVDCA equipment when it is installed and ensure that it will meet the accuracy requirements specified. Prior to installation, submit the results of the Site Survey to the Engineer in a report which lists all IPVDCA locations with any recommended changes to camera locations, mounting adjustments, camera lens adjustments, and desired detection zone locations.

Install IPVDCA equipment in accordance with the manufacturer’s instructions and the attached details to achieve the detection zones in the location(s) determined as a result of the Site Survey. Refer to the “Installation Best Practices Guide” attached below to this specification. Note that all references to “Cat5e cable” in the attached “Installation Best Practices Guide” shall refer to “23

AWG 4 Twisted Pair Category 6 Cable” as specified in “Item #1113725A – 23 AWG 4 Twisted Pair Category 6 Cable.”

Documentation: (IPVDCA)

Provide to CTDOT Office of Maintenance three (3) copies of equipment manuals furnished by the manufacturer, including the following:

- Installation and operation procedures
- Performance specifications (functions, electrical, mechanical and environmental) of the unit
- Schematic diagrams (point to point wiring)
- Pictorial of component layout on circuit board
- List of replaceable parts including names of vendors for parts not identified by universal part numbers such as JEDEC/RETMA or EIA
- Troubleshooting, diagnostic and maintenance procedures

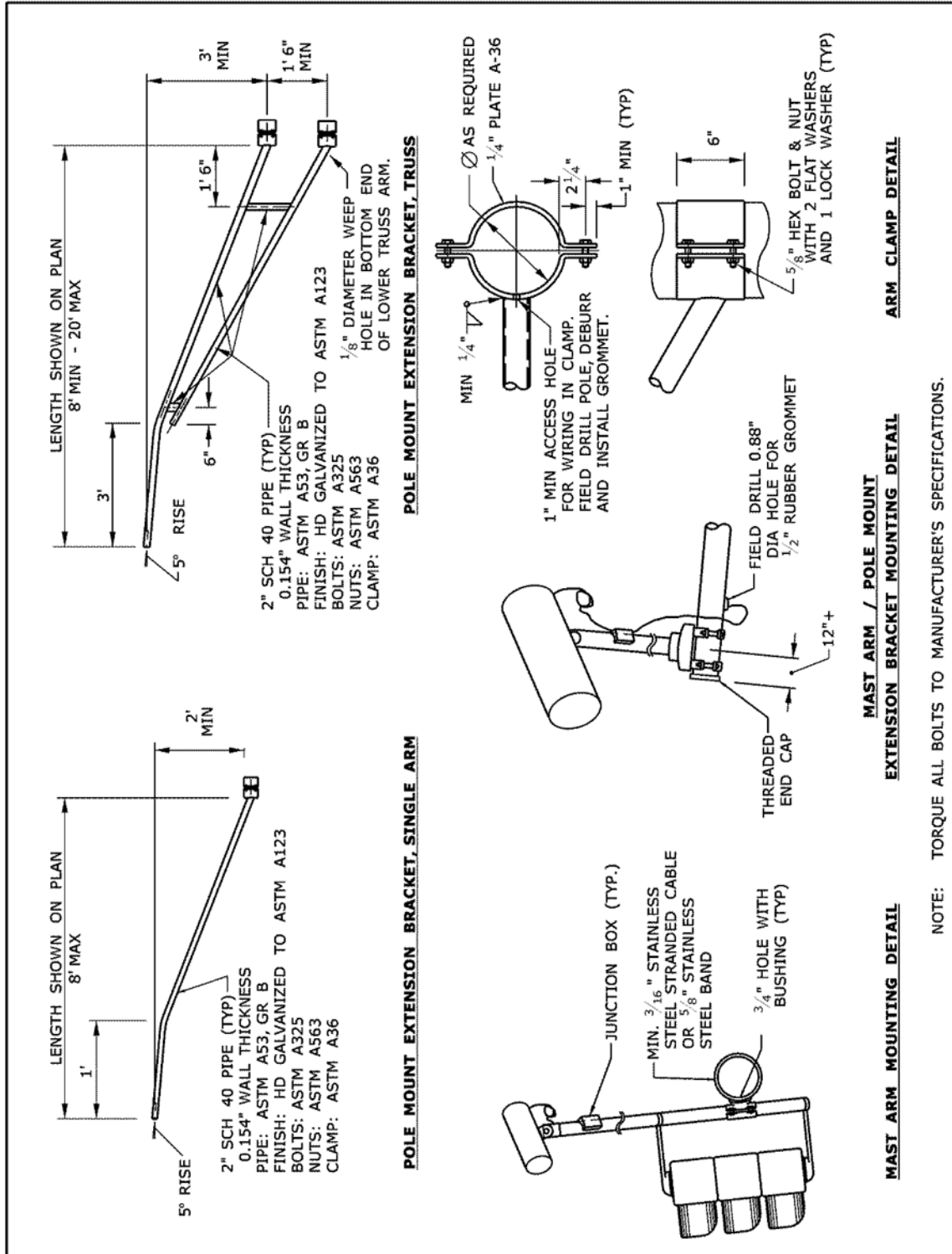
Warranties and Guarantees: (IPVDCA)

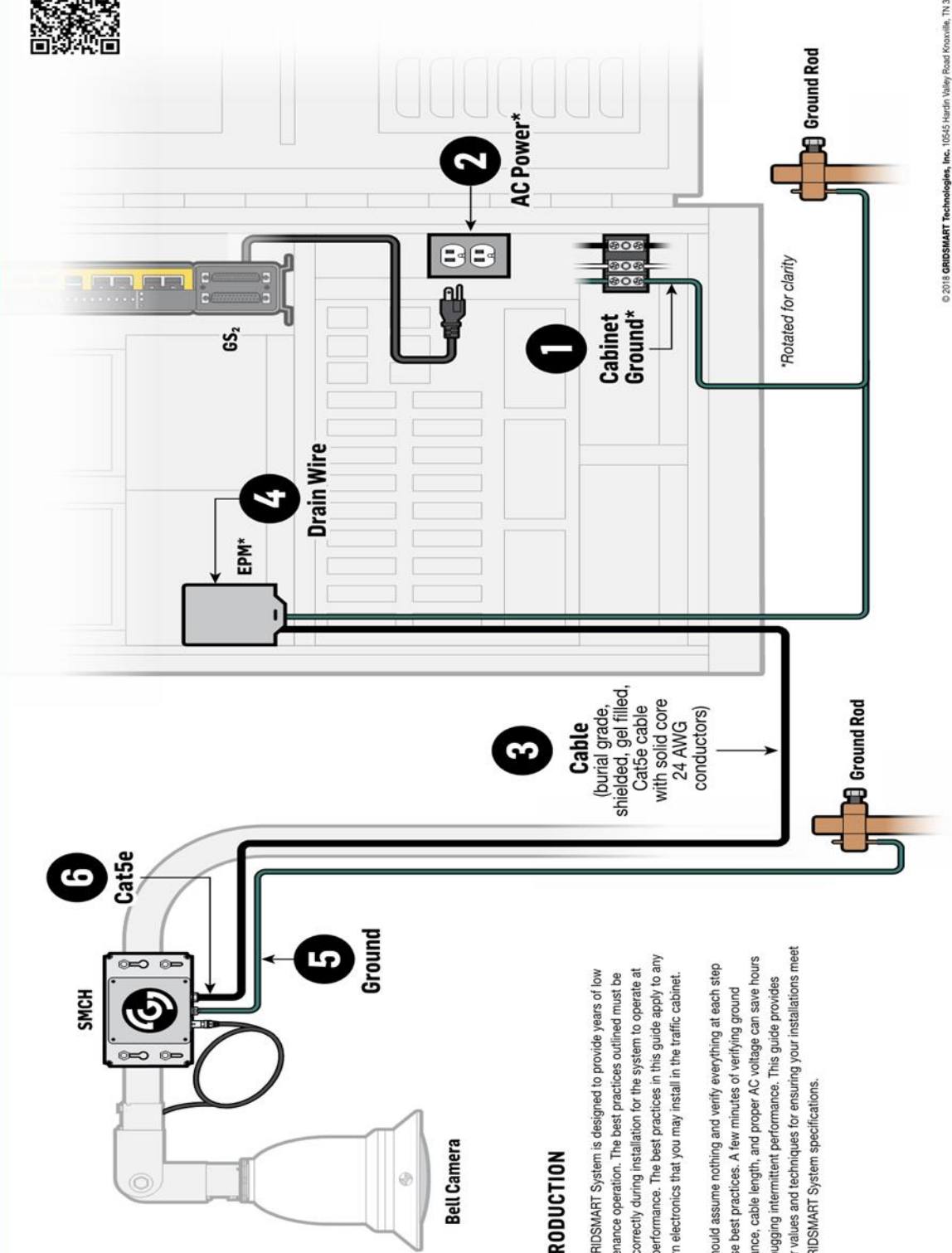
Provide warranties and guarantees to the CTDOT Office of Maintenance in accordance with Article 1.06.08 of the Standard Specifications. Warranties for all equipment furnished as part of this Contract are to cover a period of 36 months following successful completion of the entire intersection acceptance test.

Method of Measurement: The IP Video Detection Camera Assembly will be measured for payment as the number of each assembly of IP video cameras, lenses, enclosures and mounting hardware furnished, installed, operational and accepted.

Basis of Payment: This item will be paid at the Contract unit price for each “IP Video Detection Camera Assembly” complete and accepted, which price shall include the Site Survey, IP video camera, lens, enclosure, brackets used to attach the IP video camera to a support structure or extension bracket, documentation, warrantee, labor, tools and equipment necessary to provide the specified video signal to the video detection processor.

Pay Item	Pay Unit
IP Video Detection Camera Assembly	ea.





INTRODUCTION

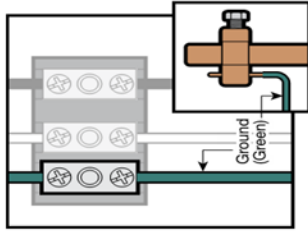
The GRIDSMART System is designed to provide years of low maintenance operation. The best practices outlined must be done correctly during installation for the system to operate at peak performance. The best practices in this guide apply to any modern electronics that you may install in the traffic cabinet.

You should assume nothing and verify everything at each step in these best practices. A few minutes of verifying ground resistance, cable length, and proper AC voltage can save hours of debugging intermittent performance. This guide provides proper values and techniques for ensuring your installations meet the GRIDSMART System specifications.

1 CABINET GROUNDING

A proper cabinet ground helps mitigate interference from electrical noise at the intersection.

- The U.S. National Electrical Code (NEC) recommends a maximum of 25 ohms for touch safety and telecommunications; PLC industry standards require a maximum of 5.0 ohms for logic reference purposes.
- Use a clamp-on ground meter to verify the cabinet ground.
- GRIDSMART requires the Diligent Instruments DLG Di-120b Tester (<http://www.diligentinstruments.com/di-120.html>).
- If the ground reading is higher than the recommended NEC value, check the connection between the cabinet ground wire and the ground rod for corrosion; clean if corrosion is present. If you are in an area with poor grounds, you may need to add a ground rod to the grounding system to improve the ground.



DLG Di-120b Tester

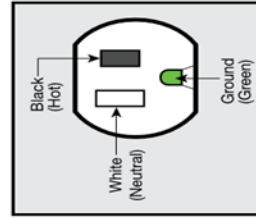


SPECIFICATION: 25 Ohms Max
MEASURED:

2 AC POWER

Plug the GRIDSMART Processor into an outlet on the filtered side of the cabinet power. Do not use GFCI type outlet.

- The outlet needs to be checked to verify that all three connections for the outlet are properly connected.
- Using a digital voltmeter (DVM), check the ac voltage from the line to the neutral and the line to ground. Both readings should be ~ 120/240VAC.



SPECIFICATION: HOT/NEU: 120/240VAC HOT/GND: 120/240VAC
MEASURED: HOT/NEU: HOT/GND:

3 CABLE TYPE & LENGTH

All GRIDSMART installations require burial grade, shielded, gel filled, Cat5e cable with solid core 24 AWG conductors. The shield will protect the data signals from radiated noise which is present in most intersections. LED streetlights have been found to be very noisy electrically and as more streetlights are switched to LED lights, the level of radiated noise will increase. The cable that GRIDSMART supplies and requires for all installations is Vertical Cable part #059-487/S/CMXF.

- The maximum length that a segment of Cat5e can be is 300 feet. If the distance from the EPM to the camera is more than 300 feet, a repeater (RBA) must be used.
- When determining length of the cable, a cable tester that measures the length of the cable is required. Do not rely on sight distance or "walking off" the distance.
- Many times, there are service loops in the pull boxes and at the base of the pole, which will not be accounted for when you do not use a meter for measuring the cable length. GRIDSMART recommends the Triplet Real World Certifier (www.triplett.com/shop/real-world-certifier-rwc1000k/) for testing the cable. The tester will provide length measurements as well as cable quality measurements.



Triplet Real World Certifier

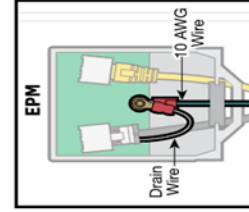


SPECIFICATION: Cable Length: 300 Ft. Max Real World Certification: 100 MB Min Cable Type: Vertical Cable part #059-487/S/CMXF
MEASURED: Cable Length: Real World Certification: Cable Type:

4 CONNECT DRAIN WIRE

The drain wire for the shielded Cat5e cable must be connected to the ground post in the EPM (Ethernet Protection Module). A crimp lug should be attached to the end of drain wire to attach it to the ground post. The drain should only be connected at the EPM end of the cable.

- If you are using an RBA, the drain must be spliced so the drain is continuous from the junction box to the EPM. A 10 AWG Wire is required to connect the EPM ground post to the traffic cabinet ground rod.
- Using a digital voltmeter, you should measure 0 Ohms between the EPM Ground Post and the traffic cabinet ground rod.

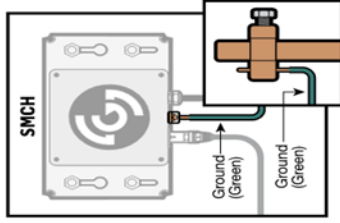


SPECIFICATION: 0 Ohms
MEASURED:

5 GROUND CONNECTIONS AT THE SMCH

The SMCH provides lightning protection for the camera.

- Use a 10-AWG wire to connect the SMCH ground lug to a well-grounded structure or a ground rod.
- Verify the resistance to ground of the structure utilizing the clamp on ground tester.

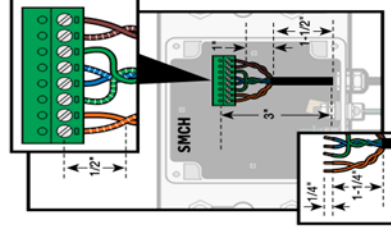


SPECIFICATION: 25 Ohms
MEASURED:

6 CAT5e AT SMCH

Proper terminal of the Cat5e to the SMCH Phoenix connector is required. Carefully implement the following requirements as shown.

- Remove no more than 1-1/2 inch of outer jacket from the end of the cable.
- No less than 1-1/2 inch of cable with outer jacket inside the SMCH.
- Pairs should be twisted as close as possible to the Phoenix connector.
- No more than 1/2 inch of untwisted conductors should be allowed. Strip 1/4 inch of the insulation from each conductor.



Intersection:
Camera Serial Number:
GS: Processor Serial Number:

ITEM #1113618A – OPTICAL FIBER CABLE, SINGLE MODE, LOOSE BUFFER TUBE CABLE, 36 FIBER

Description:

This Item specifies the requirements for furnishing, installing in conduit, splicing, and terminating fiber optic cables. As part of this item, the Contractor shall install a pull tape in all 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 certified by the manufacturer to use 100% corning glass in order to be completely compatible with the existing fiber cable supplied under Project 82-300. 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 μ 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 μ 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 ≤ 10 times the cable diameter for non-armored cables and ≤ 20 times the cable diameter for armored cables after conditioning for four hours at test temperatures of -22°F and $+140^{\circ}\text{F}$ (-30°C and $+60^{\circ}\text{C}$). 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 $+158^{\circ}\text{F}$ (-30°C to $+70^{\circ}\text{C}$) 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 6071bf (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 μm inclusive with a tolerance of $\pm 1.3 \mu\text{m}$.
 - b. The Single Mode fiber cladding shall have an outer diameter of 125 μm with a tolerance of $\pm 1.0 \mu\text{m}$.

- c. The core-to-cladding offset shall not be greater than 0.6 μm .
 - 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 ± 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 (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 Traffic management system cabinets, Traffic management system Mini-Hub cabinets and Variable Message Sign (VMS) cabinets to the fiber optic distribution (trunk) cable or between cabinets.
2. The Drop Cable shall consist of single mode fibers housed in a protective jacket. The end of the fiber installed at the Traffic Management system cabinet, Traffic Management system Mini-Hub cabinet, or VMS cabinet shall be terminated in a patch panel. 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. When drop cables are run between two cabinets the cable shall be terminated in a patch panel at both ends.
3. For drop cables landing in each traffic management system cabinet, VMS cabinet or any Incident management system (IMS) cabinet with a fiber count of 12 or less, the contractor shall furnish a 19" rack mounted patch panel with six SC fiber connectors.
4. 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.
5. 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 an ultra physical contact (UPC) finish. All connectors shall be polished to a UPC 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. The poly-line installed to verify the integrity of the conduit system shall be ¼” (6 mm) polypropylene.
2. The detectable pull tape shall consist of a single 24 AWG copper wire with polyethylene or PVC jacket woven into the polyester tape. The pull tape shall be NEPTCO Part No. WP1250PDP1250P, or approved equal, for cable sizes of less than 97 fibers. NEPTCO

Part No. WP1800PDP1800P, or approved equal, shall be used for cable size of 97-288 fibers.

3. The detectable pull tape shall have the following properties:
 - 1250 lb (5.56 kN) tensile strength
 - flat, not round, construction
 - printed foot markings
 - pre-lubricated for reduced pulling tension at start of cable pull
 - low susceptibility to absorption of moisture; 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 certified by the manufacturer against defects and failures, which may occur through normal use for a minimum period of one (1) year from the date of installation. A copy of the warranty must be presented to the Engineer after installation of the cable and 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 "foot 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 patch panel within the Traffic management system cabinet, VMS cabinet, or IMS cabinet. Sufficient slack shall be left at each end to allow removal of the rack mounted patch panel for relocation anywhere within the cabinet.
18. Drop Cable fibers in the Mini-Hub Cabinet shall be spliced to pig-tails in a rack-mounted patch panel/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.

19. All cable ends, connectors, and fiber optic jacks shall be protected from moisture ingress by using properly sealed caps.
20. 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.
21. 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.
22. Where trunk cable terminations are left "dead ended", 100 feet (25 m) of cable shall be left coiled.
23. All coiled cables shall be securely fastened in place with a minimum of four galvanized steel conduit straps.
24. 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.
25. 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.
26. 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:
27. 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 traffic management system cabinet and traffic management system minihub cabinet. 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 3 feet 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.

- 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. All single mode optical links shall be identified in the test results by identifying the cabinet site and patch panel fiber 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
 - v. Identification of each fiber including location, patch panel, and labeled fiber designator.
- g. Attenuation shall be measured in decibels referencing optical power.
- h. Each End to End single mode fiber 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. A copy of the fiber test with identifiers shall be provided to the engineer. The test results shall include detailed information for each fiber and a summary cover sheet listing losses for each fiber tested at 1310 and 1550 nm.

Method of Measurement:

Work under this item shall be measured for payment by the number of linear feet 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 foot of the Fiber Optic Cable furnished and installed as described in this Specification. This work shall include all cable, connectors, rack mounted patch panels, equipment, splicing equipment, testing, materials and incidental items required to satisfy these Specifications.

Pay Item

Pay Unit

Optical Fiber Cable – SM, LB Tube Cable, 36 Fiber

l.f.

ITEM #1118012A – REMOVAL AND/OR RELOCATION OF TRAFFIC SIGNAL EQUIPMENT

Section 11.18: Replace the entire section with the following:

11.18.01 – Description:

Remove all abandoned traffic signal equipment. Restore the affected area. Where indicated on the plans remove and reinstall existing traffic signal equipment to the location(s) shown.

Lead paint is presumed present on the painted surface of all cabinets and structures located within project limits. Any activities performed by the contractor that results in a painted surface being impacted or altered, shall be performed in accordance OSHA Lead in Construction Standard 29CFR 1926.62, or the painted surface shall be tested prior to any paint being disturbed by a qualified third party hired by the contractor to confirm that no lead is present.

11.18.02 – Materials:

The related sections of the following specifications apply to all incidental and additional material required for the proper relocation of existing equipment and the restoration of any area affected by this work.

- Division III, “Materials Section” of the Standard Specifications.
- Current Supplemental Specifications to the Standard Specifications.
- Applicable Special Provisions to the Standard Specifications.
- Current Department of Transportation, Functional Specifications for Traffic Control Equipment.

Article 11.18.03 - Construction Methods:

Schedule/coordinate the removal and/or relocation of existing traffic signal equipment with the installation of new equipment to maintain uninterrupted traffic signal control. This includes but is not limited to vehicle signals and detectors, pedestrian signals and pushbuttons, co-ordination, and pre-emption.

Abandoned Equipment

The contract traffic signal plan usually does not show existing equipment that will be abandoned. Consult the existing traffic signal plan for the location of abandoned material especially messenger strand, conduit risers, and handholes that are a distance from the intersection. A copy of the existing plan is usually in the existing controller cabinet. If not, a plan is available from the Division of Traffic Engineering upon request.

Unless shown on the plans it is not necessary to remove abandoned conduit in-trench and conduit under-roadway.

When a traffic signal support strand, rigid metal conduit, down guy, or other traffic signal equipment is attached to a utility pole, secure from the pole custodian permission to work on the pole. All applicable Public Utility Regulatory Authority (PURA) regulations and utility company requirements govern. Keep utility company apprised of the schedule and the nature of the work.

ITEM #1118012A

Remove all abandoned hardware, conduit risers, and down guys, Remove anchor rods, to 6” (150mm) below grade.

When underground material is removed, backfill the excavation with clean fill material. Compact the fill to eliminate settling. Remove entirely the following material: pedestal foundation; controller foundation; handhole; pressure sensitive vehicle detector complete with concrete base. Unless otherwise shown on the plan, remove steel pole and mast arm foundation to a depth of 2 feet (600mm) below grade. Restore the excavated area to a grade and condition compatible with the surrounding area.

- If in an unpaved area apply topsoil and establish turf in accordance with Section 9.44 and Section 9.50 of the Standard Specifications.
- If in pavement or sidewalk, restore the excavated area in compliance with the applicable Sections of Division II, “Construction Details” of the Standard Specifications.

Relocated Equipment

In the presence of the Engineer, verify the condition of all material that will be relocated and reused at the site. Carefully remove all material, fittings, and attachments in a manner to safeguard parts from damage or loss. Replace at no additional cost, all material which becomes damaged or lost during removal, storage, or reinstallation.

Salvage Equipment for State-owned Intersection No. 082-241

Salvage Material	Stock No.	Value
Controller Cabinet, Complete including but not limited to the following: Conflict Monitor Coordination Equipment Vehicle Detection Equipment	330-03-7010	\$ 500.00
Controller Unit	330-03-7005	\$ 500.00
Standard Camera		\$ 327.00

All material not listed as salvage becomes the property of the Contractor; which assumes all liabilities associated with material’s final disposition.

In the presence of the Engineer, verify the condition and quantity of salvage material prior to removal. After removal transport and store the material protected from moisture, dirt, and other damage. Coil and secure copper cable separate from other cable such as galvanized support strand.

Within 4 working days of removal, return the State owned salvage material to the Department of Transportation Stores warehouse listed below. Supply all necessary manpower and equipment to load, transport, and unload the material. The condition and quantity of the material after unloading will be verified by the Engineer.

DOT Salvage Store #134
660 Brook Street
Rocky Hill, CT

Contact Materials Management Salvage Coordinator, at (860) 258-1980, at least 24 hours prior to delivery.

Municipal Owned Traffic Signal Equipment

Salvage Equipment for City-owned Intersections No. 082-214 and 082-222

Salvage Material	Value
Controller Cabinet, Complete including but not limited to the following: Conflict Monitor Coordination Equipment Vehicle Detection Equipment	\$ 500.00
Controller Unit	\$ 500.00
Ornamental Aluminum Pedestal 8 foot (2.4 m)	\$ 100.00

Within 4 working days of removal, return the City owned salvage material to the City Yard listed below. Supply all necessary manpower and equipment to load, transport, and unload the material. The condition and quantity of the material after unloading will be verified by the Engineer.

City Yard
485 Washington Street
Middletown, CT

Contact the Public Works Department, at (860) 638-4850, at least 24 hours prior to delivery.

Article 11.18.04 – Method of Measurement:

This work will be measured as a Lump Sum.

Article 11.18.05 – Basis of Payment:

This work will be paid for at the contract lump sum price for “Removal and/or Relocation of Traffic Signal Equipment” which price shall include relocating signal equipment and associated hardware, all equipment, material, tools and labor incidental thereto. This price shall also include removing, loading, transporting, and unloading of signal equipment/materials designated for salvage and all equipment, material, tools and labor incidental thereto. This price shall also include removing and disposing of traffic signal equipment not to be salvaged and all equipment, material, tools and labor incidental thereto.

Payment is at the contract lump sum price for "Removal and/or Relocation of Traffic Signal Equipment" inclusive of all labor, vehicle usage, storage, and incidental material necessary for the complete removal of abandoned equipment/material and/or relocation of existing traffic signal equipment/material. Payment will also include the necessary labor, equipment, and material for the complete restoration of all affected areas.

A credit will be calculated and deducted from monies due the Contractor equal to the listed value of salvage material not returned or that has been damaged and deemed unsalvageable due to the Contractor's operations.

Pay Item	Pay Unit
Removal and/or Relocation of Traffic Signal Equipment	L.S. (L.S.)

ITEM #1118051A – TEMPORARY SIGNALIZATION (SITE NO. 1)

ITEM #1118052A – TEMPORARY SIGNALIZATION (SITE NO. 2)

Description:

Work under this item shall consist of providing Temporary Signalization (TS) at the intersections shown on the plans.

Sites:

- Site No. 1: Includes intersection no. 082-214 (Main Street and Washington Street).
- Site No. 2: Includes intersection No. 082-222 (Main Street and Rapallo Avenue/Grand Street) and intersection No. 082-241 (Main Street and Hartford Avenue).

1. Existing Signalized Intersection: The Contractor shall keep each traffic signal completely operational at all times during construction through the use of existing signal equipment, temporary signal equipment, new signal equipment, or any combination thereof once TS has started as noted in the section labeled “Duration.”

2. Unsignalized Intersection: The Contractor shall provide TS during construction activities and convert the temporary condition to a permanent traffic signal upon project completion. The Contractor shall furnish, install, maintain, and relocate equipment to provide a complete temporary traffic signal, including but not limited to the necessary support structures, electrical connection and disconnection (if required) and energy supply, vehicle and pedestrian indications, vehicle and pedestrian detection (paid for under Item #11112XXA – Temporary Detection {Site No. X}), pavement markings, and signing.

Materials:

- Pertinent articles of the Standard Specifications
- Supplemental Specifications and Special Provisions contained in this contract

Construction Methods: The Contractor shall perform a Preliminary Inspection and submit a Temporary Signalization (TS) Plan as described herein. No physical work will be allowed at any location until the requirements of the Preliminary Inspection and Temporary Signalization (TS) Plan have been met.

1. Preliminary Inspection

Prior to beginning any physical work, the Contractor shall meet with the Engineer and a representative from the DOT Electrical Maintenance Office (Town representative for a Town owned signal), to inspect and document (for the Engineer’s concurrence) the existing traffic signal’s physical and operational condition prior to implementing any Temporary Signalization (TS.) The inspection shall include, but not be limited to, the condition of the following:

- Controller Assembly (CA)
 - Controller Unit (CU)
 - Detection Equipment

- Pre-emption Equipment
- Coordination Equipment
- Vehicle and Pedestrian Signals
- Vehicle and Pedestrian Detectors
- Emergency Vehicle Pre-emption System (EVPS) *
- Interconnect Cable and Splice Enclosures
- Support Structures
- Handholes, Conduit and Cable

It may be necessary to repair or replace equipment that is missing, damaged, or malfunctioning. The Contractor shall prepare a list of items for replacement or repair. If authorized by the Engineer, this work will be considered “Extra Work” under Article 1.09.04.

* At a State owned signal the EVPS equipment is usually owned by the municipality. The Engineer will notify the municipality of the inspection schedule and information relating to its EVPS equipment as required.

The Preliminary Inspection meeting shall also include discussion of potential utility conflicts according to the *Utilities* section under *TS Plan* below.

2. Temporary Signalization (TS) Plan

At least 30 days prior to implementation of each stage, the Contractor shall submit a 1:40 (1:500 metric) scale TS plan in pdf format for each location to the Engineer for review and comment. This TS Plan shall include, but not be limited to the following:

- Survey Ties
- Dimensions of Lanes, Shoulders, and Islands
- Slope Limits
- Clearing and Grubbing Limits
- Signal Phasing and Timing
- Location of Signal Appurtenances such as Supports, Signal Heads, Pedestrian Push buttons, Pedestrian Signals
- Location of Signing and Pavement Markings (stop bars, lane lines, etc.)
- Location, method, and mode of Temporary Detection
- Location of utilities and potential conflicts

Review of the TS plan does not relieve the Contractor of ensuring the TS meets the requirements of the MUTCD. The existing traffic signal plan of record for State-owned traffic signals is available from the Division of Traffic Engineering upon request. The Contractor may request existing traffic signal plans for Town-owned traffic signals from the Town.

It is acceptable to use the existing traffic signal plan as the TS plan by marking up the existing plan to show any needed changes.

The Contractor shall not implement the TS plan until all review comments have been addressed.

The TS Plan shall also address the following elements:

Earthwork

The Contractor shall perform the necessary clearing and grubbing and the grading of slopes required for the installation, maintenance, and removal of the TS equipment. Upon termination of the TS, the Contractor shall restore the affected area to its prior condition and to the satisfaction of the Engineer.

Maintenance and Protection of Traffic

The Contractor shall furnish, install, maintain, relocate, and remove signal-related signing (lane-use, signal ahead, NTOR, etc.), and pavement markings, as needed.

The Contractor shall install, relocate, or remove, equipment in a manner to cause no hazard to pedestrians, traffic or property. The Contractor shall maintain traffic as specified in the Special Provisions “Prosecution and Progress” and “Maintenance and Protection of Traffic” in the Contract.

Utilities

The Contractor shall verify that proposed temporary and/or relocated signal equipment will not conflict with proposed project utility relocations. The Contractor shall ensure that temporary span/temporary poles will not restrict the ability to shift utility cables off of the poles.

The Contractor shall coordinate its TS activities with all utility companies in the project area to ensure that the proposed temporary and/or relocated signal equipment will not be in conflict with existing utilities. The Contractor shall coordinate any utility work that may be needed prior to the Contractor implementing the TS plan.

Electrical Service and Telephone Service at Existing Signalized Intersections

The Contractor shall be responsible for relocating and changing any electrical service or telephone service source if required. Any arrangements with these companies and costs associated with any relocation or change shall be paid for by the Contractor. The Contractor shall ensure that the party previously responsible for the monthly payment of service shall continue to be responsible for that payment during TS.

Electrical Service for TS at Unsignalized Intersections

The Contractor shall be responsible for providing electrical service for TS at unsignalized intersections. All charges and all arrangements with the power company, including service requests, scheduling, and monthly bills in accordance with Section 10.00.12 and Section 10.00.13 of the Standard Specifications shall be the responsibility of the Contractor. The Contractor shall remove the service or leave the service if it will become permanent as shown on the plans or as directed by the Engineer.

Temporary Signalization

The Contractor shall furnish, install, maintain, relocate, and remove existing, temporary, and proposed traffic signal equipment and all necessary hardware; modifications to or furnishing of a new CA; and reprogramming of the CU phasing and timing; and any other incidentals related to this TS, as many times as necessary for each stage/phase of construction to maintain

and protect traffic and pedestrian movements as shown on the plans or as directed by the Engineer.

Inspection

When requested by the Engineer, the TS will be subject to a field review by a representative of the Division of Traffic Engineering and/or the Town, The Contractor shall revise the TS as needed to address comments.

Detection

The Contractor shall provide vehicle detection on the existing, temporary, and/or new roadway alignment for all intersection approaches that have existing detection, detection in the final condition as shown on the signal plan, or as directed by the Engineer. The Contractor shall keep existing pedestrian pushbuttons accessible and operational at all times during TS. Temporary Detection is described and is paid for under Item # 11112XXA - Temporary Detection (Site No. X)

Emergency Vehicle Pre-emption System (EVPS)

The Contractor shall furnish, install, maintain, relocate, and remove the equipment necessary to keep the existing EVPS operational as shown on the plan. The Contractor shall not disconnect or alter the EVPS without the knowledge and concurrence of the Engineer and the EVPS owner. The Contractor shall schedule all EVPS relocations so that the system is out of service only when the Contractor is actively working. The Contractor shall ensure EVPS is returned to service and is completely operational at the end of the work day and shall keep the EVPS owner apprised of all changes to the EVPS.

Coordination

The Contractor shall furnish, install, maintain, relocate, and remove the equipment necessary to keep the intersection coordinated to adjacent signals as shown on the plan. The Contractor shall not disconnect the interconnect without the approval of the Engineer.

- Closed Loop System: If it is necessary to disconnect the communication cable, the Contractor will notify the Engineer and the Bridgeport Operation Center (BOC) or the Newington Operation Center (NOC) prior to disconnect and also after it is reconnected.
- Time Base System: The Contractor shall program and synchronize all Time Clock/Time Base Coordination (TC/TBC) units as necessary.

Maintenance

Once TS is in effect, the Contractor shall assume all maintenance responsibilities of the entire installation in accordance with Section 1.07.12 of the Standard Specifications. The Contractor shall notify the Engineer for the project records the date that Temporary Signalization begins. The Contractor shall coordinate with the Engineer to notify the following parties that maintenance responsibility has been transferred to the Contractor:

Signal Owner

CT DOT Electrical Maintenance Office or
Town Representative
Local Police Department

The Contractor shall provide the Engineer a list of telephone numbers of personnel who will be on-call during TS and shall respond to traffic signal malfunctions by having a representative at the site within three hours from the initial contact. Any traffic signal malfunction shall be made operational according to plan within twenty-four (24) hours.

If the Engineer determines that the nature of a malfunction requires immediate attention and/or the Contractor does not respond within three (3) hours, then an alternate maintenance service will be called to repair the signal. Expenses incurred by the alternate maintenance service for each call will be deducted from monies due to the Contractor with a minimum deduction of \$1,000. The alternate maintenance service may be the owner of the signal or another qualified electrical contractor.

Duration

Temporary Signalization shall commence when the Contractor begins physical work at a particular intersection.

- a) For intersections with a State furnished controller, TS terminates when the inspection of the permanent signal is complete and operational and is accepted by the Engineer.
- b) For intersections with a Contractor furnished controller, Temporary Signalization terminates at the beginning of the 30 day test period for the permanent signal.

Ownership

The Contractor shall remove and deliver any existing equipment that is designated as salvage to its original owner upon completion of use. Any temporary equipment supplied by the Contractor shall be removed by the Contractor unless noted otherwise.

Method of Measurement:

Temporary Signalization (TS) shall be measured for payment as follows:

Fifty percent (50%) shall be paid when the TS for that site is operational as shown on the plan and to the satisfaction of the Engineer.

Fifty percent (50%) shall be paid upon termination of the TS as described herein.

Basis of Payment:

This work shall be paid at the contract Lump Sum price for “Temporary Signalization (Site No.)” for each site. This price includes the preliminary inspection, TS plan for each stage/phase, furnishing, installing, maintaining, relocating and revising traffic signal equipment, controller assembly modifications, controller unit program changes such as phasing and timing, removing existing, temporary, and proposed traffic signal equipment, arrangements with utility companies, towns or cities including the fees necessary for electric and telephone service, clearing and grubbing, earthwork and grading, area restoration and all necessary hardware, materials, labor, and work incidental thereto.

All material and work for signing and pavement markings is paid for under the appropriate Contract items.

All material and work necessary for vehicle and pedestrian detection for TS is paid for under item 11112XXA - Temporary Detection (Site No. X).

All Contractor supplied items that will remain the Contractor's property shall be included in the contract Lump Sum price for "Temporary Signalization."

Any items installed as part of the permanent installation will be paid for under those separate pay items in the Contract.

<u>Pay Item</u>	<u>Pay Unit</u>
Temporary Signalization (Site No.)	L.S.

ITEM #1118301A – RELOCATE PRE-EMPTION SYSTEM (SITE NO. 1)

ITEM #1118302A – RELOCATE PRE-EMPTION SYSTEM (SITE NO. 2)

Description:

Relocate existing town owned emergency vehicle pre-emption system (EVPS) (either optical or siren) as shown on the plan or as directed by the Engineer. The EVPS equipment includes but is not limited to the following material:

- Optical Detectors
- Siren Detectors
- Phase Selectors
- System Chassis
- Auxiliary Equipment Cabinets (AEC)
- Confirmation Light
- Detector Cable (where practical)

Install new cable from the controller to the pre-emption detectors where the existing cable cannot be practically relocated.

Sites:

- Site No. 1: Includes intersection no. 082-214 (Main Street and Washington Street).
- Site No. 2: Includes intersection No. 082-222 (Main Street and Rapallo Avenue/Grand Street) and intersection No. 082-241 (Main Street and Hartford Avenue).

NOTE: Intersection No. 082-241 (Main Street and Hartford Avenue) does not have existing pre-emption equipment to relocate.

Material:

All material is existing except for miscellaneous hardware necessary for reinstallation (e.g. changing detector attachment from span wire to mast arm) and the Detector Cable.

Miscellaneous Hardware:

1. Mounting hardware designed and manufactured specifically for use with the existing EVPS.
2. Corrosion and rust resistant.

Detector Cable (Optical):

1. 3-Conductor cable with shield and ground wire.
2. AWG #20 (7x28) stranded.
3. Individually tinned copper strands.
4. Conductor insulation: 600 volt, 167^o F (75 deg. C).
5. 1 Conductor-yellow; 1 Conductor-blue; 1 Conductor-orange.
6. Aluminized mylar shield tape or equivalent.
7. AWG #20 (7x28) stranded uninsulated drain wire
8. DC resistance not to exceed 11.0 ohms per 1000 feet (305M).
9. Capacitance from one conductor to other two conductors and shield not to exceed 157pf/M (48 pf./ft.).
10. Jacket: 600 volts, 176^o F (80 deg. C), minimum average wall thickness - 0.045" (1.14mm).

11. Finished O.D.: 0.3" (7.62mm) max.

Detector Cable (Audio):

1. 2-Conductor cable with shield and ground wire.
2. AWG #14.
3. IMSA Spec 50-2 Detector Lead-In.

Construction Methods:

Conduct an initial evaluation test before removal and a final test after reinstallation. Thirty days prior to disconnection and removal of the existing pre-emption equipment, test and verify that the system is operational as shown on the plan. The thirty days is intended to provide the EVPS owner an opportunity to correct and resolve any deficiencies identified during the test. If during the thirty days the owner repairs, replaces, or corrects any malfunctioning, disconnected, or missing components, re-test that feature prior to removal. The contractor is not responsible to correct any part of the EVPS that is found to be malfunctioning, disconnected, or missing during the initial test. If the contractor is to assume maintenance responsibility of the traffic signal during Temporary Signalization, the EVPS equipment will not be included. Maintenance responsibility remains with the owner.

EVPS Test Procedure

1. Notify the system owner/user, such as the municipal fire chief or public works director, of the scheduled inspection.
2. Request a fire department representative and an emergency vehicle, which has an activation device to conduct the test. If not available, the contractor shall provide an activation device.
3. In the presence of the Engineer and the municipal representative, test each pre-empted approach with the emergency vehicle. Test the following items of the system:
 - * Confirm that the emitter or siren activates the phase selector and the phase selector activates the correct pre-emption input to the controller.
 - * Confirm adequate range. The traffic signal must be pre-empted to green sufficiently in advance of the emergency vehicle arrival. The vehicle emitter or siren shall initiate pre-emption at a minimum distance of 548.6M (1800 feet). Exception: An obstructed line-of-sight may reduce the minimum distance. Town concurrence is required.
 - * Confirm there are no false calls. Keep the emitter or siren active as the emergency vehicle passes through the intersection. No other detectors shall activate.
4. Document the test. Provide the Engineer and the municipality copies of the test results. Attached is a sample test procedure form.

Keep the appropriate fire department official apprised of when (day and time) the system is disconnected and taken out of operation.

Store all pre-emption equipment intended for re-installation in a suitable location to prevent damage from elements and construction activities. Return all pre-emption equipment not intended for re-installation to the Town.

Mount the AEC on the left side of the controller cabinet, when facing the door. Confirm that the inside of the cabinet wall is clear, so that the installation of the AEC will not damage any equipment inside the controller cabinet. Drill a 25mm (1") hole through the side of the controller cabinet. Install a close nipple through the 25mm (1") hole. Apply clear silicon caulk to both ends of the close nipple. Tighten lock-nuts and fiber bushings. Apply additional caulk if necessary to prevent moisture from entering the controller cabinet and the AEC.

Re-install and wire the pre-emption equipment in a neat and orderly manner, as shown on the plan or as directed by the Engineer. Pre-emption detector locations shown on the plan are for illustration purposes only. Field locate the detectors for the best possible line-of-sight. Install the detector cables continuous with no splices between the optical detector and the AEC. Make all connections from the phase selector to the “D” harness and to the cabinet wiring at the pre-emption termination panel.

Conduct a final test, identical to the initial test, to verify that the EVPS is as operational as before removal. If the initial test was not conducted, it is assumed the EVPS was fully operational as shown on the plan. The Contractor is then responsible for all damaged; faulty; missing; and replacement material necessary to restore the EVPS to fully operational.

If a malfunction is found other than identified during the initial test, or the system needs adjustment (such as range, emitter intensity, or detector location), schedule a follow-up test. Repeat the test procedure for all approaches that did not pass.

Notify the appropriate fire department official that the EVPS has been re-installed and is operational.

If not present in an existing traffic controller cabinet install a pre-emption disconnect switch. When switched off, the traffic controller shall not be affected by EVPS calls.

Method of Measurement:

Work under this item is measured as Lump-Sum per site. Detector Cable shall be measured by the number of linear feet (meters) supplied and installed.

Basis of Payment:

This work shall be paid at the contract Lump Sum price for “Relocate Pre-Emption System (Site No.)” for each site. This item shall include all prior testing, removal, storage, re-installation, final testing, any corrective adjustments, replacement components if necessary, documentation, disconnect switch if necessary, and all necessary hardware, materials, labor and work incidental thereto.

All material and work necessary for installing detector cable is paid for under item 111355XA – Detector Cable (Optical).

<u>Pay Item</u>	<u>Pay Unit</u>
Relocate Pre-emption System (Site No._)	L.S.

EVPS TEST PROCEDURE

Confirm that the emitter or siren activates the phase selector and the phase selector activates the correct pre-emption input to the controller.	
Confirm adequate range.	
Confirm there are no false calls.	

**ITEM #1131016A – SMART WORK ZONE MOBILE VIDEO
CAMERA/QUEUE SENSOR TRAILER (SVQS)**
**ITEM #1131017A – SMART WORK ZONE MOBILE VIDEO
CAMERA/QUEUE SENSOR TRAILER (SVQS) SERVICE**
**ITEM #1131018A – SMART WORK ZONE VARIABLE MESSAGE
SIGN/QUEUE SENSOR TRAILER (SVMQ)**
**ITEM #1131019A – SMART WORK ZONE VARIABLE MESSAGE
SIGN/QUEUE SENSOR TRAILER (SVMQ) SERVICE**
ITEM #1131020A – SMART WORK ZONE DEPLOYMENT
ITEM #1131021A – SMART WORK ZONE OPERATIONS
ITEM #1131022A – SMART WORK ZONE TRAILER RELOCATION
**ITEM #1131023A – SMART WORK ZONE QUEUE TRAILER/SENSOR
(SQT)**
**ITEM #1131024A – SMART WORK ZONE QUEUE TRAILER/SENSOR
(SQT) SERVICE**

Description: This work shall consist of furnishing, installing, operating, servicing, maintaining, relocating and removing an automated Smart Work Zone (SWZ) of the complete system for the duration of the Project.

These items shall include vehicle trailers, sensors, cameras, variable message signs, cloud hosted third party traffic speed data, processed rock for leveling trailers, website, communications equipment, relocation, service and maintenance. Included in the operational responsibilities is the assumption of all trailer license plates, communication costs such as FCC licensing, cellular telephone, wireless data networks, satellite and internet subscription charges, solar system support, battery charging and maintenance. In addition to these requirements, the Contractor shall assume all responsibility for any damaged equipment included in the system due to crashes, vandalism, adverse weather, etc. that may occur during system deployment and operation.

This system shall monitor the areas in advance of the project work zone and project's work zone area. The SWZ shall provide Connecticut Department of Transportation (CTDOT) operators control of the cameras to disseminate real-time information to the traveling public and other stakeholders. The system shall be completely operational fourteen (14) days prior to the start of roadwork to allow for traffic data accumulation by the system. The SWZ shall consist of an automated system using trailer-mounted microwave sensors that transmit vehicle speed and related data through cellular communications to a Contractor-hosted central computer system. The camera shall be used to verify traffic conditions within the viewable area of the camera. The central computer system shall send automated and operator manual commands to variable message signs through cellular communications to display travel time, delay and stopped traffic information. The speed data, video images, and variable message sign content shall be hosted on a Contractor-supplied website.

The SWZ shall be capable of detecting the presence of queued traffic in the segments identified on the plans and reporting via the queue warning Smart Work Zone Variable Message Sign/Queue Sensor Trailer (SVMQ). The distance from the SVMQ to the detected back of queue shall be reported within one-half (1/2) mile accuracy on the system, but reported on the SVMQ at one (1) mile accuracy rounded up to the nearest mile. This “real-time” queue location information shall be calculated and displayed on the applicable SVMQ to the nearest minute.

The SWZ shall have the capability to notify the construction field office, Contractor or others, as determined by the Engineer, of travel times and when the speed through the work zone decreases below thirty (30) mph. The system shall be capable of transferring real-time data in a file format compatible with Oracle®. “Motion” video feeds updated once per one (1) second shall be available for the CTDOT to display on the Contractor-provided website. In addition, any number of CTDOT or Contractor employees shall be notified via email or text message for these speed changes. Contact information will be furnished by the Engineer at the start of the SMZ deployment.

All the required components of the SWZ shall be fully operational within forty-five (45) days of notice to deploy from the Engineer. If not fully operational within said forty-five (45) days, a payment reduction of five percent (5%) for each day the entire system is not operating will apply, as determined by the Engineer.

Once operations begin, the SWZ shall perform with no major malfunctions throughout the Contract, unless the Engineer requests the system or portions of the system be removed. Malfunctions include, but are not limited to, the inability of the equipment to provide accurate real-time video feeds, delay, or travel time information, inability to withstand the construction roadside environment or normal weather conditions. The Engineer reserves the right to terminate this item at any time if it is determined the SWZ is not performing in accordance with this specification.

Construction Methods:

Submittals:

1. At least twenty (20) days prior to beginning installation, the Contractor shall submit to the Engineer for review and approval, in consultation with the CTDOT’s Subject Matter Expert, evidence that the proposed supplier has successfully completed at least five (5) SWZ projects similar in concept and scope to the proposed system in the past five (5) years. The proposed supplier shall also provide the credentials of a qualified technician who shall install and operate the system. Include names, addresses, and telephone numbers of the similar project’s owner’s representatives for verification.
2. Also, at least twenty (20) days prior to beginning installation, submit brochures and cut sheets on all units of the SWZ, with details of how and which communications systems shall be used, and the technical specifications for the website.
3. The Contractor shall demonstrate to the Engineer an operating SWZ.
4. At least fourteen (14) days prior to installation, the Contractor shall propose the actual device layout to the CTDOT for review and approval.
5. Prior to public viewing, the website map showing device locations and other interactive elements shall be submitted for the Engineer’s review.
6. The Engineer reserves the right to add or remove locations as needed.

Equipment:

1. The SWZ shall consist of the following equipment.
 - a) Two (2) SVQS with camera with pan-tilt-zoom (PTZ). The computer hardware and software must meet the manufacturer's requirements to operate and monitor the system. The camera response time to web commands for PTZ shall be reviewed and approved by the Engineer. The PTZ response time shall follow the operator's manual commands to move the camera to the desired position.
 - b) One (1) SQT shall provide real time speed, volumes, occupancy and other necessary data to the SWZ to activate messaging on the variable message signs and provide historical data.
 - c) Three (3) SVMQ shall display real-time travel time messaging and back of queue warning to the traveling public.
 - d) Communication equipment including wireless data networks, base stations, cell phone data interfaces, Ethernet network interfaces, and internet interfaces.
 - e) Customized Webpage integrated with the SWZ to include traveling public and Project staff accessibility; SWZ website shall be allowed to "link" to the CTDOT's website
 - f) Software package customized for this particular Project's needs.

2. The following shall be provided for each SQT, SVMQ and SVQS with PTZ:
 - a) Approximate locations of variable message signs and traffic sensors shown on the figures below may be adjusted to ensure sightlines and safety are adequate
 - b) Clean stone or processed rock to provide a level area for trailers and provide for sufficient height for sensors to operate correctly.
 - c) Individually mounted on trailer units with solar power.
 - d) Equipped with digital wireless cellular modems as required.
 - e) Linked to the Contractor's central computer server.
 - f) Maintained as needed to remain operational, including cleaning and inspecting components, snow and ice removal from solar panels and keeping batteries charged.
 - g) Extra set of programming instructions stored in the units for emergency use.

3. The SVQS, SQT, and SVMQ shall collect and process traffic data as programmed within the software provided with the sensors. This data shall be transmitted over a digital cellular network to access and store the respective data remotely. The remote monitoring and data collection shall be placed in areas where wireless communication is available. The SVQS, SQT, and SVMQ shall use both solar power and deep cycle batteries to provide a self-contained completely autonomous system.

The SVQS mobile camera(s) shall provide a mobile, self-contained, all-weather, trailer-mounted equipment platform. The mobile camera system shall use wireless communication. The mobile camera shall provide a rapidly-deployable real-time video system viewable from a remote location. The mobile camera shall be capable as a stand-alone camera system.

 - a) Trailer and power requirements:
 - i. 2-wheel industrial grade trailer with stabilizer legs
 - ii. Available as a mobile unit or permanent mount
 - iii. Adjustable solar array for maximum exposure to sun
 - iv. Removable trailer tongue
 - v. Battery bank sized for thirty (30) day autonomy

b) SVQS requirements:

- i. Microwave detection (Wavetronix Smart Sensor HD) with Dual Radar that reliably detects up to twenty-two (22) lanes of traffic, auto configuration
- ii. Provide data including speed, volume and occupancy
- iii. Digital cellular communications
- iv. Dome camera with day/night adjustable pan/tilt/zoom IP addressable
- v. Mobile camera system shall provide camera operating software to use camera manufacturer's operating system.
- vi. Minimum thirty (30) ft extendable mast with 360 degree lockable rotation
- vii. Capable of providing streaming or snapshot video
- viii. Electric hoists for rapid deployment

c) SQT requirements:

- i. Microwave detection reliably detects up to twenty-two (22) lanes of traffic
- ii. Data provided includes speed, volume and occupancy
- iii. Available as a mobile unit or permanent mount
- iv. Digital cellular communications

4. The SVMQ shall be configured with the following variable message sign requirements or approved equal:

a) Trailer and power requirements:

- i. 2-wheeled trailer structurally adequate to serve as both a carrier and an operating platform
- ii. Meets Federal Regulations for safety and travel
- iii. Color of trailer paint shall be safety orange or as approved by the Engineer
- iv. Bank of batteries capable of being recharged automatically by a group of solar panels located at the highest point on the unit
- v. Variable message signs shall be designed with sufficient energy backup to operate for a period of thirty (30) days (minimum) at 75°F without sun exposure
- vi. Solar panel generator array shall recharge the battery bank at a rate of 2 1/2 hours peak sun per twenty-four (24) hour period of usage
- vii. Solar panel array sized to replace the power used in typical daily operation with less than four (4) hours of sun
- viii. Deep cycle, lead acid 12-volt batteries wired in parallel, housed in a lockable heavy duty steel weatherproof battery box
- ix. Batteries recharged by a solar panel array producing 110 watts of power minimum
- x. Built-in battery charger with minimum 25 ampere per hour rating
- xi. Solar charge current meter and battery charger current meter visible
- xii. Protective housing painted with manufacturer's standard colors

b) Variable Message Sign/Queue Sensor requirements:

- i. Sign panel of welded aluminum alloy construction, assembled to prevent dissimilar metal action from occurring
- ii. Length of sign panel 128 inches or less
- iii. Front face of sign covered with clear UV-inhibited polycarbonate to prevent fading
- iv. Message center:

- 1) Three (3) separate lines, center justified
- 2) Each line up to eight (8) characters, equally spaced a minimum of three (3) inches apart
- 3) Each character eighteen (18) inches high by twelve (12) inches wide
- 4) Each character configured with thirty-five (35) LED lamp pixels in a five (5) x seven (7) element arrangement
- 5) Message color 590 nanometers (yellow-orange)
- i. Remote sign operation via central computer
- ii. Messages to be displayed shall have capability to be timed to changes at various times of day and days of week
- iii. Trailer-mounted variable message board consisting of optically enhanced LED lamp matrix panels powered by a bank of batteries in order to convey bright, distinctive messages to the traveling public
- iv. Sign capable of displaying up to eight (8) pages in a multiple page message, with variable timing in one-tenth (1/10) second increments under computer control
- v. Sign shall completely change all lines of message copy in not more than one hundred (100) milliseconds
- vi. Sign clearly visible and legible from a distance of eight-hundred (800) feet under both day and night conditions, with a photocell automatically adjusting its light source for variable light level conditions
- vii. Sign panel supported on a telescoping upright member with hydraulic lift to permit raising the sign for operation and lowering the sign for transport
- viii. Telescoping upright able to rotate 360 degrees and shall lock into position
- ix. Telescoping distance of nominally five (5) feet to allow bottom of sign to be at least seven (7) feet above the ground
- x. Sign panel shall pivot to the longitudinal axis of the trailer for transport, to reduce aerodynamic drag
- xi. Static sign attached identifying the message board is for the Project; coordinate sign content and appearance with the Engineer
- xii. Microwave detection (Wavetronix Smart Sensor HD) with dual radar that reliably detects up to twenty-two (22) lanes of traffic, auto configuration
- xiii. Data provided from sensor to include speed, volume and occupancy
- xiv. Available as a mobile unit or permanent mount
- c) Variable Message Sign on-board dedicated computer requirements:
 - i. Solid state design, removable, including a keyboard through which user originated messages may be entered for display or storage
 - ii. LCD display screen upon which messages can be reviewed before display on the message sign
 - iii. Storage of a minimum of one hundred (100) preprogrammed messages for display when called upon by an operator through the keyboard and a minimum of one hundred (100) users originated multiple page messages.
 - iv. Password coding or key entry.
 - v. Control programming to present sequenced messages under operator control through keyboard entry.
 - vi. Control for moving arrow displays.

- vii. Calendar program to automatically start and stop the display of sequences at predetermined times.
 - viii. Character board and battery diagnostics.
 - ix. Computer housing: weather resistant, shock resistant lockable control box with a light for night operation.
 - x. Power control unit housed in a lockable, steel, weatherproof battery box containing two (2) current meters (to show amperage generated with battery charger and amperage from solar panels to battery bank).
 - xi. Power control unit to incorporate a PV regulator with thermal compensation for variances in ambient temperature, to regulate the charge rate to the battery bank.
 - xii. Control circuitry connected to variable message sign's photocell that detects ambient light conditions and reduces lamp intensity at night to reduce glare.
- d) Variable Message Sign - other requirements:
- i. Variable message sign operation using cellular telephone and cellular telephone service (trailer must be located within cellular telephone coverage), allowing operator remote control of the on-board computer
 - ii. A Queue Trailer/Sensor may be located next to designated SVMQ to collect data
 - iii. The message sign shall provide for remote sign operation via central computer base station or Website allowing operators to manually override the automated messaging in order to display a message at any time. The operator shall be able to cancel this override and initiate the systems automated messaging feature.
 - iv. Any request to change messages on the Variable Message Signs shall be approved by the CTDOT.

Deployment and Operation:

The decision to deploy or remove individual devices or the entire SWZ will be made by the Engineer. Once the decision is made to deploy the system, the Engineer will coordinate with the Contractor for the duration of system deployment.

1. The SWZ shall be installed as shown in the approved layout. The locations may require repositioning as directed by the Engineer and as the project continues. The system shall be maintained and operated for the duration of the Project or as directed by the Engineer. The Contractor shall service the SWZ on a six (6) month regular interval for the duration of the Project or as directed by the Engineer. Additionally, the Contractor shall clean the Camera dome bubbles at least once per month during the winter months between December and March for the duration of the project as directed by the Engineer. The service shall include cleaning the sign panel, removing snow/ice and debris from the solar panels as needed or as directed by the Engineer. The Contractor shall follow the manufacturer's requirements for cleaning the SVQS. The cost of the service shall be included in the items (Item Nos. 1131017A, 1131019A, and 1131024A) for each unit.

2. The Contractor shall prepare the locations to receive the equipment in accordance with the equipment manufacturer's requirements. Each location shall include clean stone or processed rock provided and installed by the Contractor to level the surface area. Some location may require the trailers to be lifted over the safety barrier and placed on the level processed rock.

3. The Contractor shall install each of the system components in accordance with the manufacturer's recommendations, in compliance with all industry standards and codes such that each system is fully operational and can be operated and controlled from the Construction Field Office or remotely, as approved by the Engineer.

4. The Contractor shall coordinate the work with others as designated by the Engineer to complete installation and integration of all equipment for all system types.

5. System Calibration and Configuration: The SWZ shall provide the following:

- a) Software shall be configured for notification to appropriate personnel at the Highway Operations Center, the Construction Field Office and the Contractor by email each time a malfunction has occurred in the system. A malfunction record shall also be made in the database. The software shall be configured so that any number of approved personnel can be notified. The email shall display an error message for the device or devices affected. Through the Contractor, the SWZ Webpage Integrator shall be responsible for this notification procedure.
- b) Software shall be configured to provide current operational and location status (such as current traffic data and messages, communications system, signs, and sensors as well as latitude/longitude of all deployed devices) via the Internet to a dedicated Website established for the purpose of monitoring the corridor and the SWZ equipment.
- c) Software shall be configured to assess any type of malfunction that has occurred. This assessment includes communications disruption between any device in the system configuration, variable message board malfunctioning, speed sensor malfunction, loss of power, low battery, etc. This malfunction information shall be sent via email in text format to the Highway Operations Center, Engineer, or Contractor, as designated by the Engineer, for each occurrence.
- d) To support incident management, the SWZ software shall be configured to allow Project staff to manually override motorist information messages for a user-specified duration; after which, automatic operation will resume with display of messages appropriate to the prevailing traffic conditions. All overriding messages shall have the message content and the username logged into the database.

6. SWZ Website shall have the following:

- a) Password protected link for approved personnel to access the operational characteristics of the system, allowing manual override of errant messages.
- b) The website shall display current traffic conditions and real time speed at upstream locations to the nearest minute. The "real time" traffic delay information displayed on the SVMQ's shall be updated every one (1) minute minimum with the website delay information updated simultaneously.
- c) The website shall allow the scheduling of messages by the operator on a sign or group of signs, to turn on and to turn off messages at times set in the future.
- d) Placement of all devices shall be shown on the dedicated website using latitude/longitude coordinates. The placement of these devices on the website shall be approved by the Engineer prior to release of the website.
- e) The website shall display camera images at least five (5) frames per second. Camera images shall be displayed by a user selectable menu. Cameras can be selected one (1) at a time or all cameras images simultaneously using another page or "video wall." Camera images can be displayed by "hovering" over and selecting the camera icon.

- f) Via the internet and the dedicated website, the website shall provide a full color map using Google Maps or equivalent depicting the Project area with locations of traffic sensors and SVMQ's. Using an administrator defined color-coding scheme, the map reflects the current average speed at each traffic sensor and displays the entire information message being shown by each SVMQ either on the map or on the side bar of the website. The Contractor shall use the third party traffic speed data to "fill" in the speed data display on the website between sensors. The contractor shall use the sensors for maximum distance of one-half (1/2) mile on the map. The map shall be automatically refreshed a minimum of once every minute to display any changes to traffic sensor(s) and/or SVMQ's. A legend of all icons and a short description of each shall be placed on the website.
- g) The SWZ website shall be capable of providing and displaying the travel delay cost data (monetary values) in a graph and/or chart format and allow users to run reports against the data by hour, day and month intervals through the browser. This feature shall not be accessible by the public. The SWZ website shall have report output formats that include at minimum PDF, rich text format, and Microsoft Excel formats. See requirement 10. part o.
- h) The SWZ Website shall provide a map with current traffic conditions by way of a colored layer over the road. The layer on the map shall display a different color for the different traffic speeds by use of colored bars over the existing road, with a legend explaining the meaning of each color. The color descriptions are as follows:
 - i. less than 10 mph = black
 - ii. less than 30 mph = red
 - iii. less than 40 mph = orange
 - iv. less than 50 mph = yellow
 - v. 50 mph and over = green

7. Smart Work Zone Operations

- a) System Communications shall meet the following requirements:
 - i. The Contractor shall perform the required configuration of the SWZ's communications system during system initialization.
 - ii. Communications between the server and any individual SVMQ or SVQS shall be independent through the full range of deployed locations and shall not rely upon communications with any other SVMQ or SVQS sensor.
 - iii. The SWZ communications system shall incorporate an error detection/ correction mechanism to insure the integrity of all traffic conditions data and motorist information messages.
- b) In addition to meeting manufacturer's specifications, the Contractor shall program the SWZ to ensure that the following General Operational requirements are met:
 - i. The SWZ traffic sensors shall be such that the accuracy is not degraded by inclement weather and visibility conditions including precipitation, fog, darkness, excessive dust and road debris. The sensors shall be capable of acquiring traffic data for a minimum of twenty-two (22) lanes of traffic on a lane-by-lane basis.
 - ii. The SWZ shall operate continuously (24 hours, 7 days a week) when deployed on the Project. It shall always be collecting and storing data.

- iii. All traffic data and motorist information messages displayed by the SWZ shall be archived in the database with time and date stamps.
- iv. The SWZ shall be capable of acquiring traffic volume and speed data, developing travel times, and selecting motorist information messages automatically without operator intervention after system initialization.
- v. The SWZ shall automatically select default and advisory messages based on traffic conditions at a single traffic sensor point or at multiple traffic sensor points in combination.
- vi. Administrative users shall be able to create and save a library of messages with up to twenty (20) different default or automatic advisory messages for each SVMQ.
- vii. System operator control functions shall be password protected.
- viii. To support incident management, the SWZ shall allow the Engineer and Project staff with password privileges to manually override motorist information messages for a user-specified duration, after which automatic operation shall resume with display of messages appropriate to the prevailing traffic conditions.
- ix. The SWZ shall be capable of providing current operational status (such as current traffic data and messages, communications system, signs and sensors, video feeds) via the dedicated Project website.
- x. For remote sign operation, the website shall allow password-protected access for Project staff to manually override automated messaging in order to display a message at any time. The staff shall be able to send a pre-programmed or custom message to a selected sign or group of signs. The staff shall be able to cancel this manual override and initiate any and all of the system's automated messaging features at any time.
- xi. The default and advisory message content shall be programmable from the website as well as the field laptops.
- xii. The dedicated Project website shall provide a full color map depicting the Project area with locations of SVQS sensors and SVMQ's. The graphical representation of each device location is based on latitude/longitude coordinates. The map shall show the current traffic conditions at each SQT and display the entire SVMQ message at each location.
- xiii. The website shall have a link to the CTDOT's website and the website shall allow the CTDOT's website to link to it.
- xiv. The system shall autonomously restart in case of power failure in any part of the system.
- xv. Each SVMQ shall be capable of displaying eight (8) characters on each of three (3) rows. Standard messages shall be as defined in "Smart Work Zone Management System Motorist Information Messages" section below.
- xvi. Cameras must be capable of operating on both solar and AC power. Should the visibility of the traffic cameras be degraded by inclement weather including snow, precipitation, excessive dust or road debris, the Contractor shall clean the camera housing to restore proper viewing.

8. Training and Support required:

- a) Ensure that the SWZ is furnished, installed and maintained by personnel who are experienced in this type of work. Deploying firm personnel must have a minimum of five (5) similar deployments.
- b) Training shall be provided to Project staff on their authorized use and operation of the physical field hardware, software and website of the SWZ.
- c) The Contractor shall supply training and documentation to enable the Engineer to add additional signs or traffic sensors to the system. The Contractor shall provide the communications for any of these additional signs or traffic sensors.

9. System Operational Performance:

- a) To ensure a prompt response to incidents involving the integrity of the SWZ devices, the Contractor shall be required to make all necessary corrections to the components of the system within twenty-four (24) hours of notification by the CTDOT.
- b) If all corrections are made within this twenty-four (24) hour period and the system is brought back on-line, no pay reduction (as outlined in the Method of Measurement section) will occur.
- c) If the twenty-four (24) timeframe expires and the components of the system are not fully restored to proper working order, no payment will be made from the time of initial notification until the system is brought back on-line. If the system is restored within ten (10) days, a pro-rated monthly payment reduction will be determined as outlined in the Method of Measurement section.
- d) If the components of the SWZ are down for more than ten (10) total days in a month, whether they are consecutive or cumulative, and then NO payment will be made for that month. Components are the SWZ variable message signs, SWZ Mobile Camera with PTZ, Communications Equipment, and SWZ Queue Sensors, computer hardware and software required to place the real time information on the signs, and the project's Website. The CTDOT reserves the right to remove the SWZ components if it determines the system is not performing in accordance with this specification, and no additional payment shall be made.

10. Data Acquisition requirements:

- a) Each SVQS sensor shall communicate with the field computers and the website to activate the appropriate SVMQ whenever the prevailing traffic speed slows to below fifteen (15) mph (or other designated speed as determined by the Engineer). Once activated, pre-programmed messages shall be automatically displayed on the SVMQ. The message content shall be as directed by the Engineer.
- b) The SWZ shall be capable of calculating and having "real time" delay information displayed on the SVMQ's. This "real time" delay shall be calculated and displayed on the SVMQ's to the nearest minute.
- c) The website delay information shall be updated simultaneously with the traffic speed information displayed on the Variable Message Signs.
- d) To allow for motorist information messages of high specificity, the SWZ shall acquire quantitative traffic data using an accurate speed measurement technique that includes the capability of detecting stopped traffic and counting traffic volume.
- e) The SWZ system's traffic sensors shall be of a type whose accuracy is not degraded by inclement weather or low visibility conditions including precipitation, fog, darkness, excessive dust, and road debris.

- f) The SWZ shall be capable of acquiring traffic data from up to twenty-two (22) lanes of traffic in multiple directions, for example: Eleven (11) northbound and eleven (11) southbound.
- g) The Contractor shall provide redundancy for data archiving and exchange. The Contractor shall provide Content Delivery Network (CDN) to aggregate video data streams from any PTZ camera to a centralized location to reduce bandwidth consumption from each individual PTZ camera head to end users and allow for separate controllable/configurable streams for public and operator use.
- h) The CDN shall be capable of allowing the Project staff to start and stop public feeds from the SWZ website while not interfering with the private feeds being displayed on the website.
- i) All traffic data acquired by the SWZ including, but not limited to, calculated data fields shall be archived in a log file with time and date stamps for the duration of the Project. During the Project, requests for archived data may be made through the Engineer to the SWZ contractor. The Contractor shall provide this data to the Engineer within five (5) days upon receipt of the original request.
- j) At the end of the Project, the SWZ Contractor shall provide the CTDOT comprehensive Project archive data with the exception of video. This logged information shall be in a format compatible with CTDOT requirements. The Contractor shall coordinate with the Engineer for requirements.
- k) The SWZ shall provide device outage alerts via email to the Engineer for outages greater than fifteen (15) minutes. The alerts shall be used to generate a monthly summary spreadsheet displaying outages greater than twenty-four (24) hours, submitted to the Engineer. The email addresses for recipients of outage alerts shall be provided by the Engineer. Any pay reductions as per the pro-rated schedule will be calculated from the monthly outage summaries, as described in the Method of Measurement section.
- l) The system shall be capable of transferring for each camera device a video data format acceptable to the CTDOT.
- m) The Contractor shall provide notification of data format changes to the CTDOT before they take place.
- n) Unique device identifiers shall be coordinated at the beginning of the Project and shall not change once the SWZ contractor has initially defined them, unless otherwise approved by the Engineer.
- o) The SWZ shall be capable of calculating travel delay cost (monetary value) information for passenger cars and trucks from the beginning of the Project to the end of the Project. The SWZ system shall maintain a database of current and historical travel delay cost data. The SWZ travel delay cost information shall be provided in dollars per hours (\$/hr.) of travel time. The SWZ travel time delay cost information shall follow the Chapter 2 (Sections 2.2.1 – 2.2.2.3) of the Work Zone Road Users Costs Manual (FHWA-HOP-12-005). The Contractor shall provide the calculations and formulas for the travel delay costs to the Engineer for review and approval prior to the SWZ system implementation. The Contractor shall provide examples of the charts and tables for the travel delay costs to the Engineer for review and approval prior to the SWZ system implementation. The scale of the travel delay costs charts and tables shall be consistent with the data accumulated by the SWZ throughout the Project period.

11. SWZ Motorist Information Message requirements:

- a) The SVMQ shall be capable of providing speed, delay, length of traffic queue, travel time, stopped vehicles, and lane closure message advisories to motorists.
- b) Records of all motorist information messages and travel times displayed by the SWZ shall be submitted to the Engineer in a format compatible with CTDOT requirements.
- c) The SWZ must have capacity to preset up to twenty (20) different default or automatic advisory messages for each SVMQ.
- d) Message Sets:

- i. The upstream SVMQs within 1 1/2 miles of the work zone shall display either the following message or an alternate message approved by the Engineer:

ROAD WORK AHEAD

XX MIN THRU WORKZONE

- ii. SVMQs located within the work zone will display different messages as per their location. Either the following sample message or an alternate message approved by the Engineer will be displayed:

TO EXIT XX

X MILES

X - X MIN

- iii. Queue warning SVMQ's located prior to any construction activity that negatively impacts traffic flows shall display the following message or an alternate message approved by the Engineer:

STOPPED TRAFFIC XX MILES

BE PREPARED TO STOP

- or -

SLOW TRAFFIC XX MILES

USE CAUTION

- e) The sequences above are a minimum requirement and can be adjusted by the Engineer at his or her discretion.
- f) The SWZ shall acquire traffic flow data and use an accurate speed calculation technique that includes the capability of detecting stopped traffic, counting traffic volume and lane occupancy.
- g) The wireless cellular communications system(s) used for the Project must be reliable, dependable, and capable of functioning at all times regardless of weather, locations and cell phone usage. The Contractor shall be responsible for all communications costs, utilities, and satellite or cellular phone services needed to provide the dependable functioning SWZ.

Approximate Location of SWZ:

Figures 1-3 and Tables 1-3 are provided as a guide. Actual locations of the SWZ equipment shall be determined in the field. The Engineer will review and approve final locations of the equipment.

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FIGURE 1: Arrigoni Bridge and Surrounding Routes

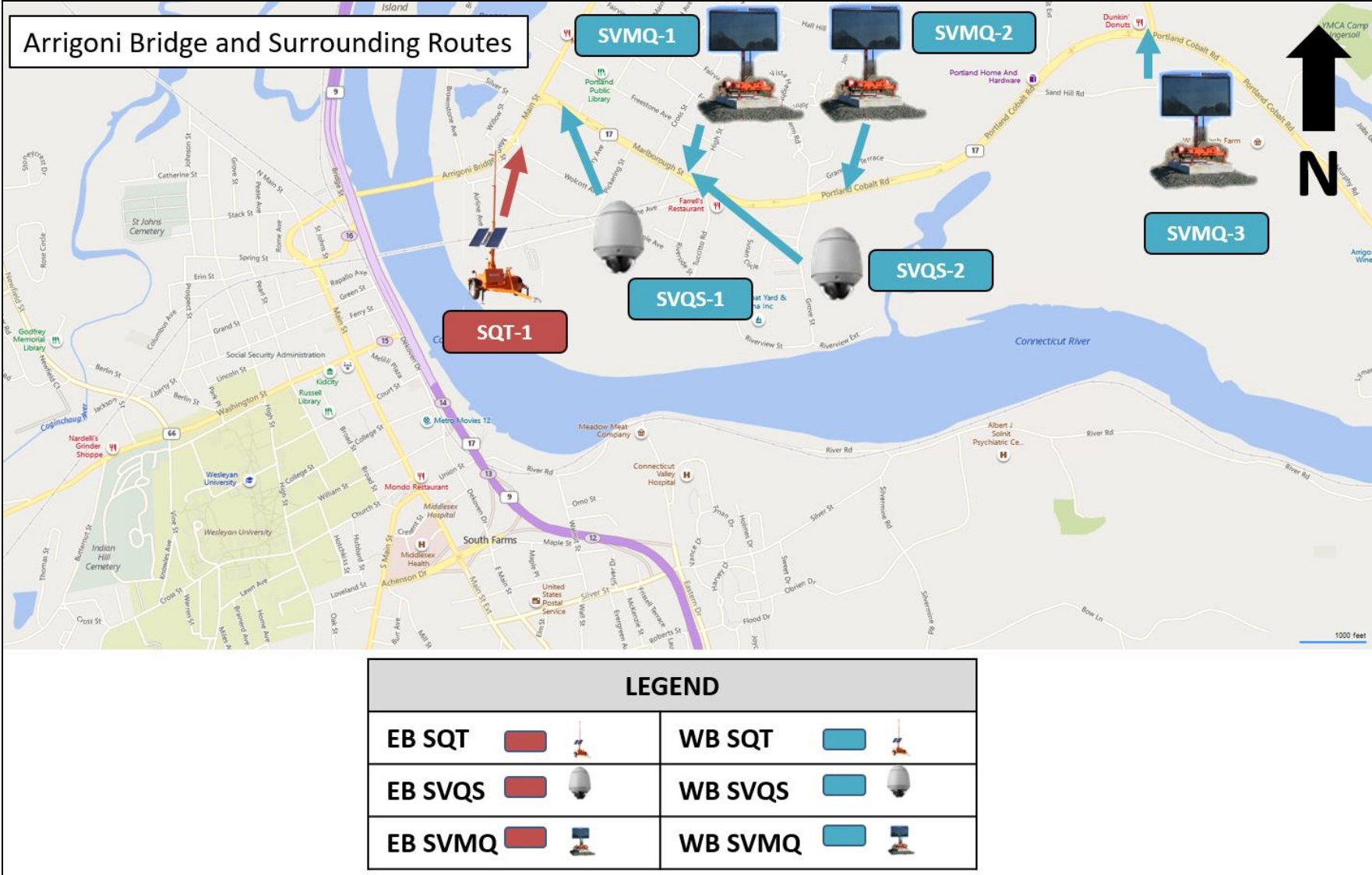


Table 1: Approximate Location of SWZ Implementation for the Project Site. All locations shall be confirmed with the Engineer.

Table 1 – Arrigoni Bridge and Surrounding Route				
Route	Direction	Town	Location	Type of Equipment
17/66	Eastbound	Portland	Grass on eastbound side following Arrigoni Bridge	SQT
17/66	Westbound	Portland	Grass median between turn lane sign and tree	SVQS
17/66	Westbound	Portland	Grass area in front of Cumberland Farms	SVMQ
17/66	Westbound	Portland	Grass area in front of Cumberland Farms	SVQS
17/66	Westbound	Portland	Grass area in front of Motorsports	SVMQ
17/66	Westbound	Portland	Grass area in front of strip mall following Route 66/Route 17 intersection	SVMQ

Trailer Relocation Operations:

1. The Contractor shall relocate the SWZ trailers as agreed between the Contractor and the Engineer.
2. The Contractor shall reconfigure the SWZ equipment including the SVQS sensor and the camera with PTZ to monitor travel lanes at the relocation site. The Contractor shall confirm the reconfigured settings with the Engineer.
3. The Contractor shall update the website with the relocation sites of the SWZ. The Website shall show the new location of the SWZs upon completion of the update. The update shall occur within two (2) weekdays of the relocation.

Method of Measurement:

1. The SWZ Deployment will be measured as a Contract lump sum item.
2. The SVMQ, SVQS, and SQT items will be measured based on uninterrupted operation of all trailer, sensors, cameras with pan-tilt-zoom, variable message signs, solar panels,

batteries. SVMQ, SVQS, and SQT will be measured for payment on a per unit basis for each month that the piece of equipment is in use, and as follows:

- a) Measurement will begin from the date each unit is fully operational, as determined by the Engineer, to the date it is released back to the Contractor.
 - b) The Engineer will compute periods of less than one (1) month at the rate of 1/30 of a month for each day of use.
3. The SVMQ, SVQS, and SQT service items will be measured for payment by the month or fraction of a month as follows:
- a) Includes monthly operations, monthly cellular service communications, maintenance, charging batteries, cleaning solar panels, camera dome bubble, repair, programming, and integration.
 - b) The following pro-rated reduction of the monthly payment will be computed if the monthly summary spreadsheet of outages greater than twenty-four (24) hours indicates interruption of service has occurred:

1 day = 5% pay reduction	6 days = 30% pay reduction
2 days = 7% pay reduction	7 days = 35% pay reduction
3 days = 10% pay reduction	8 days = 40% pay reduction
4 days = 20% pay reduction	9 days = 50% pay reduction
5 days = 25% pay reduction	10 days = 75% pay reduction
 - c) If the components of the SWZ are down for more than ten (10) total days in a month, whether they are consecutive or cumulative, and then NO payment will be made for that month.
4. The SWZ Operations item will be measure items will be measured for payment by the month for web site operations.
5. The SWZ Trailer Relocation item will be measured for payment each time a SQT, SVQS, or SVMQ is relocated from an existing location to another location, as approved or directed by the Engineer.

Basis of Payment:

- 1. Payment for accepted SWZ installation will be at the Contract lump sum price for “Smart Work Zone Deployment” which shall include submittals, component delivery, and system set up, all materials, equipment, tools, travel and labor incidental thereto. The Contractor shall comply with the requirements stated in the System Performance section herein.
- 2. Payment for accepted trailer-mounted components will be at the Contract unit price per month or a fraction of the month for each “Smart Work Zone Queue Trailer/Sensor (SQT),” “Smart Work Zone Mobile Video Camera/Queue Sensor Trailer (SVQS)” and “Smart Work Zone Variable Message Sign/Queue Sensor Trailer (SVMQ)” which price shall include queue trailer and sensor, camera/queue sensors and trailers, variable message signs, sensors and trailers, cloud hosted third party traffic speed data, processed rock, temporary license plates, solar panels, batteries, removal, travel, and all materials, equipment, tools and labor incidental thereto.

3. Payment for accepted SQT Service, SVMQ Service, and SVQS Service items shall include all operational and service costs directly related to the furnishing and installing individual trailers and trailer-mounted equipment including, but not limited to, cellular communications, programming, service, maintenance, cleaning, repair, and all materials, equipment, tools, and labor incidental thereto.
4. Payment for uninterrupted SWZ operations as specified will be at the Contract unit price per month for “Smart Work Zone Operations” which price shall include all operations and maintenance costs not directly related to the individual trailers and trailer mounted equipment including, but not limited to, website operations, data collection and travel delay costs calculations, programming, system integration, maintenance, repair, and all materials, equipment, tools and labor Cost for hosting a web site incidental thereto.
5. Payment for approved relocation of SQT, SVQS and SVMQ units will be at the Contract unit price for each “Smart Work Zone Trailer Relocation” which price shall include processed rock, website revisions, and all materials, equipment, tools and labor incidental thereto.
6. The contractor shall provide the project SWZ Operational Data reports on spreadsheets in Microsoft Excel format on a monthly basis to the Engineer. The operational data reports shall include historical and real time data for the following:
 - Work Zone Travel Time
 - Work Zone Travel Speed
 - Work Zone Traffic Volume
 - Work Zone Travel Delay and Queue Length (if Available)
 - Work Zone User Delay Cost

The data on the spreadsheets, in 15 minute intervals, shall include the directional Average Daily Travel Time (minutes), Average Travel Speed (mph), and Average Daily Traffic Volume (vehicles/hr.).

Historical baseline (preconstruction phase) data shall be used to establish the benchmark for comparison with the actual real time (construction phase) data for assessment of the work zone mobility impacts. The baseline data should be collected a minimum of two (2) weeks prior to any construction impacts on the roadway.

The cost of furnishing the monthly Operational Performance Measures report shall be included in the unit price for the Smart Work Zone Operations item.

A template for a spreadsheet in Microsoft Excel format is shown below.

Time Interval (min)	Traffic Volume (vehicles)	Travel Time (min)	Travel Speed (mph)	Queue Length (mil)	Delay Cost (\$)
00:00-00:15					
00:15-00:30					
00:30-00:45					
00:45-01:00					

The pay unit is each that will be paid on a monthly basis for each of the Smart Work Zone Variable Message Sign/Queue Sensor Trailer (SVMQ) and the Smart Work Zone Video Camera/Queue Sensor Trailer (SVQS). The Engineer may remove or add SWZ items by unit at the Engineer’s discretion. The contractor will be notified thirty (30) days in advance by the Engineer. The payment shall be adjusted based on the actual number of SWZ units installed or removed including corresponding operations items.

<u>Pay Item</u>	<u>Pay Unit</u>
Smart Work Zone Deployment	l.s.
Smart Work Zone Operations	mo.
Smart Work Zone Trailer Relocation	ea.
Smart Work Zone Queue Trailer/Sensor (SQT)	ea.
Smart Work Zone Queue Trailer/Sensor (SQT) Service	mo.
Smart Work Zone Variable Message Sign/Queue Sensor Trailer (SVMQ)	ea.
Smart Work Zone Variable Message Sign/Queue Sensor Trailer (SVMQ) Service	mo.
Smart Work Zone Video Camera/Queue Sensor Trailer (SVQS)	ea.
Smart Work Zone Video Camera/Queue Sensor Trailer (SVQS) Service	mo.

ITEM #1206023A – REMOVAL AND RELOCATION OF EXISTING SIGNS

Section 12.06 is supplemented as follows:

Article 12.06.01 – Description is supplemented with the following:

Work under this item shall consist of the removal and/or relocation of designated side-mounted extruded aluminum and sheet aluminum signs, sign posts, sign supports, and foundations where indicated on the plans or as directed by the Engineer. Work under this item shall also include furnishing and installing new sign posts and associated hardware for signs designated for relocation.

Article 12.06.03 – Construction Methods is supplemented with the following:

The Contractor shall take care during the removal and relocation of existing signs, sign posts, and sign supports that are to be relocated so that they are not damaged. Any material that is damaged shall be replaced by the Contractor at no cost to the State.

Foundations and other materials designated for removal shall be removed and disposed of by the Contractor as directed by the Engineer and in accordance with existing standards for Removal of Existing Signing.

Sheet aluminum signs designated for relocation are to be re-installed on new sign posts.

Article 12.06.04 – Method of Measurement is supplemented with the following:

Payment under Removal and Relocation of Existing Signs shall be at the contract lump sum price which shall include all extruded aluminum and sheet aluminum signs, sign posts, and sign supports designated for relocation, all new sign posts and associated hardware for signs designated for relocation, all extruded aluminum signs, sheet aluminum signs, sign posts and sign supports designated for scrap, and foundations and other materials designated for removal and disposal, and all work and equipment required.

Article 12.06.05 – Basis of Payment is supplemented with the following:

This work will be paid for at the contract lump sum price for “Removal and Relocation of Existing Signs” which price shall include relocating designated extruded aluminum and sheet aluminum signs, sign posts, and sign supports, providing new posts and associated hardware for relocated signs, removing and disposing of foundations and other materials, and all equipment, material, tools and labor incidental thereto. This price shall also include removing, loading, transporting, and unloading of extruded aluminum signs, sheet aluminum signs, sign posts, and sign supports designated for scrap and all equipment, material, tools and labor incidental thereto.

<u>Pay Item</u>	<u>Pay Unit</u>
Removal and Relocation of Existing Signs	L.S.

ITEM #1208931A – SIGN FACE - SHEET ALUMINUM (TYPE IX RETROREFLECTIVE SHEETING)

Section 12.08 is supplemented and amended as follows:

12.08.01—Description:

Add the following:

This item shall also include field testing of metal sign base posts as directed by the Engineer.

12.08.03—Construction Methods:

Delete the last sentence and add the following:

Metal sign base posts shall be whole and uncut. Sign base post embedment and reveal lengths shall be as shown on the plans. The Contractor shall drive the metal sign base posts by hand tools, by mechanical means or by auguring holes. If an obstruction is encountered while driving or placing the metal sign base post, the Contractor shall notify the Engineer who will determine whether the obstruction shall be removed, the sign base post or posts relocated, or the base post installation in ledge detail shall apply. Backfill shall be thoroughly tamped after the posts have been set level and plumb.

Field Testing of Metal Sign Posts: When the sign installations are complete, the Contractor shall notify the Engineer the Project is ready for field testing. Based on the number of posts in the Project, the Engineer will select random sign base posts which shall be removed by the Contractor for inspection and measurement by the Engineer. After such inspection is completed at each base post location, the Contractor shall restore or replace such portions of the work to the condition required by the Contract. Refer to the table in 12.08.05 for the number of posts to be field tested.

12.08.04—Method of Measurement:

Add the following:

The work required to expose and measure sign base post length and embedment depth using field testing methods, and restoration of such work, will not be measured for payment and shall be included in the general cost of the work.

12.08.05—Basis of Payment:

Replace the entire Article with the following:

This work will be paid for at the Contract unit price per square foot for “Sign Face - Sheet Aluminum” of the type specified complete in place, adjusted by multiplying by the applicable Pay Factor listed in the table below. The price for this work shall include the completed sign, metal sign post(s), span-mounted sign brackets and mast arm-mounted brackets, mounting hardware, including reinforcing plates, field testing, restoration and replacement of defective base post(s), and all materials, equipment, and work incidental thereto.

Pay Factor Scale: Work shall be considered defective whenever the base post length or base post embedment depth is less than the specified length by more than 2 inches. If the number of defects results in rejection, the Contractor shall remove and replace all metal sign base posts on the Project, at no cost to the Department.

Number of Posts to be Tested and Pay Factors (Based on Number of Defects)

Number of Posts in Project =>	51-100	101-250	251-1000	>1000
Sample Size=>	5 Posts	10 Posts	40 Posts	60 Posts
0 Defects	1.0	1.0	1.025	1.025
1 Defect	0.9	0.95	0.975	0.983
2 Defects	Rejection	0.9	0.95	0.967
3 Defects	Rejection	Rejection	0.925	0.95
4 Defects	Rejection	Rejection	0.9	0.933
5 Defects	Rejection	Rejection	Rejection	0.917
6 Defects	Rejection	Rejection	Rejection	0.9
7 or more Defects	Rejection	Rejection	Rejection	Rejection

Note: Projects with 50 or fewer posts will not include field testing

ITEM #1302053A – RESET WATERGATE

DESCRIPTION: This item shall consist of the removal, resetting, adjustment and reinstallation of the water gate boxes in accordance with the dimensions and details located on the plans, specifications or as directed by the Engineer or the Middletown Water and Sewer Department. The Middletown Water and Sewer Department shall be notified prior to any work on or around the water facilities at (860) 638-3500.

MATERIALS: If required the Contractor may be furnished Middletown Water and Sewer Department standard water gate boxes and associated parts. All additional materials including backfill and resurfacing material shall be furnished by the Contractor.

CONSTRUCTION METHODS: Water gate boxes and any associated appurtenances shall be carefully removed, re-installed, reset and adjusted to the final grade. The Contractor shall have the Middletown Water and Sewer Department operate all valves to demonstrate the proper operation of any associated water facilities to the satisfaction of the Engineer and Middletown Water and Sewer Department. All gate boxes shall be left free of all debris or matter that may interfere with the proper operation of associated water facilities. Gate boxes shall be installed vertically, centered over the operating nut, and the elevation of the top shall conform to the finished grade of roadway or other surrounding surface.

Any damage done to the Middletown Water and Sewer Department facilities by the Contractor shall be repaired or replaced by the Contractor at his expense.

METHOD OF MEASUREMENT: This work will be measured for payment by the actual number of water gate boxes reset, each, and accepted by the Engineer and the Middletown Water and Sewer Department.

BASIS OF PAYMENT: This work will be paid for at the contract unit price per each as measured and accepted. This price shall include all equipment, labor and incidentals required to accomplish the work required under this item.

Pay Item	Pay Unit
Reset Watergate	ea.

ITEM #1301081A – 6” DUCTILE IRON PIPE (WATER MAIN)**ITEM #1303196A – RELOCATE FIRE HYDRANT**

Description: The Work under this Section shall consist furnishing materials for the removal, resetting, pressure testing, disinfecting and preparation of as-built plan for the resetting of the existing fire hydrant as shown on the Contract Drawings.

Materials: All materials and workmanship, whether or not specifically described or shown, or whether implied, shall be only first quality new and of a grade satisfactory to the City of Middletown Water and Sewer Department. The City of Middletown Water and Sewer Department shall have the right to reject any part of the work in case the materials or workmanship is not of satisfactory quality. The Contractor shall replace the same with acceptable work or materials at his own expense. All materials shall conform to the requirements of the City of Middletown “General Requirements Water Main and Service Installation dated January 2017”.

1. Ductile Iron Pipe, Joints, Fittings and Specials: All buried ductile iron pipe shall be mechanical joint as shown on the contract drawings, conforming to AWWA/ANSI C151/A21.51 (latest revision) and shall be CLASS 52 (Rated Working Pressure of 250 psig) with a MINIMUM Factor of Safety of 1.50. All fittings shall conform in all respects to AWWA Standard C110, latest revision. All ductile iron pipe, fittings, or specials shall be clearly marked on the outside surface with the class, thickness class designation and initials of manufacturer, in accordance with AWWA C151.

All valves shall be mechanical joint with retaining glands, EBAA Megalug.

Ductile iron pipe and accessories shall conform to the following additional requirements:

Laying Length: 18 Feet
 Thickness Class: 52
 Joint Type: “TR Flex” type joints and Mechanical Joints.
 Interior Surface: Cement Lined, Seal Coat.
 Exterior Surface: Asphaltic Coating
 Field cut piping: Restraint of field cut pipe shall be provided with factory manufactured fittings or pipe couplings or spool pieces and retainer glands.

Fittings for water mains shall conform in all respects to AWWA Standard C110, latest revision, and to the additional requirements specified herein.

Fittings and accessories shall conform to the following additional requirements specified herein:

Joint Type: Mechanical with retaining glands and split retaining glands.
 Pressure Rating: 350 psi

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Type of Iron: Ductile
 Interior Surface: Cement Lined, Seal Coat.
 Exterior Surface: Asphaltic Coating

Cement mortar lining for pipe, fittings, as specified above shall conform in all respects to AWWA Standard C104 (latest revision). Lining thickness shall be that specified in Section 4.7.1 of AWWA Standard C104. Seal coat shall be that specified in Section 4.11 of AWWA Standard C104.

Rubber gasket joints for the water main pipe and fittings, as specified above, shall conform to AWWA Standard C111 (latest revision).

Pipe couplings shall be installed where required for connection to existing work and as shown on the Drawings. Pipe couplings shall be solid sleeves giving a watertight seal suitable for water pressure to 250 psi, as approved by the City of Middletown Water and Sewer Department.

All pipe, pipe fittings, accessories and appurtenances shall be new and unused.

All bolts, nuts, rods, and miscellaneous connecting pieces not provided with an approved factory coating shall be given two (2) coats of bitumastic coal-tar after installation.

2. Gate Valve: Gate Valves shall conform in all respects to AWWA Standard C509, C550 and C111 (latest revision).

Resilient Seat Gate Valves shall incorporate the following features:

Type of Valve Ends:	Mechanical Joint with retainer glands
Type of Gate:	Resilient Seat
Type of Stem Seal:	Double O-Rings
Type of Mounting:	Iron Body, Bronze Mounted
Type of Stem:	Bronze, Non-rising
Type of Gaskets:	Mechanical Joint Gasket
Minimum Rated Working Pressure:	250 psi
Direction of Operating Nut Opening Rotation:	Open-Right
As a minimum the inside of the valve body and bonnet are to be coated with a fusion bonded epoxy in accordance with ANSI/AWWA C550, latest revision.	

Wrench Nuts shall be 2"x 2" conforming to Section 19 of AWWA C-509 (latest revision).

3. Valve Box: Valve boxes shall be 5 - 1/4" buffalo type, cast iron, two piece, slip type, with a flange located approximately 2" from the top of the valve box, suitable for the size valve on which they are used.

Covers shall be cast iron, marked "WATER", with two notched openings.

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Valve boxes and covers shall be United States made only.

Valve boxes shall be centered over the operating nut of the valve and set to be flush at final pavement or finished grade.

Valve boxes shall be of good quality cast iron free from all defects in material and workmanship and shall be coated with coal-tar pitch enamel or other approved coating.

4. Valve Box Adaptor: Shall be Valve Box Adaptor II by Adaptor, Inc for all valve and gate boxes.

5. Insertion and Gate Valve: Insertion Valves shall be extra heavy pattern designed to withstand the strains of making wet tap connections and they shall be of sizes suitable for use on the pipe on which the respective sleeve is to be installed and for use with the tapping valves. Tapping sleeves shall be Mueller Mechanical Joint Tapping Sleeve H-615 on all tapes that are the same size as the main, or approved equals as approved by the City of Middletown Water and Sewer Department.

All other tapping sleeves shall be Smith Blair 622 or 625 Tapping Sleeves or approved qual. Outlet flanges shall be mechanical joint.

Mechanical joint nuts and bolts are to conform to ANSI/AWWA C111/A21.11-00. Inside and outside of all tapping sleeves to be coated in accordance with AWWA Standards for the exterior of Ductile Iron Fittings ANSI/AWWA C153/A21.55-00 Section 4.3.

Tapping valves shall be furnished with mechanical joint ends. Valves are to be provided with a full face red rubber gasket and square shank tee head bolts.

Except for as modified herein, tapping valves shall be as specified in VALVE Section of the Specifications.

6. Mechanical Air Release Assembly: Air release assembly shall include all components shown on the contract drawings and in accordance with the City of Middletown Water and Sewer Department requirements.

Assembly shall include necessary insulation kit to allow removal for access to air release.

7. Blow-off Assembly: Blow-off assembly shall include all components shown on the contract drawings and in accordance with the City of Middletown Water and Sewer Department requirements.

8. Fire Hydrants: Hydrants shall be Mueller Super Centurion 250 – A421. Pressure rating shall not be less than 250 psi. OPEN LEFT, counterclockwise, and shall have one steamer connection,

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4-1/2-inch diameter NST and two 2-1/2-inch diameter NST hose connections. Finish shall be factory painted John Deere Green on bonnet and caps and John Deere yellow for the remainder.

9. 3/4" Crushed Stone: Shall be Form 817 M.01.01, Gradation No 67 and M.02.01.1 for crushed stone.

10. Course Sand: Shall be Form 817, M.03.01.2 – Fine Aggregate

11. Select Backfill: Shall be Form 817, M.02.01 for Bank Run Gravel Meeting M.02.06, Grading C

12. Grout: Shall be Form 817, M.03.05

13. Retainer Glands: Shall be Megalug by EBAA Iron with twist off set screws.

14. Filter Fabric: Shall be Form 817, Section 7.55 and M.08.01-19

Construction Methods:

1. Quality Assurance and Submittals: The Contractor shall furnish to the Engineer manufacturer's notarized test reports and methods of test to show compliance with all specification requirements, and notarized certificates of conformance stating that all materials to be furnished under this Section of the Specifications conform with all specification requirements, and each shipment of pipe, fittings, joints and gaskets and accessories meet all requirements of the Specifications.

The Contractor shall furnish to the State manufacturer's written transcripts in accordance with Section 51-14 of AWWA Standard C151, latest revision.

Qualifications of the Installer: Only thoroughly trained and experienced personnel who are completely familiar with the requirements for this work shall be involved with the work. Personnel must be capable of carrying out the recommendations of the manufacturer of the piping, valves, fittings, specials, and appurtenances for the proper installation procedures.

Comply with State and local controlling authority requirements for materials, installation, fire protection, testing, disinfection and connection to existing water mains.

Comply with NFPA 24 for fire-protection water main piping materials and installation.

Laboratory test reports for disinfection of water main and appurtenances.

Test reports for hydrostatic leakage tests shall be submitted to the City of Middletown Water and Sewer Department.

Certificates shall attest that tests set forth in each applicable referenced publication have been performed, whether specified in that publication to be mandatory or otherwise and that production control tests have been performed at the intervals or frequency specified in the publication. Other tests shall have been performed within three (3) years of the date of submittal of certificates on the same type, class, grade, and size of material as is being provided for the project.

Contractor shall have the pipe supplier prepare and shall submit to the City of Middletown Water and Sewer Department and the Department a "LAYING SCHEDULE" and "SEQUENCE OF CONSTRUCTION" of all pipe and accessories to be furnished and installed under this Contract. No work shall be undertaken until the laying schedule has been submitted to and reviewed by the City of Middletown Water and Sewer Department.

2. Sequencing and Scheduling: Coordinate connection to existing gate valve with the City of Middletown Water and Sewer and the Department.

All necessary operations of existing valves required for the work of this contract will be made by the City of Middletown Water and Sewer Department at its own expense. The Contractor shall be responsible for notifying the City of Middletown Water and Sewer Department a minimum of 48 hours in advance of any desired valve operations. The Contractor shall be responsible for notifying the affected residents a minimum of 10 days in advance of any planned service interruption.

3. Delivery, Storage and Handling: Inspect materials delivered to site for damage. Unload and store with minimum handling. Store materials on site in enclosures or under protective covering. Store jointing materials and rubber gaskets under cover out of direct sunlight. Do not store materials directly on the ground. Keep inside of pipes and fittings free of dirt and debris.

Handle pipe, fittings, and other accessories in a manner to ensure delivery to the site in sound undamaged condition. Take special care to avoid injury to coatings and linings on pipe and fittings and make satisfactory repairs if coatings or linings are damaged. Carry, do not drag, pipe. Store jointing materials and rubber gaskets that are not to be installed promptly, under cover out of direct sunlight.

The Contractor shall furnish to the City of Middletown Water and Sewer Department, copies of the printed recommendations of the pipe manufacturer for the handling, storing, protection and installation of pipe, fittings and valves.

All materials found to be defective during the process of the work will be rejected by the City of Middletown Water and Sewer Department and the Contractor shall promptly remove such defective material from the job site. All defective material shall be replaced by the Contractor with new sound material at no additional expense to the City of Middletown Water and Sewer Department and the State. The Contractor shall be responsible for the safe storage of all material.

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4. Excavation: Perform trench excavation operations as specified with Form 817 Section 2.05 "Trench Excavation".

5. Bedding: Install pipe on coarse sand compacted to a minimum depth of 6 inches beneath the pipe, unless otherwise noted. Carefully tamp bedding material around the installed pipe to a depth equal to the spring line of the pipe. Continue placing and coarse sand bedding material, compacted as above, to the top of the pipe. Backfill to a height of 12 inches above the top of the pipe with coarse sand bedding material.

The remaining trench area shall then be backfilled and compacted with select backfill material or suitable approved material in accordance with Section 2.02 Roadway Excavation, Formation of Embankment and Disposal of Surplus Material.

6. Pipe, Fittings and Accessories: The top of the water pipe shall be 4'- 6" minimum below grade based on final roadway surface. Install piping free of sags.

Each pipe shall be laid true to line and grade and in such manner as to form a close concentric joint with the adjoining pipe and to prevent sudden offsets in the grade line. No spalls, shims or lumps shall be used to raise the pipe to grade. All pipe shall be maintained accurately to the required line and grade. Any pipe that has the grade or joint disturbed after laying shall be relayed.

Trenches shall be kept free from water so as to prevent flotation of the pipes. Pipelines shall be constructed in dry trenches and shall not be laid when the condition of the trench or the weather is unsuitable for such work. An adjustable, water tight, removable plug, shall be provided and placed on the open end of the newly layed pipe when pipe is not being placed. At times when work is not in progress, open ends of pipe and fittings shall be securely closed so that no trench water, earth or other substance will enter the pipe or fittings. Pipes shall not be used as conductors for trench drainage during construction.

Pipe and fitting joints shall be extended after installing the locking segments and prior to setting the joint deflection to minimize expansion during pressurization, in accordance with the manufacturer's written instructions. Maximum joint deflection is 4 degrees.

Jointing of mechanical joint specials, fittings, and valves shall be provided in accordance with the printed recommendations of the pipe manufacturer and as specified. The mechanical joint fittings, specials and valves shall be suitable for jointing with the pipe with which they are used and the Contractor shall provide, at no additional expense to the State, all necessary adapters for the proper jointing of pipe, pipe fittings, specials, and valves. The last eight 8" inches of the outside of the spigot end of pipe and the inside of the bell of the mechanical joint shall be thoroughly cleaned to remove all oil, grit and other foreign matter from the joint. When assembling joint, the gland shall be brought into place and bolts tightened in a manner to insure the maintaining of the same space between the gland and the face of the flange at all points

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around the socket. The range of bolt torque in making up joints shall be as recommended by the manufacturer of the mechanical joints.

Overstressing of bolts will not be permitted; if effective sealing is not obtained at the recommended maximum bolt torque, the joint shall be disassembled, thoroughly cleaned and reassembled. Bolts shall be checked in the presence of the Engineer with a torque wrench approved by the City of Middletown Water and Sewer Department.

All fittings shall be anchored to prevent any movement of the fittings or the adjacent pipe. This anchorage shall be provided by the installation of Portland Cement concrete thrust blocks, anchor blocks or retainer glands as shown on the Drawings and where and as directed by the Engineer. Contractor shall verify extent of anchorage required with Engineer prior to piping assembly. Joints within 50 feet of a fitting or valve shall be restrained for two pipe joints on either side of the fitting or valve. Hand excavation may be required to excavate for the concrete thrust blocks, the shape and size of which shall be in accordance with contract drawings. The Engineer may require concrete to be placed at points on the pipeline other than at fittings. All concrete used for thrust restraint shall be exposed for at least sixteen (16) hours before being covered.

Air Release assemblies shall be installed in accordance with the City of Middletown Water and Sewer Department requirements and Contract Drawings.

7. Valves: The valve installations shall not be made when trench or weather conditions are unsuitable for the work. All excavations and valve structures shall be kept free of water during installation of the valves and jointing operations and for such additional lengths of time as may be required to insure the satisfactory installation of the valve assemblies and appurtenant work.

The Contractor shall make the necessary excavations, as directed, to uncover existing work for the purpose of determining, by the Engineer, the exact locations of all connections of new work to existing work. Connections of new work to existing appurtenances shall be provided in accordance with the printed recommendations of the respective manufacturer and as approved by the Engineer.

Before installation, the Contractor shall carefully inspect the materials for defects and no materials shall be installed which are known to be defective in any way. All new valves shall be fully opened and then closed to verify proper operation. All materials found to be defective before or after installation will be rejected and shall be replaced by the Contractor with new, sound and approved material at no additional expense to the State. The Contractor shall be responsible for verifying in the field all lines, grades, dimensions and conditions and for the correct fittings of all parts prior to the order of materials and parts. Before jointing, all lumps, blisters and excess coating material shall be removed from the joint surfaces. All oil or grease shall be removed. The joint surfaces shall be wire-brushed and wiped clean and dry.

Valve boxes shall be provided for all valves and they shall be set plumb. Valve Box Adaptor II shall be placed between the valve operating nut and the valve box. Valve boxes shall be centered

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on the valve operating nut so that it may be operated with a valve wrench. Care shall be taken that no part of the riser section and its pad shall bear on any part of the valve. Provision shall be made to keep any stones, mud or debris from entering the riser section during and after backfilling. Any blockage of the box shall be remedied by the Contractor at his own expense. Valves and riser section shall be flush with the finished surface of the pavement. Valve nut shall be 2 to 3-1/2 feet below finished grade. Proved gate valve stem extension with 2" x 2" operating nut as needed. The bottom of the cover shall have a minimum clearance of 3 inches from the top of the riser pipe.

Pipe bedding shall be carefully tamped under and around the valve box riser section and pad, and compaction will extend to a distance of at least four feet in locations of continuous trenching, elsewhere to the undisturbed trench face in each direction.

Jointing of mechanical joint valves and accessories shall be provided in accordance with the printed recommendations of the manufacturer as specified. The mechanical joint valves shall be suitable for jointing with the pipe with which they are used and the Contractor shall provide, at no additional expense to the State, all necessary adapters for the proper jointing of the pipe, flexible couplings, pipe fittings, specials and valves.

8. Reset Fire Hydrant: Existing fire hydrant assembly shall be relocated as shown on the drawings. Fire hydrant supply shall be extended in accordance with City of Middletown Water and Sewer Department requirements. The existing gate valve, gate lacing or retainer, valve box and gate box shall be maintained.

The Contractor shall make the necessary excavations, as directed, to uncover existing work for the purpose of determining, by the Engineer, the exact locations of all connections of new work to existing work. Connections of new work to existing appurtenances shall be provided in accordance with the printed recommendations of the respective manufacturer and as approved by the Engineer.

Before installation, the Contractor shall carefully inspect the existing fire hydrant for defects and no materials shall be installed which are known to be defective in any way. At which point all materials found to be defective before or after installation will be rejected and shall be replaced by the Contractor with new, sound and approved material at no additional expense to the State or the City. The Contractor shall be responsible for verifying in the field all lines, grades, dimensions and conditions and for the correct fittings of all parts prior to the order of materials and parts. Before jointing, all lumps, blisters and excess coating material shall be removed from the joint surfaces. All oil or grease shall be removed. The joint surfaces shall be wire-brushed and wiped clean and dry.

9. Disinfection: The Contractor shall disinfect the water main in accordance with the procedure outlined in the AWWA Standard for Disinfecting Water Mains, Designation C651. Bacteriological testing shall be performed per City requirements. Samples can only be collected on Wednesdays.

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The contractor may secure-in-place chlorine tablets during installation to obtain a minimum chlorine concentration of 25 ppm for a duration of 48-hours. Alternative the contractor may continuously inject a chlorine solution or use granulated powder to acquire a minimum concentration of 50 ppm.

Granulated powder may be placed in the piping during installation or liquid chlorine can be injected through a corporation cock after installation until a concentration of 50 ppm is maintained for a minimum of 24-hours. The highly chlorinated wastewater shall be discharged to the sanitary sewer. This procedure must meet or exceed the AWWA standard C651.

If the water main does not meet the requirements of the bacteriological test, water required for subsequent disinfections, disinfection and tests shall be provided by the Owner at the Contractor's expense.

10. Hydrostatic Testing: The Contractor shall perform a hydrostatic test the water main. The Contractor shall furnish all labor, equipment, and materials for testing.

The test pressure shall be 200 psi. The test pressure shall be maintained for at least 2 hours, during which time the leakage shall not exceed the allowable leakage as tabulated in AWWA C600. The hydrostatic test shall be conducted in the presence of the City of Middletown Water & Sewer Department.

All visible leaks shall be made tight and, if the line does not meet the above leakage test, it shall be repaired and retested until the leakage requirement is met.

All defective work shall be repaired or replaced at the expense of the Contractor. If the line does not meet the requirements of the leakage test, water required for subsequent tests shall be provided by the City at the Contractor's expense.

All costs for performing the hydrostatic test including pumps, gauges, water and other work and materials required shall be considered part of water main installation.

11. As-Builts: Upon completion of work, 12 inch by 30 inch as-built drawings shall be furnished to the Water & Sewer Department for review and approval. Upon approval contractor shall provide mylar prints and electronic copies in PDF and AUTOCAD formats.

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

- A. "6" Ductile Iron Pipe" shall be measured for payment by the "linear feet" along the centerline of the pipe, measured through all fittings and valves in the line.
- B. "Reset Existing Fire Hydrant" shall be measured for payment per unit "each" complete in place and accepted by the State.

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Basis of Payment:

- A. The quantity of “Ductile Iron Pipe (Water Main)”, measured in place as provided above, will be paid for at the Contract unit price bid per “linear foot” including retainer glands, fittings, thrust blocks, connections to existing water mains, modular mechanical rubber seal rings, field installed joint restraint, field cutting of pipe, pipe marking tape, galvanized encasement of water main, trench excavation, backfill, pipe bedding, compaction, saw cutting of the existing pavement, test pits, hydrostatic testing, disinfection, tools, equipment, and labor incidental to complete the installation.
- B. The quantity of “Reset Existing Fire Hydrant”, measured in place as provided above, will be paid for at the Contract unit price bid per “each” including fittings, couplings, removal, storage, reset, tool, equipment and labor incidental to complete the installation of the fire hydrant. Megalug retaining glands and thrust blocks shall not be paid for under this item, but shall be considered as included in the linear foot payment for the water main pipe.

<u>PAY ITEM</u>	<u>PAY UNIT</u>
6” Ductile Iron Pipe (Water Main)	l.f.
Reset Existing Fire Hydrant	ea.

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ITEM #1403501A – RESET MANHOLE (SANITARY SEWER)

Work under this item shall conform to the applicable provisions of Section 5.07 of the Standard Specification Form 817 amended as follows:

Sub-Article 5.07.05-5:

Add the following “Reset Manhole (Sanitary Sewer)”:

Description: The Contractor shall adjust to final grade the manhole frames and covers of the Sanitary Manhole as shown, specified or directed. Also included is furnishing and lowering manhole riser sections and brick masonry, where indicated on the plans, or as directed by the Engineer.

Materials:

BRICK UNITS – Shall conform to ASTM C-32, Grade MS

MORTAR – Shall conform to Section M.11

MANHOLE RISER SECTIONS – Shall conform to ASTM C-478 and have two coats of bituminous water proofing material on the exterior surface.

ALUMINUM MANHOLE RUNGS – Shall be fabricated from 6061-T6 aluminum alloy as manufactured by ALCOA, or equal.

FLEXIBLE JOINT SALANT – Shall be Kent Seal No. 2, or equal.

Construction Methods:

The Contractor shall carefully excavate the manhole frame and cover and add or delete brick masonry, block masonry or manhole risers as necessary to reset frame and cover to final grade.

The present cover slab or cone section may be reused if it is not damaged, in which case it shall be replaced by the Contractor as his expense.

The Contractor may be required to “unstack” the existing cone section so that riser sections can be added or deleted. Flexible joint sealant shall be installed between pre-cast sections to produce a water proof joint.

Any material damaged by the Contractor shall be repaired or replaced by the Contractor at no cost.

Forty-eight (48) hours prior to resetting manhole frames and covers, the Contractor shall notify the City of Middletown, Water and Sewer Department, to schedule inspections of the existing manhole frames and covers that are to be reset. If during the inspection it is determined that the existing frames and covers are broken or worn to the point that they should be replaced, the City will furnish new frames and covers for installation by the Contractor.

Method of Measurement: This work shall be measured for payment by the number of manholes (sanitary sewer) adjusted to grade and accepted by the Engineer.

Basis of Payment: This work shall be paid for at the contract unit price each bid for “Reset Manhole (Sanitary Sewer)” complete in place, which price shall include all labor and equipment to incorporate manhole into the work. It shall also include the clearing, trenching and disposal of excavated materials, refilling trenches, furnishing the additional material for refilling, grading, sheeting, bracing, pumping and temporary and permanent resurfacing of disturbed areas. All excavation, disposal of surplus material and refill materials necessary to adjust the manhole frame and cover will be considered as included in the unit price bid.

Pay Item	Pay Unit
Reset Manhole (Sanitary Sewer)	ea.

ITEM #1507000A – PROTECTION AND SUPPORT OF EXISTING UTILITIES

Description:

Work under this item shall consist of designing, furnishing, placing and subsequently removing temporary supports and protection shields which will be necessary to protect and/or stabilize the existing utilities during construction. Crown Castle has facilities underneath the south sidewalk of the bridge that will be affected. The affected utilities include a cable in conduit. The maximum unsupported length of these utilities shall be ten feet. It is the Contractors responsibility to ensure proper support.

The work pertaining to the temporary support of the utilities primarily involves the support and prevention of damages which are possible during the construction. This work includes, but is not limited to supporting the existing utility in place while the sidewalk struts and brackets are replaced.

The Contractor is advised that no service interruption resulting from Contractor operations will be allowed, except as otherwise provided for in the Special Provision “Prosecution and Progress.” Extreme caution shall be exercised during all stages of construction in order to preserve the existing utilities. A Department representative shall be present at the installation of the temporary supports. Further attention shall be paid to “Section 1.07 – Legal Relations and Responsibilities.”

The Contractor shall notify the Engineer prior to the start of his work and shall be responsible for all coordination with the Department. The Contractor shall allow the Engineer complete access to the work.

The Contractor is cautioned that it is his responsibility to verify locations, conditions and field dimensions of all existing features, as actual conditions may differ from information indicated on the plans or contained elsewhere in these specifications.

Materials:

The materials for this work shall be of satisfactory quality for the purpose intended and shall be approved by the Engineer. The material shall be intended for use in structures and shall be sound and capable of safely carrying the specified loads.

Construction Methods:

The Contractor shall prepare working drawings and computations showing his proposed method of support and protection for each utility to be supported and protected. Preparation of working drawings and computations shall conform to the requirements of Article 1.05.02. The support shall safely carry all utility dead loads and any imposed loadings under all possible construction

conditions. The utility protection shields shall safely carry any imposed loadings under all possible construction conditions. Said supports and protections shall be constructed in a manner that will not interfere with the proposed construction.

The design shall be submitted to the utility representatives for review and approval. Following approval, the design shall be submitted to the Engineer for final approval at least three (3) weeks prior to the beginning of construction. No work will be allowed in the vicinity of any utility until the Contractor receives approval of his support method from the utility representative and the Engineer.

The Contractor shall use every effort to protect all utilities from damage of any nature which might result from carelessness or negligence in his operations. He shall be held solely and strictly responsible for any damage resulting from such carelessness and negligence.

A periodic inspection of the temporary utility support and protection shall be performed by the Contractor, as directed by the Engineer.

The Contractor shall support and maintain the existing utilities until the proposed construction has been completed to a point where removal of the supports will not cause damage to the protected utility.

When the temporary utility support and protection systems are no longer required, they shall be removed from the site by the Contractor.

Method of Measurement:

This work, being paid for on a lump sum basis, will not be measured for payment.

Basis for Payment:

The work will be paid for at the contract lump sum price for “Protection and Support of Existing Utilities” which price shall include designing and detailing all supports and protection shields, furnishing, installing, periodic inspection, removing supports and protection shields, coordinating work with the utility companies, and all materials, equipment, tools and labor incidental thereto.

Pay Item

Pay Unit

Protection and Support of Existing Utilities

l.s.

PERMITS AND/OR REQUIRED PROVISIONS:

The following Permits and/or and Required Provisions follow this page are hereby made part of this Contract.

- **PERMITS AND/OR PERMIT APPLICATIONS**

General Permit for Coastal Maintenance
U.S. Coast Guard Construction Letter
Flood Management General Certificate

Approval Date: October 26, 2015
Approval Date: December 10, 2018
Approval Date: January 18, 2019

- **Construction Contracts - Required Contract Provisions (FHWA Funded Contracts)**

General Permit for Coastal Maintenance

DEEP-OLISP-GP-2015-02

Issuance Date: October 26, 2015
Expiration Date: October 26, 2035

Bureau of Water Protection and Land Reuse
Office of Long Island Sound Programs
860-424-3034

General Permit for Coastal Maintenance

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General Permit for Coastal Maintenance

Section 1. Authority

This general permit is issued under the authority of section 22a-361(d) of the General Statutes.

Section 2. Definitions

As used in this general permit:

“Adverse impacts on coastal resources” means adverse impacts on coastal resources as defined by section 22a-93(15) of the General Statutes.

“Ancillary structures” means structures which facilitate boating access or support including utility lines such as fuel, waste, water, electric and cable, and berthing devices such as bollards, cleats, dock hooks, fenders and davits.

“Approval of registration” means an approval of registration issued under Section 4 of this general permit.

“Authorized activity” means any activity authorized by this general permit.

“Backflow prevention structure” means a device such as a flap gate or duck bill that allows water to drain out from a closed water discharge system and prevents backflow of tidal water into a closed water discharge system.

“Beach grading” means the redistribution and regrading of on-site beach sand between mean low water and the coastal jurisdiction line without the nourishment or addition of any off-site beach sand or other material.

“Beach raking” means the use of motorized equipment and any associated implements on a beach below the coastal jurisdiction line for the purpose of removing macroalgae, stones, shells or other natural or unnatural debris.

“Boat launch infrastructure” means boat launch ramps, docks, gangways, approaches, aprons, drainage structures, erosion control, pavement or any other structures or features associated with the launching of vessels at public boat launch facilities.

“Boating access or support” means moorings, fixed or floating docks, gangways or piles specifically utilized for the following recreational activities: berthing, accessing, loading, repairing, launching, hauling, fueling or discharging waste from boats.

“Catch basin” means a stormwater system structure in which grit, sand, sediment or debris is collected.

“Catch basin cleaning” means removal of grit, sand, sediment or debris from a catch basin by use of a vacuum, backhoe, shovel, or other device.

“Closed water discharge system” means a piping system that discharges stormwater

originating from an upland area to an area below the coastal jurisdiction line and is not connected on the landward side to any tidal wetlands.

“Coastal habitat creation” means to bring into existence a habitat that was not historically supported at the site in question including the conversion of an existing habitat in favor of a new habitat.

“Coastal habitat enhancement” means the intentional alteration of a habitat to improve one or a very limited number of functions of the existing habitat type.

“Coastal jurisdiction line” means coastal jurisdiction line as defined by section 22a-359(c) of the General Statutes.

“Coastal resources” means coastal resources as defined by section 22a-93(7) of the General Statutes.

“Coastal restoration activities” means the intentional alteration of a site to reestablish the approximate biogeophysical conditions that existed in the predisturbance ecosystem or habitat and, for the purposes of this general permit, shall include coastal habitat creation and coastal habitat enhancement. Such activities include, but are not limited to, open marsh water management activities, ditching, pond creation, raising marsh surface elevation, mowing, planting, removal of vegetation, the placement, repair or removal of tide regulating structures, and the installation or repair of fish bypass systems.

“Commissioner” means commissioner as defined by section 22a-2(b) of the General Statutes.

“Cultch” means a substrate appropriate for larval oyster attachment, consisting of gravel or shell material.

“Day” means the calendar day; if any date specified in the general permit falls on a Saturday, Sunday, or legal holiday, such deadline shall be the next business day thereafter.

“Department” means the department of energy and environmental protection.

“Department of Energy and Environmental Protection maintenance activities” means repair or replacement of certain appurtenances and facilities associated with the launching or retrieving of boats at State launches.

“Department of Transportation maintenance activities” means rehabilitation, repair, replacement of state-owned and maintained transportation infrastructure and appurtenances such as highways, roadways, bridges, and railways, and associated supporting and protective structures integral to the use and functionality of such infrastructure including, but not limited to, temporary accessways, stormwater-related structures, bridge piers, decks and abutments, mechanical, electrical or operational structures or workhouses.

“Derelict structure” means any flotsam, structure or vessel, or component thereof, that has been abandoned or deserted, is no longer capable of functioning as intended, or is impeding navigation.

“Dock” means an elevated or floating structure comprised of an open fixed pile-supported pier, gangway, or float, or any part or combination thereof, including all associated previously authorized boating-related appurtenances or features including but not limited to piles or pile clusters, boatlifts, utilities, or wave-attenuating devices.

“Individual permit” means a permit or certificate of permission issued to a named permittee under section 22a-361, section 22a-363b, or 22a-32 of the General Statutes.

“Existing inhabited structure” means a house, dwelling, or abode which was in use prior to the effective date of this general permit.

“FEMA” means the Federal Emergency Management Agency.

“FEMA standards” means municipal flood hazard or floodplain ordinances or regulations, approved by FEMA to allow participation of the municipality in the National Flood Insurance Program under the provisions of 44 CFR parts 59 and 60.

“Intertidal flats” means intertidal flats as defined by section 22a-93(7)(D) of the General Statutes.

“Harbormaster” means a harbormaster or deputy harbormaster appointed pursuant to section 15-1 of the General Statutes.

“Licensed shellfish operator” means a person licensed by the commissioner of agriculture to take, harvest, cultivate, produce oysters or other shellfish pursuant to Chapter 491 of the General Statutes.

“Marina boundary” means an area within which reconfiguration activities may occur and which has been established by the commissioner by connecting with straight lines the terminating point of existing authorized in-water boating-access structures including fixed or floating docks, gangways and piles, but excluding dredge footprints, vessels, mooring buoys, navigational markers and property lines.

“Marina reconfiguration” means the placement, replacement, removal or relocation of moorings, fixed or floating docks, piles, ladders, gangways, or finger piers and ancillary structures within an established marina boundary for boating access or support or for seasonal storage of such structures subject to the conditions of this general permit.

“Mean high water” means the average of all high water heights observed over the National Tidal Datum Epoch.

“Mean low water” means the average of all low water heights observed over the National Tidal Datum Epoch.

“Mooring boundary” means an area within which reconfiguration activities may occur and which is established by the commissioner by connecting with straight lines the perimeter of

existing in-water mooring buoys, but excluding dredge footprints, vessels, mooring swing radii, navigational markers, and property lines.

“Mooring reconfiguration” means the placement, replacement, removal or relocation moorings, within an established mooring boundary for boating access or support, exclusive of fixed and floating docks.

“Municipality” means a city, town or borough of the state.

“Non-commercial” means a structure which is (1) not rented and no other charge by the permittee is made for its use or maintenance; and (2) is not operated, maintained, or used by any for-profit entity.

“Order” means any consent order, removal order, cease and desist order, or any other enforcement action taken by the commissioner under authority of sections 22a-6, 22a-7, 22a-108, 22a-178, 22a-181, 22a-225, 22a-428, 22a-430, 22a-431, 22a-432, 22a-433, or 22a-449 of the General Statutes, or under any authority available by law or any enforcement action taken by the U.S. Army Corps of Engineers (“Corps”) or the U.S. Environmental Protection Agency (“EPA”); or any order entered by a state or federal court of competent jurisdiction pursuant to an enforcement action taken by the commissioner, the Corps, or EPA.

“Permittee” means any person or municipality to which the commissioner has issued an approval of registration under this general permit.

“Person” means person as defined by section 22a-2(c) of the General Statutes.

“Prior authorization” means a permit, certificate of permission, or approval of general permit registration issued by the State of Connecticut under section 22a-32, 22a-361, 22a-361(d), or 22a-363b of the General Statutes which was issued before the date of submission of a registration under this general permit.

“Registrant” means a person who or municipality which files a registration pursuant to Section 4 of this general permit.

“Registration” means a registration form filed with the commissioner pursuant to Section 4 of this general permit.

“Remedial activity” means any dredging, construction, placement of fill, obstruction or encroachment or work incidental thereto, or any other work the purpose of which is to restore a site or habitat to its natural condition, to correct a violation of law, to remove an unauthorized structure, fill, obstruction or encroachment, or to conduct remediation as defined by section 22a-133k-1 of the Regulations of Connecticut State Agencies.

“Removal of derelict structure” means the physical removal of derelict structures using hand-held tools or mechanical equipment.

“Repointing” means filling by hand, using hand-held equipment, cracks or weak spots in a seawall with mortar or small stones without increasing the waterward encroachment of the

seawall.

“*Seawall*” means any dry stone or concrete structure, including bulkheads, retaining walls and riprap revetments, the purpose or effect of which is to prevent upland materials from slumping or otherwise entering the area waterward of the coastal jurisdiction line. The term does not include steel, timber, or plastic sheet pile, railroad ties or concrete blocks.

“*Site*” means geographically contiguous land or water on which an authorized activity takes place or on which an activity for which authorization is sought under this general permit is proposed to take place. Non-contiguous land or water owned by the same person and connected by a right-of-way which such person controls and to which the public does not have access shall be deemed the same site.

“*Skim coating*” means, a layer of coating, applied by hand using hand-held equipment, to the face of a seawall not exceeding one inch in thickness.

“*Temporary access of construction vehicles or equipment*” means operation of construction vehicles or heavy equipment, including active equipment or material loading or off-loading via barge, within areas below the coastal jurisdiction line for the purposes of accessing, supporting, or conducting work above the coastal jurisdiction line and otherwise unregulated pursuant to section 22a-361 of the General Statutes.

“*Tidal wetlands*” means wetland as defined by section 22a-29(2) of the General Statutes.

“*Watercourse*” means watercourse as defined by section 22a-38 of the General Statutes.

Section 3. Authorization Under This General Permit

(a) Eligible Activities

Provided the requirements of Section 3(b) of this general permit are satisfied, this general permit authorizes the following activities:

- (1) establishment of a marina boundary and reconfiguration within such boundary, or the establishment of a mooring boundary and reconfiguration within such boundary;**
- (2) remedial activities which have been required by an order as defined in this general permit;**
- (3) modification of an existing inhabited structure which is located in whole or in part waterward of the coastal jurisdiction line and landward of mean high water for the purposes of conforming such structure to FEMA standards;**
- (4) reconstruction of a legally existing structure, obstruction or encroachment which was installed pursuant to a prior authorization and which exists in a serviceable state; and (b) removal of debris and reconstruction of a legally existing structure, obstruction or encroachment which has been damaged or destroyed by a casualty loss**

not more than one calendar year prior to the date of submission of the registration required in Section 4(a) of this general permit;

(5) maintenance activities performed on certain existing Department of Transportation infrastructure as follows:

- (A) Bridge Deck Drains.** Repair, rehabilitation, replacement and cleaning of bridge deck drains, scuppers and weeps, including the removal of accumulated sediment;
- (B) Bridge Painting.** Preparation of steel and painting including the placement of containment devices upon bridges;
- (C) Bridge Mechanical, Electrical and Operational Repairs.** Rehabilitation or replacement of appurtenances necessary for bridge safety and operation including lighting, fixtures, mechanical or electrical rooms or boxes, catenary support and wires, and signals and signal boxes;
- (D) Bridge Superstructure.** Rehabilitation, rinsing, repair or replacement of bridge superstructure components such as steel or timber members, plates or hardware, or bridge bearings, or the full bridge superstructure;
- (E) Bridge Decks.** Repair, rehabilitation or replacement of bridge decks membrane and bituminous wearing surfaces, joints, rails, ties, and fencing or other protective systems;
- (F) Bridge Supports.** Repair concrete superstructure or substructure elements including spalling, repointing or grouting of concrete, repairs to the joints, and application of protective coating;
- (G) Bridge Scour.** Manually placing grout bags within or immediately adjacent to the footprint of bridge substructure;
- (H) Walls and Abutments.** Repair of concrete wingwalls, endwalls or bridge abutments and pipe repair or replacement of such structures associated with such necessary wingwall, endwall or abutments;
- (I) Pipes and Culverts.** Removal of pipes and culverts, including the creation of open channels associated with the removal of such pipes and culverts;
- (J) Outlet Protection.** Repair, rehabilitation or expansion of an existing splash pad or plunge pool associated with an existing stormwater outfall or the installation of a new splash pad or plunge pool associated with the removal of a pipe or culvert;
- (K) Shoreline Protection.** Repair of previously protected shorelines

including riprap and stone armoring including shaping, regrading, placement of bedding material and riprap or armor stone to the pre-existing contours, and repair of seawalls to pre-existing conditions including repointing, patching, resetting stones, and applying a skim coat to the face of the seawall;

- (L) **Access.** Installation and use of low-impact temporary access structures including scaffolding, low ground pressure equipment, elevated trestle, scaffolding, ladders, and construction mats; and
- (M) **Rail Infrastructure.** Repair, rehabilitation or replacement of ballast, ties, rails, catenary towers and wires, signal cable tray, signal conduits, signal box and foundation, and electrical substations.

- (6) **beach grading or beach raking conducted in the area between mean low water and the coastal jurisdiction line;**
- (7) **removal of derelict structures;**
- (8) **placement of cultch;**
- (9) **minor repair to seawalls including patching concrete, repointing mortar between stones, resetting fallen stones and applying a skim coat to the face of the seawall;**
- (10) **catch basin cleaning;**
- (11) **repair or replacement of a backflow prevention structure on a closed water discharge system;**
- (12) **coastal restoration activities including coastal habitat creation and coastal habitat enhancement;**
- (13) **temporary access of construction vehicles or equipment; and**
- (14) **maintenance activities performed on certain existing Department of Energy & Environmental Protection boat launch infrastructure as follows:**
 - (A) **repair, replacement or repositioning of concrete planks, concrete panels, or interlocking blocks;**
 - (B) **repair or replacement of bituminous concrete;**
 - (C) **replacement or removal of gravel, stone or riprap material; and**
 - (D) **repair of trench drains, drainage systems, or erosion protection.**

Any discharge of water, substance or material into the waters of the state other than

the one specified in this section is not authorized by this general permit, and any person who or municipality which initiates, creates, originates or maintains such a discharge must apply for and obtain authorization under section 22a-430 of the General Statutes prior to the occurrence of such discharge.

(b) *Requirements for Authorization*

This general permit authorizes each of the activities listed in Section 3(a) of this general permit provided:

(1) Registration

A completed registration with respect to the activities identified in Section 3(a)(1), 3(a)(2), or 3(a)(3) of this general permit has been filed with the commissioner and the commissioner has issued an approval of registration with respect to such activity.

Or

A completed registration with respect to the activities identified in Section 3(a)(4) of this general permit has been filed with the commissioner.

Or

No registration is required with respect to activities identified in Section 3(a)(5) through Section 3(a)(14) of this general permit.

(2) Coastal Area Management

Such activity is consistent with all-applicable goals and policies in section 22a-92 of the General Statutes, and will not cause adverse impacts to coastal resources as defined in section 22a-93 of the General Statutes.

(3) Endangered and Threatened Species

Such activity does not threaten the continued existence of any species listed pursuant to section 26-306 of the General Statutes and will not result in the destruction of adverse modification of habitat designated as essential to such species.

(4) Aquifer Protection

Such activity, if it is located within an aquifer protection area as mapped under section 22a-354b of the General Statutes, complies with regulations adopted pursuant to section 22a-354i of the General Statutes.

(5) Conservation and Preservation Restrictions

Such activity, if located on or may affect property subject to a conservation or preservation restriction, complies with section 47-42d of the Connecticut General Statutes, by providing the following to the commissioner: proof of written notice to the holder of such restriction of the proposed activity's registration pursuant to this general permit or a letter from the holder of such

restriction verifying that the proposed activity is in compliance with the terms of the restriction.

(6) **Flood Management**

Such activity shall be consistent with all applicable standards and criteria established in sections 25-68d(b) of the General Statutes and sections 25-68h-1 through 25-68h-3, inclusive, of the Regulations of Connecticut State Agencies.

(c) ***Geographic Area***

This general permit applies throughout the tidal, coastal and navigable waters of the State of Connecticut and, where not explicitly disallowed, in tidal wetlands.

(d) ***Effective Date and Expiration Date of this General Permit***

This general permit is effective on the date it is issued by the commissioner and expires twenty (20) years from such date of issuance.

(e) ***Effective Date of Authorization***

Any activity identified in section 3(a)(1), 3(a)(2) and 3(a)(3) of this general permit is authorized by this general permit on the date the commissioner issues a written approval of registration with respect to such activities.

Any activity identified in Section 3(a)(4) of this general permit is authorized on the date the commissioner receives a completed registration with respect to such activity which meets the requirements of Section 4 of this general permit.

Any activity identified in Sections 3(a)(5) through 3(a)(14) of this general permit is authorized by this general permit effective on the date this general permit becomes effective, or on the date the activity is initiated, whichever is later.

(f) ***Transition to and from an Individual Permit***

No person shall operate or conduct an activity authorized by both an individual permit and this general permit. The requirements for transitioning authorization are as follows:

(1) ***Transition from an Individual Permit to Authorization under this General Permit.*** If an activity meets the requirements of authorization of this general permit and such operation or activity is presently authorized by an individual permit, the permittee may seek a modification to the permit to exclude such operation or activity from the individual permit or if the operation or activity is the sole operation or activity authorized by such permit, the permittee shall surrender its permit in writing to the commissioner. In either event, such permittee's individual permit shall continue to apply and remain in effect until authorization of such operation or activity under this general permit takes effect.

(2) ***Transition from Authorization under this General Permit to an Individual Permit*** If an activity or operation is authorized under this general permit and the commissioner subsequently issues an individual permit for the same activity,

then on the date any such individual permit is issued by the commissioner, the authorization issued under this general permit shall automatically expire.

Section 4. Registration Requirements

(a) *Who Must File a Registration*

Any person or municipality seeking under the authority of this general permit to conduct work set forth in Section 3(a)(1) through 3(a)(4) of this general permit, shall file with the commissioner:

- (1) A registration form which meets the requirements of Section 4 of this general permit; and
- (2) The applicable fee.

(b) *Scope of Registration*

A registrant shall register each activity for which the registrant seeks authorization under this general permit on a separate registration form.

(c) *Contents of Registration*

(1) Fees

(A) Fee Schedule

- i. For work pursuant to Sections 3(a)(1) and 3(a)(2) of this general permit, the registration fee of \$700.00 shall be submitted with a registration form.
- ii. For work pursuant to Section 3(a)(3) of this general permit, the registration fee of \$100.00 shall be submitted with the registration form.
- iii. For work pursuant to Section 3(a)(4) of this general permit, above, the registration fee of \$300.00 shall be submitted with the registration form.
- iv. The registration shall not be deemed complete and no activity shall be authorized by this general permit unless the registration fee has been paid in full.
- v. The registration fee shall be paid by check or money order payable to the **Department of Energy and Environmental Protection**.

(B) The registration fee is non-refundable.

(2) Registration Form

A registration shall be filed on forms prescribed and provided by the commissioner.

(d) *Where to File a Registration and Other Related Documents*

A registration shall be filed with the commissioner at the following address:

CENTRAL PERMIT PROCESSING UNIT
DEPARTMENT OF ENERGY AND ENVIRONMENTAL PROTECTION
79 ELM STREET
HARTFORD, CT 06106-5127

(e) *Notification of Harbor Management Commission*

Where applicable, a copy of the registration shall be submitted to the harbor management commission in the town where the work is proposed at the time the registration is filed with the commissioner.

(f) *Additional Information*

The commissioner may require a registrant to submit additional information, which the commissioner reasonably deems necessary to evaluate the consistency of the subject activity with the requirements for authorization under this general permit.

(g) *Action by Commissioner*

- (1) The commissioner may reject without prejudice a registration if it is determined that it does not satisfy the requirements of Section 4(c) of this general permit or more than thirty (30) days have elapsed since the commissioner requested that the registrant submit additional information or the required fee and the registrant has not submitted such information or fee. Any registration refiled after such a rejection shall be accompanied by the fee specified in Section 4(c)(1) of this general permit.
- (2) The commissioner may disapprove a registration if it is found that the subject activity is inconsistent with the requirements for authorization under Section 3 of this general permit, or for any other reason provided by law.
- (3) Disapproval of a registration under this subsection shall constitute notice to the registrant that the subject activity may not lawfully be conducted or maintained without the issuance of an individual permit.
- (4) The commissioner may approve a registration with reasonable conditions. If the commissioner approves a registration with conditions, the permittee shall be bound by such conditions as if they were a part of this general permit.
- (5) Rejection, disapproval, or approval of a registration shall be in writing.

Section 5. Conditions of This General Permit

The permittee shall at all times continue to meet the requirements for authorization set forth in Section 3 of this general permit. In addition, a permittee shall assure that activities authorized by this general permit are conducted in accordance with the following conditions:

(a) *Special Conditions for MARINA AND MOORING FIELD RECONFIGURATION authorized in Section 3(a)(1) of this general permit.*

- (1) Registrant for such reconfiguration is a yacht club or marina whose slips are entirely open for public use by membership or rental.
- (2) Such activities are not located on or over tidal wetlands or intertidal flats.
- (3) Such activities do not increase the number of berthing or mooring slips at the facility by more than 5% in any calendar year.
- (4) Such activities and any vessels berthed or moored to such reconfigured structures or moorings shall not interfere with the access to any riparian or littoral property and shall be placed and maintained within any established marina or mooring field boundary.
- (5) Prior to any such reconfiguration, the registrant must demonstrate that all regulated in-water structures are authorized by the State and are in compliance with such authorizations, as applicable.
- (6) Such activities shall include only structures used for boating access or support. Such activities shall not include structures such as offices, residences, restaurants, concessions, gazebos, viewing platforms, workshops, patios, or storage facilities, or other walled or roofed structure such as attendant shed, marina office, or other building.
- (7) Such activities shall not include the construction, installation, relocation, or modification of any wave-attenuating structures.
- (8) Such activities shall not include the construction or installation of any docks wider than the widest docks of the similar function previously authorized nor shall it include the installation of any gangways wider than the widest gangways previously authorized.
- (9) Such activities shall not include dredging, the placement of fill, or the installation of other structures not specifically authorized herein, including but not limited to seawalls, riprap, bulkheads, and travel lifts.
- (10) The placement of fixed piers or floating docks within any mooring boundary is prohibited under this general permit.
- (11) Any fixed piers or floating docks, in a marina boundary, shall be constructed in a manner that does not unreasonably restrict access to or along lands and waters waterward of mean high water.
- (12) Any fixed piers or floating docks, in a marina boundary, shall be designed to allow most wave and water current energy to pass through or under such

structure.

- (13) Any fixed pier, in a marina boundary, shall utilize the minimum number of pilings necessary, consistent with safety and resource protection considerations, and where feasible shall utilize large spans on fewer pilings rather than smaller spans on more pilings.
- (14) The permittee shall notify the commissioner of the commencement of any work authorized by the approval of registration no later than three days before commencing such work and shall notify the commissioner in writing of the completion of such work no later than seven days after such completion.

(b) *Special Conditions for REMEDIAL ACTIVITIES authorized in Section 3(a)(2) of this general permit.*

- (1) Such remedial activity has been required under an order as defined in Section 2 of this general permit requiring the permittee to conduct such remedial activity.
- (2) The permittee shall notify the commissioner of the commencement of any work authorized by the approval of registration no later than three days before commencing such work and shall notify the commissioner in writing of the completion of such work no later than seven days after such completion.

(c) *Special Conditions for RESIDENTIAL FLOOD HAZARD MITIGATION authorized in Section 3(a)(3) of this general permit.*

- (1) Prior to the commencement of work, the registrant shall obtain all other legally required authorizations applicable to such activity, including without limitation a building permit issued pursuant to section 8-3 of the General Statutes, a coastal site plan approval pursuant to sections 22a-105, 22a-106, or 22a-109 of the General Statutes, or a variance issued pursuant to section 8-6 of the General Statutes.
- (2) The sole purpose and effect of such activity is to conform an existing inhabited structure with applicable FEMA standards. Such activity may include, without limitation, elevating the subject structure and installing break-away walls, or other activities consistent with residential floodproofing standards.
- (3) No activity authorized herein shall result in the conversion of a dwelling from seasonal to year-round use, or in any other expansion or alteration of use of the subject structure.
- (4) Such activity shall not be construed as authorizing the construction or maintenance of any shoreline flood and erosion control structure as defined by section 22a-109(c) of the General Statutes.
- (5) Such activity does not create any further waterward encroachment of any structure, or the expansion of the subject structure's floor area, living space, or the addition of appurtenances such as decks or porches.

- (6) Such activity is not located waterward of mean high water or on or over tidal wetlands.
 - (7) The registrant shall comply with the standards and requirements set forth in section 25-68b through 25-68h of the General Statutes, as applicable.
- (d) ***Special Conditions for RECONSTRUCTION authorized in Section 3(a)(4) of this general permit.***
- (1) Such reconstruction is limited to the reconstruction of a structure, obstruction or encroachment which has been the subject of a prior authorization. This authorization explicitly does not apply to “grandfathered” or previously unauthorized structures that exist without the benefit of a prior authorization.
 - (2) Unless otherwise authorized in writing by the commissioner, such reconstruction activity shall be in-kind and in-place conforming to the siting, layout, design, materials and structural components as set forth in the prior authorization. The permittee shall not deviate from said authorization without prior written approval of the Commissioner.
 - (3) Such reconstruction shall be conducted in accordance with the requirements for authorization set forth herein and in accordance with any applicable terms and conditions set forth in the prior authorization.
 - (4) Prior to any reconstruction activity, the permittee shall obtain site plans signed and sealed by a professional engineer or land surveyor licensed in the State of Connecticut showing both the pre-construction site conditions and structures and the proposed site conditions and structures.
 - (5) The contractor(s) shall, whenever work is being performed, maintain a copy of the plans referenced above on the work site and make such plans available for inspection.
 - (6) Prior to any reconstruction activity, the permittee shall take site photographs documenting the pre-construction conditions.
 - (7) Such reconstruction does not apply to any dredging, regrading, fill or any other activities which restore or modify grades, depths, slopes, contours, tidal elevations or property boundaries.
 - (8) Such reconstruction does not apply to any groins or jetties.
 - (9) Such reconstruction does not apply to oversheeting of bulkheads.
 - (10) Any reconstruction activity of flood and erosion control structures is prohibited in areas of tidal wetlands.
 - (11) Any reconstruction activity of flood and erosion control structures which

increases the top elevation is prohibited.

- (12) Any reconstruction activity of docks that occur in areas of tidal wetlands shall be conducted such the lowest horizontal member of such fixed pier is no lower than five (5) feet off the surface of any underlying wetland areas, except if the previous authorization indicates such horizontal member is required to be constructed at a greater elevation.
 - (13) Any reconstruction activity which proposes minor modifications or engineering improvements to flood and erosion control structures, without modifying the footprint of such structure, may be allowable provided that the permittee provides a narrative of such changes and a copy of the pre-construction and proposed site conditions plans with the registration filed pursuant to Section 4 of this general permit. Such modifications or improvements may include but are not limited to weep holes, footings, tie-backs, or returns. Approval for such modifications will be made at the sole discretion of the Commissioner and the permittee will be notified in writing of such decision.
 - (14) Not later than five days prior to the commencement of work authorized herein, the permittee shall notify the commissioner of the commencement of work unless otherwise authorized by the commissioner.
 - (15) Not later than 90 days after completion of any work authorized herein, the permittee shall prepare a Compliance Certification, a copy of which is attached to the registration form as Appendix A. Such Compliance Certification shall be completed by a professional engineer or land surveyor licensed in the State of Connecticut and shall be signed and sealed by such professional.
 - (16) Not later than 120 days after completion of any work authorized herein, the permittee shall submit: (1) the Compliance Certification; (2) a copy of the pre-construction and post-construction plans; and (3) a copy of the pre-construction site photographs.
 - (17) Such reconstruction shall be conducted only upon property owned by the permittee or the registrant shall submit written permission from the rightful property owner approving such activity with the registration filed pursuant to Section 4 of this general permit.
- (e) ***Special Conditions for DEPARTMENT OF TRANSPORTATION MAINTENANCE authorized in Section 3(a)(5) of this general permit.***
- (1) In conducting any Department of Transportation Maintenance activities, the permittee shall follow any applicable Best Management Practices, design manuals and materials specifications published, used or adopted by the Connecticut Department of Transportation.
 - (2) In conducting the work authorized herein, the permittee shall not cause permanent impacts to tidal wetlands associated with the installation of temporary or permanent structures, staging, or storage.

- (3) In conducting any bridge painting, preparation or cleaning activities authorized herein, the permittee shall install and utilize proper containment that prevents discharges into coastal waters or wetlands. The permittee shall ensure the containment system is in optimal operating condition until the work authorized herein is completed.
- (4) Any debris associated with any activity authorized herein, including sediment or debris from drains, scuppers or weeps; residue from scraping, sandblasting, abrading or painting, shall be collected and disposed of at an approved upland site applicable for such debris.
- (5) This authorization specifically does not allow for the increase of additional stormwater flows from the structures authorized herein.
- (6) The permittee shall stage any barges employed to complete the work authorized herein such that no more than 50% of the channel beneath any bridge is impeded at any time.
- (7) Any debris containment systems employed by the permittee shall be designed so as to prevent impacts to navigation. Prior to commencement of work, the permittee shall obtain Advance Approval by the U.S. Coast Guard, when applicable.
- (8) The full superstructure replacement authorized herein shall not include the replacement of existing bridge piers or foundations or construction of new bridge piers or foundations, nor shall it include any expansion of the width of any superstructure that could increase the volume of stormwater associated with such work.
- (9) Unless otherwise authorized in writing by the commissioner, the permittee, prior to the commencement of any bridge scour repair, shall install turbidity curtains or other appropriate containment extending from the water surface to the substrate around the work area. Such curtains shall be maintained in optimal operating condition until project completion at which time the erosion and sediment controls shall be removed to an upland location.
- (10) Prior to the installation of any grout bags, the permittee shall consult with Department of Energy & Environmental Protection Inland Fisheries Division regarding necessary project modifications or restrictions to protect fisheries resources. Any such modifications or restrictions become binding.
- (11) The permittee shall install any grout bags by hand. Such grout bags shall be located within the footprint of the existing footing and shall not extend further than two feet from the face of such footing. Such grout bags shall be placed in such a manner that they do not pose any adverse impact to navigation or fish passage.
- (12) In conducting work to wingwalls, endwalls, abutments, pipes, culverts, outlet

protection, or other shoreline armoring the permittee shall work during periods of low flow and low tide so as minimize sedimentation and impacts to coastal resources.

- (13) In constructing any new outlet protection where a section of pipe has been removed, the permittee shall not exceed the area of the disturbance caused by the removal of the pipe.
 - (14) In conducting shoreline protection projects authorized herein, riprap or armoring shall not exceed the footprint of the protection originally in-place and shall be at the same grade and slope.
 - (15) Not later than 90 days subsequent to the completion of any shoreline protection project including rip rap, bedding material, or other shoreline armoring authorized herein, the permittee shall submit as-built drawings showing the project.
 - (16) In conducting any riprap work, the permittee shall place such riprap to its full course thickness in one operation to produce a reasonably well-graded slope without causing displacement of the underlying bedding material.
 - (17) Prior to the commencement of work authorized herein, the permittee has obtained approval from the commissioner from sections 25-68b through 25-68h, inclusive, of the General Statutes, and sections 25-68h-1 through 25-68h-3 of the Regulations of Connecticut State Agencies, inclusive, as applicable.
 - (18) Where construction requires heavy equipment operation in wetlands, the equipment shall either have low ground pressure or it shall be placed on construction mats that are adequate to support the equipment in such a way as to minimize disturbance of wetland soil and vegetation. Construction mats are to be placed in the wetland from the upland or from equipment positioned on swamp mats if working within a wetland. Dragging construction mats into position is prohibited.
 - (19) Not later than January 15 of any year following a year in which the Department of Transportation conducted work under this general permit, the permittee shall submit a Project Report to the commissioner. The Project Report shall specify which projects, and which components of such projects, were conducted under this general permit, and a summary of the total number of times in the reporting year that the Department of Transportation conducted work under this general permit.
- (f) ***Special Conditions for BEACH GRADING and BEACH RAKING authorized in Section 3(a)(6) of this general permit.***
- (1) Unless otherwise authorized in writing by the Commissioner, all beach grading work authorized herein is prohibited between April 1st and September 15th, inclusive, of any year in order to protect spawning horseshoe crabs and nesting and migrating shorebirds.
 - (2) Unless otherwise authorized in writing by the Commissioner, any beach raking activity which uses motorized equipment or employs implements which

penetrate more than two inches is prohibited between May 10th and July 15th, inclusive, of any year in order to protect spawning horseshoe crabs. Surficial beach raking by hand may be conducted at any time.

- (3) Such beach grading or beach raking activities are not conducted in areas of tidal wetlands or intertidal flats.
 - (4) All structures located at or waterward of the coastal jurisdiction line on the site where such activities are proposed are authorized through an individual permit of this department and are in full compliance with such permit.
 - (5) Such beach grading or beach raking activities shall not be conducted in areas waterward of mean low water.
 - (6) In conducting such beach grading or beach raking activities, the permittee shall not store, stage, or operate any equipment in-water at any time.
 - (7) No work authorized herein shall impede access to any riparian or littoral property.
 - (8) No work authorized herein shall take place on any leased or managed shellfish bed.
 - (9) Any material including macroalgae, stones, shells or other natural or unnatural debris removed during beach raking activities shall be disposed of above the coastal jurisdiction line and outside of any tidal wetlands.
- (g) ***Special Conditions for DERELICT STRUCTURES authorized in Section 3(a)(7) of this general permit.***
- (1) Prior to the commencement of work authorized herein, the permittee must obtain written permission from the property owner if the permittee is not the property owner whereupon such activity is to be undertaken.
 - (2) Prior to the commencement of work authorized herein, the permittee shall install either (a) siltation curtains or (b) floating turbidity booms, if necessary, around the work area. Such curtains or booms shall be maintained in optimal operating condition until the work is completed and the area has stabilized.
 - (3) Such activity is prohibited between June 1st and September 30th, inclusive, of any year in order to protect spawning shellfish in the area unless otherwise authorized in writing by the commissioner.
 - (4) Any such activity which occurs in the intertidal zone shall only be conducted during periods of low water.
 - (5) Such activity shall not disturb, displace or destroy objects determined by the State of Connecticut Historic Commission to have historical significance.

(h) *Special Conditions for PLACEMENT OF CULTCH authorized in Section 3(a)(8) of this general permit.*

- (1) Such placement of cultch shall only be conducted by a licensed shellfish operator in beds or areas designated for shellfishing under section 26-194 or section 26-242 of the General Statutes.
- (2) Such placement of cultch shall be conducted only in appropriate locations for colonization by oysters, based upon factors of salinity, water quality, water circulation patterns and substrate composition.
- (3) Such placement of cultch shall not be conducted in areas of tidal wetlands or submerged aquatic vegetation beds.
- (4) Prior to the commencement of such placement of cultch, such licensed shellfish operator obtains all required authorizations from the Department of Agriculture Bureau of Aquaculture and Laboratory and the local shellfish commission, as applicable.
- (5) Prior to the commencement of such placement of cultch, such licensed shellfish operator obtains permission in writing from the owner or lessee of such shellfish bed or area.
- (6) Such placement of cultch shall be conducted in such a manner that it does not exceed a layer of cultch on the seafloor greater than 12” in depth.
- (7) Such placement of cultch shall be conducted such that the placement does not exceed 1,500 bushels per acre of seafloor.

(i) *Special Conditions for MINOR SEAWALL REPAIR authorized in Section 3(a)(9) of this general permit.*

- (1) Any minor seawall repair authorized herein may include patching concrete, repointing mortar between stones, resetting fallen stones, and applying a skim coating to the face of a seawall.
- (2) Any minor seawall repair authorized herein shall not include the waterward encroachment of the face of the existing wall nor shall it include a new footing waterward of the face of any existing footing.
- (3) Such seawall has been constructed in conformance with an individual permit issued by this department, or was installed prior to June 24, 1939, or installed in its entirety landward of mean high water prior to January 1, 1987, and has been continuously maintained and serviceable since such time.
- (4) No work authorized under this section shall consist of “substantial maintenance” as defined by 22a-363a of the General Statutes.
- (5) No work authorized herein shall measurably increase the height or extend any

lateral or waterward encroachment of the seawall.

- (6) Such seawall work shall only be conducted during periods of low water and shall be conducted by hand using hand-held equipment.

(j) *Special Conditions for CATCH BASIN CLEANING authorized in Section 3(a)(10) of this general permit.*

- (1) All waste resulting from the work authorized herein including but not limited to grit, sand, or other sediment or debris shall be removed from the area waterward of the coastal jurisdiction line and disposed of at an upland location in accordance with applicable law.
- (2) Sediment removal authorized herein shall not include removal of material located waterward of the waterward terminus of the pipe.
- (3) Activities such as flushing or power washing, or other similar activities that would create sedimentation or turbidity in the receiving waters is strictly prohibited.

(k) *Special Conditions for BACKFLOW PREVENTION STRUCTURES authorized in Section 3(a)(11) of this general permit.*

- (1) Such portion of the closed water discharge system has been constructed in conformance with an individual permit issued by this department, or was installed prior to June 24, 1939, or installed in its entirety landward of mean high water prior to January 1, 1987, and has been continuously maintained and serviceable since such time.

(l) *Special Conditions for RESTORATION ACTIVITIES authorized in Section 3(a)(12) of this general permit.*

- (1) Any restoration activities conducted under this authorization, except those consisting of the installation or repair of a fish bypass system, must be performed by, or under the direct supervision of, the department.
- (2) Any installation or repair of a fish bypass system which includes the removal or structural or functional modification of any dam, must be performed either by (a) the department; or (2) by a person who has consulted with department staff regarding project design and implementation. Any such person must implement recommendations made by department staff and shall retain a copy of such written consultation during construction at the construction site.
- (3) Any installation or repair of a fish bypass system which includes the removal or structural or functional modification of any dam, must have prior authorization under section 22a-403 of the General Statutes, as applicable.

(m) *Special Conditions for TEMPORARY ACCESS OF CONSTRUCTION*

VEHICLES OR EQUIPMENT authorized in Section 3(a)(13) of this general permit.

- (1) This authorization is only for active operation of vehicles or equipment. At no time shall such vehicles or equipment be stored below the coastal jurisdiction line.
- (2) No vehicles or equipment shall be operated within areas of tidal wetlands or below the mean low water line. No vehicles or equipment shall be operated in the water during periods of high water above the mean low water line.
- (3) No material including but not limited to fill, construction materials, excavated material or debris, shall be deposited, placed, or stored below the coastal jurisdiction line or within areas of tidal wetlands.
- (4) Any barges used for such work may only come ashore and be secured in place while actively loading or off-loading equipment and shall not be moored or spudded in place for longer than necessary for such loading or off-loading activities.
- (5) This authorization explicitly does not cover construction vehicles or equipment associated with work or other activities regulated pursuant to section 22a-361 or 22a-32 of the General Statutes.

(n) Special Conditions for MAINTENANCE OF DEPARTMENT OF ENERGY AND ENVIRONMENTAL PROTECTION BOAT LAUNCH INFRASTRUCTURE authorized in Section 3(a)(14) of this general permit.

- (1) No work authorized herein shall occur in tidal wetlands.
- (2) Debris associated with any activity authorized herein shall be collected and disposed of at an approved upland site applicable for such debris.
- (3) Such maintenance activities are limited to boat launches which have been the subject of a prior authorization.
- (4) Such maintenance activities shall not include dredging or excavation of any sediments.
- (5) Except as may be explicitly authorized by the Commissioner, such maintenance activities shall be in-kind and in-place conforming to the siting, layout, design, materials and structural components as set forth in the prior authorization. Any riprap or armoring shall not exceed the footprint as was originally in-place and shall be to the same grade and slope.
- (6) Not later than January 15 of any year following a year in which the Department of Energy and Environmental Protection conducted work under this general permit, the permittee shall submit a Project Report to the commissioner. The Project Report shall specify which projects, and which components of such projects, were

conducted under this general permit, and a summary of the total number of times in the reporting year that the Department of Energy and Environmental Protection conducted work under this general permit.

(o) ***General Construction and Use Conditions applicable to this General Permit.***

- (1) Prior to the commencement of any work authorized by this general permit or any approval of registration, the permittee shall provide copies of this general permit and any applicable approval of registration to any contractor employed to conduct such work and shall make such documents available for inspection at the site whenever work is being performed at the site.
- (2) No registrant or permittee shall initiate construction of any activity authorized herein prior to submission and approval of registration, as applicable, or prior to the submission of a Project Report, as applicable.
- (3) Any activity authorized herein shall be conducted in accordance with the site plans and drawings included with the approval of registration, as applicable.
- (4) Any barge utilized conducting any activity authorized herein, where allowed, shall not be stored over intertidal flats, submerged aquatic vegetation or tidal wetlands or in a location that interferes with navigation. In the event that any barge associated with the work authorized herein becomes grounded, no dragging or prop-dredging shall occur to free the barge.
- (5) Any activity authorized herein shall not be conducted such that it creates a hazard to or interferes with existing navigation uses in adjacent waterways. Such activities shall be setback from federal navigation channels and shall also be setback as prescribed in any harbor management plan approved pursuant to section 22a-113m of the General Statutes.
- (6) Such activities are, where applicable, consistent with a harbor management plan approved pursuant to section 22a-113m of the General Statutes.
- (7) The construction, installation, use or removal of any activity authorized herein shall not interfere with access or navigation to or from any riparian or littoral property.
- (8) The permittee shall maintain in good working condition all structures authorized under this general permit. Unless otherwise authorized in writing by the commissioner, the permittee shall remove from tidal, coastal or navigable waters of the state or tidal wetlands any structure or portions of structures which have been destroyed by any cause whether natural or man-made.
- (9) In the course of conducting any activity authorized herein, no person shall place any equipment or material, including fill, construction materials, construction debris or solid waste as defined in section 22a-207 of the General Statutes in any wetland or watercourse, nor use any wetland or watercourse as staging area except as explicitly authorized herein or in any approval of registration.

- (10) Upon completion of any work authorized herein, the permittee shall restore any area affected by, or used as a staging area in connection with, such activity to the condition of such area prior thereto.
- (11) Any debris associated with any activity authorized herein shall be removed from the area waterward of the coastal jurisdiction line and tidal wetlands and disposed of at an approved upland site applicable for such debris.
- (12) The permittee shall dispose of any solid waste, as defined in section 22a-207 of the General Statutes generated by the work authorized herein in accordance with all applicable law, including Chapters 446e and 446k of the General Statutes.
- (13) Any activity authorized herein shall be conducted so as to minimize adverse impacts to coastal resources and processes.
- (14) Any activity authorized herein shall be conducted so as to minimize adverse impacts to commercial and recreational fishing and shellfishing.
- (15) Any activity authorized herein shall not create an obstruction or hindrance that will have an adverse effect on the flood heights, flood carrying and water capacity of the waterways and floodplains.
- (16) Any activity authorized herein shall not adversely affect existing or designated uses of the waters of the state as defined in Connecticut's Water Quality Standards pursuant to section 22a-426 of the General Statutes.
- (17) In conducting any activity authorized herein, the permittee shall not cause or allow pollution, as defined in section 22a-423 of the General Statutes, including without limitation pollution resulting from erosion and sedimentation.
- (18) In undertaking the work authorized hereunder, the permittee shall not cause or allow pollution of wetlands or watercourses, including pollution resulting from sedimentation and erosion. For purposes of this permit, "pollution" means "pollution" as that term is defined by CGS section 22a-423.
- (19) Except as specifically authorized by this permit, the permittee shall establish a minimum of a 10 foot setback from any wetlands or watercourses in and adjacent to the area where work is to be conducted or areas which are to be used for access to the work area. Such setback area(s) shall be flagged so as to be readily identifiable by contractor personnel until the authorized work is completed.
- (20) Except as specifically authorized by this permit, no equipment or material, including but not limited to, fill, construction materials, excavated material or debris, shall be deposited, placed or stored in any wetland or watercourse on or off-site, or within any delineated setback area, nor shall any wetland, watercourse or delineated setback area be used as a staging area or access way other than as provided herein.

Section 6. General Conditions

(a) *Reliance on Registration*

When evaluating a registration, the commissioner relies on information provided by the registrant. If such information proves to be false or incomplete, the authorization issued under this general permit may be suspended or revoked in accordance with law, and the commissioner may take any other legal action provided by law.

(b) *Duty to Correct and Report Violations*

Upon learning of a violation of a condition of this general permit, a permittee shall immediately take all reasonable action to determine the cause of such violation, correct such violation and mitigate its results, prevent further such violation, and report in writing such violation and such corrective action to the commissioner within five (5) days of the permittee's learning of such violation. Such report shall be certified in accordance with Section 6(d) of this general permit.

(c) *Duty to Provide Information*

If the commissioner requests any information pertinent to the authorized activity or to determine compliance with this general permit, or with the permittee's approval of registration, the permittee shall provide such information in writing within thirty (30) days of such request. Such information shall be certified in accordance with Section 6(d) of this general permit.

(d) *Certification of Documents*

Any document, including but not limited to any notice, which is submitted to the commissioner under this general permit shall be signed by, as applicable, the registrant or the permittee in accordance with section 22a-430-3(b)(2) of the Regulations of Connecticut State Agencies, and by the individual or individuals responsible for actually preparing such document, each of whom shall certify in writing as follows:

“I have personally examined and am familiar with the information submitted in this document and all attachments thereto, and I certify that, based on reasonable investigation, including my inquiry of those individuals responsible for obtaining the information, the submitted information is true, accurate and complete to the best of my knowledge and belief. I understand that a false statement made in the submitted information may be punishable as a criminal offense, in accordance with section 22a-6 of the General Statutes, pursuant to section 53a-157b of the General Statutes, and in accordance with any other applicable statute.”

(e) *Date of Filing*

For purposes of this general permit, the date of filing with the commissioner of any document is the date such document is received by the commissioner. The word “day” as used in this general permit means the calendar day; if any date specified in the general permit falls on a Saturday, Sunday, or legal holiday, such deadline shall be the next business day thereafter.

(f) *False Statements*

Any false statement in any information submitted pursuant to this general permit may be punishable as a criminal offense, in accordance with section 22a-6 of the General Statutes, pursuant to section 53a-157b of the General Statutes, and in accordance with any other applicable statute.

(g) *Correction of Inaccuracies*

Within fifteen (15) days after the date a permittee becomes aware of a change in any of the information submitted pursuant to this general permit, becomes aware that any such information is inaccurate or misleading, or that any relevant information has been omitted, such permittee shall correct the inaccurate or misleading information or supply the omitted information in writing to the commissioner. Such information shall be certified in accordance with Section 6(d) of this general permit. The provisions of this subsection shall apply both while a request for approval of registration is pending and after the commissioner has approved such request.

(h) *Transfer of Authorization*

An approval of registration under this general permit is transferable only in accordance with the provisions of section 22a-60 of the General Statutes.

(i) *Other Applicable Law*

Nothing in this general permit shall relieve the permittee of the obligation to comply with any other applicable federal, state and local law, including but not limited to the obligation to obtain any other authorizations required by such law.

(j) *Other Rights*

This general permit is subject to and does not derogate any present or future rights or powers of the State of Connecticut and conveys no rights in real or personal property nor any exclusive privileges, and is subject to all public and private rights and to any federal, state, and local laws pertinent to the property or activity affected by such general permit. In conducting any activity authorized hereunder, the permittee may not cause pollution, impairment, or destruction of the air, water, or other natural resources of this state. The issuance of this general permit shall not create any presumption that this general permit should or will be renewed.

Section 7. Commissioner's Powers

(a) *Abatement of Violations*

The commissioner may take any action provided by law to abate a violation of this general permit, including the commencement of proceedings to collect penalties for such violation. The commissioner may, by summary proceedings or otherwise and for any reason provided by law, including violation of this general permit, revoke a permittee's authorization hereunder in accordance with sections 22a-3a-2 through 22a-3a-6, inclusive, of the Regulations of Connecticut State Agencies. Nothing herein shall be construed to affect any remedy available to the commissioner by law.

(b) **General Permit Revocation, Suspension, or Modification**

The commissioner may, for any reason provided by law, by summary proceedings or otherwise, revoke or suspend this general permit or modify it to establish any appropriate conditions, schedules of compliance, or other provisions which may be necessary to protect human health or the environment.

(c) **Filing of an Individual Permit Application**

If the commissioner notifies a permittee in writing that such permittee must obtain an individual permit to continue lawfully conducting the activity authorized by this general permit, the permittee may continue conducting such activity only if the permittee files an application for an individual permit within sixty (60) days of receiving the commissioner's notice. While such application is pending before the commissioner, the permittee shall comply with the terms and conditions of this general permit and the subject approval of registration. Nothing herein shall affect the commissioner's power to revoke a permittee's authorization under this general permit at any time.

Issued Date: October 26, 2015

Robert J. Klee
Commissioner

This is a true and accurate copy of the general permit executed on **October 26, 2015** by the Commissioner of the Department of Energy and Environmental Protection.

U.S. Coast Guard Bridge Administration

GENERAL CONSTRUCTION REQUIREMENTS

1. All bridge closures, or bridge operating schedule changes, must be requested in writing, 90 days in advance, from the First Coast Guard District Bridge Branch Office. No channel restrictions, or vertical clearance reductions may be made without written approval from the above office.
2. Waterway closures/restrictions, barge placement or safety zones must also be requested a minimum of 90-days in advance. Please contact: USCG Sector Long Island Sound, 120 Woodward Ave., New Haven, CT 06512-3628. Ph: (203) 468-4596.
3. All submissions to the Coast Guard for review and approval must first be approved by the owner of the bridge or their authorized agent. All submission of plans, scope of work, and schedules of operation must be sent to the First Coast Guard District, Bridge Branch Office.
4. At least 30 days prior to commencement of any work, we must have for our review, a copy of the construction plans, contractor' schedule, preferably depicted in a time line graphic format, and the contractor's daily hours of operation. The construction plan package must show the following: (1) a plan of the entire waterway area in the vicinity of the project. (2) The location of work barges during working and off-hours. (3) In addition, a drawing must be included, if applicable, depicting any scaffolding or containment used indicating the location and the total vertical or horizontal channel reduction. All vertical clearance reductions below low steel or concrete under the bridge as a result of the use of scaffolding must be clearly detailed on the drawings shown in total feet. (4) Emergency 24 hour telephone numbers for all responsible individuals for this project must be submitted to this office before any phase of construction begins in case of an emergency situation during off-hours.
5. Scaffolding used under ANY span of the bridge must be lighted with constant burning red lights every 50 feet and on all corners. The placement of scaffolding must not interfere with the ability of a moveable bridge to open for vessel traffic. Moveable bridges must continue to operate according to their normal schedule unless special drawbridge operation regulation changes have been requested. Warning signs must be posted on both sides of the bridge, visible for a 1-mile range, to warn mariners of the vertical clearance reduction. The signs shall face upstream and downstream so as to draw the mariner's attention to the fact that the clearance has been reduced.
6. All barges placed in the waterway must be lighted with constant burning white lights on all four corners of the barge. The contractor is required to comply with all provisions of the Navigation Rules International-Inland, regarding the use of work barges or floating equipment in the waterway www.navcen.uscg.gov .
7. Placement of construction barges in the navigable channel shall be done so as to provide a minimum horizontal clearance reduction. Only one navigation channel of a swing bridge may be blocked by work equipment at anytime. Barges must be moved out of the navigable channel after working hours unless approved in writing by the USCG.

CT

8. Barges held in place by anchor lines must be marked by anchor buoys, which should be lighted.
9. The vertical and horizontal clearances through the navigable channel of the completed structure (as-built clearances) shall be certified in writing to this office by a responsible official of the permittee, a licensed surveyor or a registered professional engineer upon completion of bridge work. As built clearances consist of: vertical clearance in the navigational channel measured from mean high and mean low water to the lowest point of the superstructure; horizontal clearance through the navigational channel between piers or fenders measured normal to the axis of the channel. Documentation shall state the horizontal and vertical datum (e.g., NAVD88) used for all measurements. Please contact this office if there are questions regarding the required clearance data for specific bridge types, i.e. fixed or movable.
10. The on-scene contractor must have a VHF-FM marine radio set to the bridge communication channels 16/13 or the designated channel for the bridge. Additional marine radios monitoring the above channels must also be maintained at the main control of any floating equipment or barges on station.
11. Preventive measures must be taken to prevent any hot work, debris, or construction material from entering the waterway. This includes sandblasting material, paint, and any concrete work by-products. Welding and burning must cease upon approach of a vessel and shall not start again until the vessel has passed the bridge.
12. The project manager must contact the Coast Guard Sector Long Island Sound via marine radio before commencement of any and after completion of any Hot Work. A cell phone back-up may be used to contact the above Coast Guard Unit at (203) 468-4401.
13. If permanent bridge navigational lighting cannot be maintained operational during any phase of this project, temporary battery/power lights must be installed at the same locations. These temporary lights must be visible for a distance of **2,000 yards on 90% of the nights of the year**. Generally, a lamp of **(50 candela)** will meet these requirements. Plans for temporary lighting shall be submitted to this office for written approval. Deviations from the approved **temporary lighting shall be permitted only upon written authorization from this office.**
14. **All newly constructed bridge piers, or those in the process of demolition, must be lighted with either red or white flashing (60 flashes per minute) lights. All cofferdams used during construction must also be lighted with red or white flashing (60 flashes per minute) on all four corners.**
15. Bridge protective fenders shall not be constructed or rebuilt with any metal surfaces on the rubbing face of the fender system. All bolts, spikes, or other metal fastening devices must be countersunk. Metal splicing plates, if used, shall be mounted on back of outer wales.
16. All piles including those previously damaged or broken that are not being used in the new or repaired fender shall be extracted rather than cut off at the mud line. Upon completion of all fender repairs a bottom sweep is required to determine if any piles or debris are present in the waterway. A wire-drag sweep or side-scan sonar is the preferred method.
17. It is the owners' responsibility to ensure that channel depths are not affected by this work. Any material, machinery or equipment lost, dumped, thrown into, or otherwise entering the

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waterway must be removed immediately. If immediate removal is impractical and the object entering the waterway could possibly obstruct or hazard navigation, the object must be marked immediately to protect navigation and the Coast Guard shall be notified as soon as possible. Such notification shall give the location and type of obstruction and the navigational markings installed.

18. Spillage of oil and hazardous substances is specifically prohibited by Section 311 of the Clean Water Act, as amended. Measures including properly maintaining construction equipment, designating fuel/hazardous substances handling areas to allow spills to be contained before reaching the waterway, instructing personnel not to dispose of oil/hazardous substances into drains or into the waterway directly, and other necessary procedures should be implemented to prevent spillage. If oil/hazardous substances are spilled into the waterway in spite of such planning, the U.S. Coast Guard is to be notified immediately at 800-424-8802. An adequate supply of absorbent material should be readily accessible to soak up any possible spillage pending Coast Guard arrival. The use of chemical dispersing agents and emulsifiers is not authorized without prior, specific, federal approval.
19. The bridge owner/contractor shall provide any and all necessary equipment and personnel to determine the presence of any "suspected" obstructions in the waterway at any time either during or following the completion of bridge construction or demolition operations.
20. The owner or registered professional engineer shall certify that the waterway depths have not been impaired and that the waterway is clear of materials or debris resulting from bridge construction or demolition.
21. This approval may be revoked and/or civil penalties imposed for failure to ensure that the above listed stipulations are adhered to or if work is determined to hazard or impair navigation.
22. This bridge work authorization does not relieve the project proponent of the responsibility to comply with applicable state, local or other federal requirements for this project.



16594
December 10, 2018

Timothy D. Fields, P.E.
Transportation Principal Engineer
Bureau of Engineering and Construction
Connecticut Department of Transportation
2800 Berlin Turnpike
P.O. Box 317546
Newington, CT 06111-7546

Dear Mr. Fields:

We reviewed your letter request of November 21, 2018 received November 29, 2018 to conduct repairs on the Arrigoni (Route 66) Bridge mile 32.2 across the Connecticut River between Portland and Middletown, CT. The project includes a temporary vertical clearance reduction of 10.5 feet during the duration of the project from fall 2019 through fall 2022. We have no objections to the work described in your letter provided the general construction and safety standards in Enclosure (1) are adhered to as they may be applicable. These stipulations are based on the facts you have provided presently; however, additional requirements may be needed if information or conditions not anticipated warrant.

Specific Requirements

- a. At no time during the work will the waterway be closed to navigation without prior approval from the Coast Guard. You and the contractor are required to maintain contact with Coast Guard Sector Long Island Sound. (LT Andrew, 203-468-4432 or MST1 Linnick, 203-468-4565)
- b. Should any material, machinery or equipment be lost, dumped, thrown overboard, sunk or misplaced which may be dangerous to or obstruct navigation, immediate notice shall be given to the Coast Guard and the object removed with the utmost dispatch. Until removal can be effected, the objects shall be properly marked in order to protect navigation. Notice to the Coast Guard shall give a description and location of any such object and the action taken or being taken to protect navigation.
- c. At least 30 days prior to commencement of any work, we must have for our review, a copy of the construction plans, contractor schedule, preferably depicted in a time line graphic format, and the contractor's daily hours of operation. The construction plan package must include the following: (1) a plan of the entire waterway area in the vicinity of the project; (2) the location of work barges during working and off-hours; (3) a drawing, if applicable, depicting scaffolding or containment used and the location of any reduction of vertical or horizontal clearance. All vertical clearance reductions below low steel or concrete under the bridge as a result of scaffolding must be detailed on the

16594
November 30, 2018

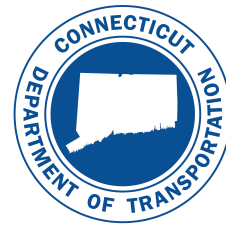
drawings shown in total feet; and (4) emergency 24 hour telephone numbers for responsible individuals for this project.

You are responsible for compliance with the requirements of any Federal, state, or local agency with jurisdiction over the project. Please contact me at the above listed number if you have any questions.

Sincerely,

J. L. Rousseau
Senior Bridge Management Specialist
By direction

Encl: General Construction Requirements
E-Copy: Coast Guard Sector Long Island Sound



Eligibility Determination Form

DEEP General Permit for Coastal Maintenance

DEEP-OLISP-GP-2015-02

Authorization under this permit does not obviate the need for other State or Federal Permits as may be required for the proposed activities.

Project Number:

Bridge Number:

Waterway:

Location (Route/Town):

Brief Project Description:

Office:

Contact:

The above referenced project has been determined to be eligible for Authorization under the *General Permit for Coastal Maintenance Section 3(a)(5)* "maintenance activities performed on certain Department of Transportation infrastructure". This determination has been made by the Office of Environmental Planning, Water/Natural Resources Unit.

Project activities which are eligible for coverage under this Authorization under Section 3(a)(5) are:

- A – Bridge Deck Drains
- B – Bridge Painting
- C – Bridge Mechanical, Electrical, and Operational Repairs
- D – Bridge Superstructure
- E – Bridge Decks
- F – Bridge Supports
- G – Bridge Scour
- H – Walls & Abutment
- I – Pipes & Culverts
- J – Outlet Protection
- K – Shoreline Protection (required post-construction as-built survey)
- L – Access
- M – Rail Infrastructure

Required Coordination

Fisheries Coordination/Concurrence date:

Special Requirements:

U.S. Coast Guard Coordination date:

Special Requirements:

NDDDB Coordination: Species identified:

Special Requirements

As built survey required within 90 days of project completion

Special Conditions

SPECIAL CONDITIONS FOUND IN SECTION 5(e) ITEMS 1-19 ARE DIRECTLY APPLICABLE TO THIS AUTHORIZATION AND THE CONTRACT SHALL INCORPORATE CONTRACT ITEMS/SPECIAL PROVISIONS AS NECESSARY TO MEET THE REQUIRED CONDITIONS.

OEP Staff Certification:

District Reporting Requirement: Each District is responsible for the yearly reporting of Construction Projects authorized under this General Permit. Reporting is to be made to the Office of Environmental Planning, Water/Noise Compliance Unit on forms prescribed by that Office.



16594
December 10, 2018

Timothy D. Fields, P.E.
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Bureau of Engineering and Construction
Connecticut Department of Transportation
2800 Berlin Turnpike
P.O. Box 317546
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November 30, 2018

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By direction

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E-Copy: Coast Guard Sector Long Island Sound

U.S. Coast Guard Bridge Administration

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20. The owner or registered professional engineer shall certify that the waterway depths have not been impaired and that the waterway is clear of materials or debris resulting from bridge construction or demolition.
21. This approval may be revoked and/or civil penalties imposed for failure to ensure that the above listed stipulations are adhered to or if work is determined to hazard or impair navigation.
22. This bridge work authorization does not relieve the project proponent of the responsibility to comply with applicable state, local or other federal requirements for this project.



Connecticut Department of
**ENERGY &
ENVIRONMENTAL
PROTECTION**

August 16, 2017

Mr. Michael Salter
State of Connecticut Department of Transportation
2800 Berlin Turnpike
P.O. Box 317546
Newington, CT 06131
michael.salter@ct.gov

Project: CT DOT 82-312, Phase 2 Rehabilitation of Arrigoni Bridge No. 00524, Route 66 over the CT River in Middletown and Portland, Connecticut
Request No.: 201702663

Dear Michael,

I have reviewed Natural Diversity Data Base maps and files regarding the area delineated on the map you provided for the proposed CT DOT 82-312, Phase 2 Rehabilitation of Arrigoni Bridge No. 00524, Route 66 over the CT River in Middletown and Portland, Connecticut. According to our information we have records for State Threatened *Falco peregrinus* (peregrine falcon) and *Haliaeetus leucocephalus* (Bald eagle) from the vicinity of this project. Thank you for including the protocols you will follow to ensure the protection of the nesting peregrine falcon and bald eagle with respect to this project. I concur that by utilizing these protocols that the proposed activities will not have an adverse impact on the peregrine falcons or bald eagles that may nest on this bridge or nearby. This determination is good for two years. Please re-submit an NDDB Request for Review if the scope of work changes or if work has not begun on this project by August 16, 2019.

Natural Diversity Data Base information includes all information regarding critical biological resources available to us at the time of the request. This information is a compilation of data collected over the years by the Department of Energy and Environmental Protection's Natural History Survey and cooperating units of DEEP, private conservation groups and the scientific community. This information is not necessarily the result of comprehensive or site-specific field investigations. Consultations with the Data Base should not be substitutes for on-site surveys required for environmental assessments. Current research projects and new contributors continue to identify additional populations of species and locations of habitats of concern, as well as, enhance existing data. Such new information is incorporated into the Data Base as it becomes available.

Please contact me if you have further questions at (860) 424-3592, or dawn.mckay@ct.gov. Thank you for consulting the Natural Diversity Data Base. Also be advised that this is a preliminary review and not a final determination.

Sincerely,

A handwritten signature in cursive script that reads 'Dawn M. McKay'.

Dawn M. McKay
Environmental Analyst 3

SECTION 1.10 ENVIRONMENTAL COMPLIANCE

Article 1.10.03 Water Pollution Control:

Add the following after Required Best Management Practices Number 13.

14. The Contractor is hereby notified that the Bald Eagle (*Haliaeetus leucocephalus*) may be located within the vicinity of this project. The bald eagle is a state threatened species and is also protected under both the Federal Bald and Golden Eagle Protection Act, and the Federal Migratory Bird Treaty Act. The bald eagle has adapted to life in urban settings and is becoming a common visitor in winter, particularly at favored locations along the Connecticut River, Housatonic River, and large lakes/reservoirs. In the winter, bald eagles may congregate into groups called communal winter roosts in order to conserve energy, take advantage of protective habitat, and be closer to food sources. The bald eagle is typically associated with large diameter trees (30 inch DBH or greater) for nest building and roosting purposes. Though somewhat tolerant of human activity, bald eagles can be negatively affected if work is too close to an active nest or winter roost. For this reason, special conditions regarding the location and timing of work around eagle usage areas must be adhered to.

In order to protect this species, construction activities will not be allowed to take place within 600 feet of a confirmed nest or winter roost as follows:

- Bald eagle nesting areas: construction activities will not be allowed to take place within 600 feet of a confirmed nest between February 1st and August 1st.
- Winter roost areas: construction activities will not be allowed to take place within 600 feet of a confirmed winter roost area between December 1st and March 31st.

Construction activities will be allowed within project areas that are outside the 600 foot buffer.

Additionally, the cutting of large trees (30 inch DBH or greater) shall be reviewed and approved by the Engineer in coordination with the Department's Office of Environmental Planning (OEP) staff. Any change in construction sequencing or timing of proposed work in the project area, which might disturb bald eagles must be coordinated through the Engineer.

The time period and approximate areas of the project expected to be subject to these restrictions based on the best available eagle activity information are attached. Prior to the start of work and during the project, areas subject to these restrictions may be updated based on confirmed nest/winter roost information and shall be provided by the OEP. Exact locations of nests/winter roosts will not be provided in order to further protect the species.

The Contractor shall, through the Engineer, at least 10 days prior to the commencement of any construction activities, arrange for a CT DOT Environmental Inspector from the OEP or their authorized delegate to be available to meet and identify the approximate roost and/or nest location as well as discuss proper protocol for maintaining environmental commitments made to the protection of this species and habitat.

This species is protected by State and Federal law which prohibit killing, harming, taking, harassing, or keeping them in your possession. Workers shall be notified of the existence of bald eagles in the area and be apprised of the laws protecting them. Photographs of, and the laws protecting, bald eagles shall be posted in the Contractor's and DOT field offices (species ID sheets will be provided by OEP). Any observations of this species are to be immediately reported to the Engineer.

15. The peregrine falcon (*Falco peregrinus*) is a State threatened species and Connecticut's largest falcon, measuring up to 20 inches. Adults are slate gray above and pale underneath with fine bars and spots of black; they have long pointed wings with a narrow tail. Young falcons have the same composition but are darker underneath and browner all over. Peregrine falcons have adapted to life in urban settings. In Connecticut, they sometimes utilize bridges for nesting and brood rearing purposes. Peregrines will actively and aggressively defend the nest. The peregrine will attack anyone or anything that comes within the area of its nest. The peregrine falcon nesting season occurs between the months of April and July. For this reason, special conditions regarding the timing of work on the structures, and immediate area that have nesting falcons must be adhered to.

In order to protect this species and project personnel, any construction and/or inspection activities which are within 500 feet of an identified nest shall not be permitted during nesting season (between April 1st and July 31st.) Any change in construction sequencing or timing affecting work within 500 feet of a known nest shall not be permitted.

The Contractor shall, through the Engineer, at least 10 days prior to the commencement of any construction activities, arrange for a CT DOT Environmental Inspector from the Office of Environmental Planning (OEP) or their authorized delegate to be available to meet and identify the nest location as well as discuss proper protocol for maintaining environmental commitments made to the protection of this species and habitat.

This species is protected by State laws which prohibit killing, harming, taking, or keeping them in your possession. Workers shall be notified of the existence of peregrine falcons in the area and be apprised of the laws protecting them. Photographs of, and the laws protecting, peregrine falcons shall be posted in the Contractor's and DOT field offices (species ID sheets will be provided by OEP). Any observations of this species are to be immediately reported to the Department.

Project No.: 82-312
Description: Bridge No. 00524 (Arrigoni Bridge)
 Route 66 over Connecticut River, Route 9, &
 P & W Railroad
Town: Middletown/Portland
Date: November 20, 2018

m e m o r a n d u m

to: Mr. Michael E. Masayda
 Trans. Principal Engineer
 Hydraulics and Drainage
 Bureau of Engineering and Highway Operations

from: Timothy D. Fields
 Transportation Principal Engineer
 Bridge Consultant Design
 Bureau of Engineering and Highway Operations

Digitally signed by Timothy D. Fields, P.E.,
 DN: cn=Timothy D. Fields, o=State of Connecticut,
 ou=Department of Transportation,
 ou=Principal Engineer, ou=Office of
 Construction - Division of Bridges,
 l=Newington, st=Connecticut, c=US
 Reason: I am approving this document
 Date: 2018.11.20 15:00:22-0500'

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 Replacements and Superstructure Repairs
- Minor Bridge Substructure 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 – See Attachment A
- Location plan – Attachment B
- Description of Floodplain involvement and how project qualifies for general certification – Attachment C
- FEMA Flood Insurance Rate Map (FIRM) and Floodway Boundary Map (if applicable) – Attachment D
- Design plans, (September 2018) with FEMA floodplain and floodway boundaries plotted – Attachment E
- FEMA 100-year flood elevation plotted on elevation view (for structures) – See Attachment E

Print Name: Sowatei K. Lomotey

Title: Project Manager

Signature

Digitally signed by Sowatei K. Lomotey, P.E., S.E.,
 DN: cn=Sowatei K. Lomotey, o=State of Connecticut,
 ou=Department of Transportation, ou=Principal Engineer,
 ou=Office of Construction - Division of Bridges,
 l=Newington, st=Connecticut, c=US
 Reason: I am approving this document
 Date: 2018.11.20 15:00:22-0500'

Date: November 20, 2018

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 1-18-19

Construction Contracts - Required Contract Provisions (FHWA Funded Contracts)

Index

1. Federal Highway Administration (FHWA) Form 1273 (Revised May 1, 2012)
2. Title VI of the Civil Rights Act of 1964 / Nondiscrimination Requirements
3. Contractor Work Force Utilization (Federal Executive Order 11246) / Specific Equal Employment Opportunity
4. Requirements of Title 49, CFR, Part 26, Participation by DBEs
5. Contract Wage Rates
6. Americans with Disabilities Act of 1990, as Amended
7. Connecticut Statutory Labor Requirements
 - a. Construction, Alteration or Repair of Public Works Projects; Wage Rates
 - b. Debarment List - Limitation on Awarding Contracts
 - c. Construction Safety and Health Course
 - d. Awarding of Contracts to Occupational Safety and Health Law Violators Prohibited
 - e. Residents Preference in Work on Other Public Facilities (Not Applicable to Federal Aid Contracts)
8. Tax Liability - Contractor's Exempt Purchase Certificate (CERT – 141)
9. Executive Orders (State of CT)
10. Non Discrimination Requirement (pursuant to section 4a-60 and 4a-60a of the Connecticut General Statutes, as revised)
11. Whistleblower Provision
12. Connecticut Freedom of Information Act
 - a. Disclosure of Records
 - b. Confidential Information
13. Service of Process
14. Substitution of Securities for Retainages on State Contracts and Subcontracts
15. Health Insurance Portability and Accountability Act of 1996 (HIPAA)
16. Forum and Choice of Law
17. Summary of State Ethics Laws

18. Audit and Inspection of Plants, Places of Business and Records
19. Campaign Contribution Restriction
20. Tangible Personal Property
21. Bid Rigging and/or Fraud – Notice to Contractor
22. Consulting Agreement Affidavit
23. Federal Cargo Preference Act Requirements (46 CFR 381.7(a)-(b))

Index of Exhibits

- EXHIBIT A – FHWA Form 1273 (Begins on page 14)
- EXHIBIT B – Title VI Contractor Assurances (page 34)
- EXHIBIT C – Contractor Work Force Utilization (Federal Executive Order 11246) / Equal Employment Opportunity (page 36)
- EXHIBIT D – Health Insurance Portability and Accountability Act of 1996 (HIPAA) (page 43)
- EXHIBIT E - Campaign Contribution Restriction (page 51)
- EXHIBIT F – Federal Wage Rates (Attached at the end)
- EXHIBIT G - State Wage Rates (Attached at the end)

1. Federal Highway Administration (FHWA) Form 1273

The Contractor shall comply with the Federal Highway Administration (FHWA), Form 1273 attached at Exhibit A, as revised, which is hereby made part of this contract. The Contractor shall also require its subcontractors to comply with the FHWA – Form 1273 and include the FHWA – Form 1273 as an attachment to all subcontracts and purchase orders.

2. Title VI of the Civil Rights Act of 1964 / Nondiscrimination Requirements

The Contractor shall comply with Title VI of the Civil Rights Act of 1964 as amended (42 U.S.C. 2000 et seq.), all requirements imposed by the regulations of the United States Department of Transportation (49 CFR Part 21) issued in implementation thereof, and the Title VI Contractor Assurances attached hereto at Exhibit B, all of which are hereby made a part of this Contract.

3. Contractor Work Force Utilization (Federal Executive Order 11246) / Equal Employment Opportunity

- (a) The Contractor shall comply with the Contractor Work Force Utilization (Federal Executive Order 11246) / Equal Employment Opportunity requirements attached at Exhibit C and hereby made part of this Contract, whenever a contractor or subcontractor at any tier performs construction work in excess of \$10,000. These goals shall be included in each contract and subcontract. Goal achievement is calculated for each trade using the hours worked under each trade.
- (b) Companies with contracts, agreements or purchase orders valued at \$10,000 or more will develop and implement an Affirmative Action Plan utilizing the ConnDOT Affirmative Action Plan Guideline. This Plan shall be designed to further the provision of equal employment opportunity to all persons without regard to their race, color, religion, sex or national origin, and to promote the full realization of equal employment opportunity through a positive continuation program. Plans shall be updated as required by ConnDOT.

4. Requirements of Title 49, Code of Federal Regulations (CFR), Part 26, Participation by DBEs, as may be revised.

Pursuant to 49 CFR 26.13, the following paragraph is part of this Contract and shall be included in each subcontract the Contractor enters into with a subcontractor:

“The Contractor, subrecipient or subcontractor 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, Participation by DBEs, in the award and administration of U.S. DOT-assisted contracts. Failure by the Contractor 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 ConnDOT (recipient) deems appropriate, which may include, but is not limited to: (1) Withholding monthly progress payments, (2) Assessing sanctions, (3) Liquidated damages; and/or, (4) Disqualifying the contractor from future bidding as non-responsible.”

5. Contract Wage Rates

The Contractor shall comply with:

The Federal and State wage rate requirements indicated in Exhibits F and G hereof, as revised, are hereby made part of this Contract. The Federal wage rates (Davis-Bacon Act) applicable to this Contract shall be the Federal wage rates that are current on the US Department of Labor website (<http://www.wdol.gov/dba.aspx>) as may be revised 10 days prior to bid opening. These applicable Federal wage rates will be physically incorporated in the final contract document executed by both parties. The Department will no longer physically include revised Federal wage rates in the bid documents or as part of addenda documents, prior to the bid opening date. During the bid advertisement period, bidders are responsible for obtaining the appropriate Federal wage rates from the US Department of Labor website.

To obtain the latest Federal wage rates go to the US Department of Labor website (link above). Under Davis-Bacon Act, choose "Selecting DBA WDs" and follow the instruction to search the latest wage rates for the State, County and Construction Type. Refer to the Notice to Contractor (NTC) - Federal Wage Determinations (Davis Bacon Act).

If a conflict exists between the Federal and State wage rates, the higher rate shall govern.

Prevailing Wages for Work on State Highways; Annual Adjustments. With respect to contracts for work on state highways and bridges on state highways, the Contractor shall comply with the provisions of Section 31-54 and 31-55a of the Connecticut General Statutes, as revised.

As required by Section 1.05.12 (Payrolls) of the State of Connecticut, Department of Transportation's Standard Specification for Roads, Bridges and Incidental Construction (FORM 816), as may be revised, every Contractor or subcontractor performing project work on a Federal aid project is required to post the relevant prevailing wage rates as determined by the United States Secretary of Labor. The wage rate determinations shall be posted in prominent and easily accessible places at the work site.

6. Americans with Disabilities Act of 1990, as Amended

This provision applies to those Contractors who are or will be responsible for compliance with the terms of the Americans with Disabilities Act of 1990, as amended (42 U.S.C. 12101 et seq.), (Act), during the term of the Contract. The Contractor represents that it is familiar with the terms of this Act and that it is in compliance with the Act. Failure of the Contractor to satisfy this standard as the same applies to performance under this Contract, either now or during the term of the Contract as it may be amended, will render the Contract voidable at the option of the State upon notice to the contractor. The Contractor warrants that it will hold the State harmless and indemnify the State from any liability which may be imposed upon the State as a result of any failure of the Contractor to be in compliance with this Act, as the same applies to performance under this Contract.

7. Connecticut Statutory Labor Requirements

(a) Construction, Alteration or Repair of Public Works Projects; Wage Rates. The Contractor shall comply with Section 31-53 of the Connecticut General Statutes, as revised. The wages paid on an hourly basis to any person performing the work of any mechanic, laborer or worker on the work herein contracted to be done and the amount of payment or contribution paid or payable on behalf of each such person to any employee welfare fund, as defined in subsection (i)

of section 31-53 of the Connecticut General Statutes, shall be at a rate equal to the rate customary or prevailing for the same work in the same trade or occupation in the town in which such public works project is being constructed. Any contractor who is not obligated by agreement to make payment or contribution on behalf of such persons to any such employee welfare fund shall pay to each mechanic, laborer or worker as part of such person's wages the amount of payment or contribution for such person's classification on each pay day.

(b) Debarment List. Limitation on Awarding Contracts. The Contractor shall comply with Section 31-53a of the Connecticut General Statutes, as revised.

(c) Construction Safety and Health Course. The Contractor shall comply with section 31-53b of the Connecticut General Statutes, as revised. The contractor shall furnish proof to the Labor Commissioner with the weekly certified payroll form for the first week each employee begins work on such project that any person performing the work of a mechanic, laborer or worker pursuant to the classifications of labor under section 31-53 of the Connecticut General Statutes, as revised, on such public works project, pursuant to such contract, has completed a course of at least ten hours in duration in construction safety and health approved by the federal Occupational Safety and Health Administration or, has completed a new miner training program approved by the Federal Mine Safety and Health Administration in accordance with 30 CFR 48 or, in the case of telecommunications employees, has completed at least ten hours of training in accordance with 29 CFR 1910.268.

Any employee required to complete a construction safety and health course as required that has not completed the course, shall have a maximum of fourteen (14) days to complete the course. If the employee has not been brought into compliance, they shall be removed from the project until such time as they have completed the required training.

Any costs associated with this notice shall be included in the general cost of the contract. In addition, there shall be no time granted to the contractor for compliance with this notice. The contractor's compliance with this notice and any associated regulations shall not be grounds for claims as outlined in Section 1.11 – "Claims".

(d) Awarding of Contracts to Occupational Safety and Health Law Violators Prohibited. The Contract is subject to Section 31-57b of the Connecticut General Statutes, as revised.

(e) Residents Preference in Work on Other Public Facilities. NOT APPLICABLE TO FEDERAL AID CONTRACTS. Pursuant to Section 31-52a of the Connecticut General Statutes, as revised, in the employment of mechanics, laborers or workmen to perform the work specified herein, preference shall be given to residents of the state who are, and continuously for at least six months prior to the date hereof have been, residents of this state, and if no such person is available, then to residents of other states

8. Tax Liability - Contractor's Exempt Purchase Certificate (CERT – 141)

The Contractor shall comply with Chapter 219 of the Connecticut General Statutes pertaining to tangible personal property or services rendered that is/are subject to sales tax. The Contractor is responsible for determining its tax liability. If the Contractor purchases materials or supplies pursuant to the Connecticut Department of Revenue Services' "Contractor's Exempt Purchase Certificate (CERT-141)," as may be revised, the Contractor acknowledges and agrees that title to such materials and supplies installed or placed in the project will vest in the State simultaneously with passage of title

from the retailers or vendors thereof, and the Contractor will have no property rights in the materials and supplies purchased.

Forms and instructions are available anytime by:

Internet: Visit the DRS website at www.ct.gov/DRS to download and print Connecticut tax forms; or Telephone: Call 1-800-382-9463 (Connecticut calls outside the Greater Hartford calling area only) and select Option 2 or call 860-297-4753 (from anywhere).

9. Executive Orders

This contract is subject to the provisions of Executive Order No. Three of Governor Thomas J. Meskill, promulgated June 16, 1971, concerning labor employment practices, Executive Order No. Seventeen of Governor Thomas J. Meskill, promulgated February 15, 1973, concerning the listing of employment openings and Executive Order No. Sixteen of Governor John G. Rowland promulgated August 4, 1999, concerning violence in the workplace, all of which are incorporated into and are made a part of the contract as if they had been fully set forth in it. The contract may also be subject to Executive Order No. 14 of Governor M. Jodi Rell, promulgated April 17, 2006, concerning procurement of cleaning products and services and to Executive Order No. 49 of Governor Dannel P. Malloy, promulgated May 22, 2015, mandating disclosure of certain gifts to public employees and contributions to certain candidates for office. If Executive Order No. 14 and/or Executive Order No. 49 are applicable, they are deemed to be incorporated into and are made a part of the contract as if they had been fully set forth in it. At the Contractor's request, the Department shall provide a copy of these orders to the Contractor.

10. Non Discrimination Requirement (pursuant to section 4a-60 and 4a-60a of the Connecticut General Statutes, as revised): References to "minority business enterprises" in this Section are not applicable to Federal-aid projects/contracts. Federal-aid projects/contracts are instead subject to the Federal Disadvantaged Business Enterprise Program.

(a) For purposes of this Section, the following terms are defined as follows:

- (1) "Commission" means the Commission on Human Rights and Opportunities;
- (2) "Contract" and "contract" include any extension or modification of the Contract or contract;
- (3) "Contractor" and "contractor" include any successors or assigns of the Contractor or contractor;
- (4) "Gender identity or expression" means a person's gender-related identity, appearance or behavior, whether or not that gender-related identity, appearance or behavior is different from that traditionally associated with the person's physiology or assigned sex at birth, which gender-related identity can be shown by providing evidence including, but not limited to, medical history, care or treatment of the gender-related identity, consistent and uniform assertion of the gender-related identity or any other evidence that the gender-related identity is sincerely held, part of a person's core identity or not being asserted for an improper purpose.
- (5) "good faith" means that degree of diligence which a reasonable person would exercise in the performance of legal duties and obligations;
- (6) "good faith efforts" shall include, but not be limited to, those reasonable initial efforts necessary to comply with statutory or regulatory requirements and additional or substituted efforts when it is determined that such initial efforts will not be sufficient to comply with such requirements;
- (7) "marital status" means being single, married as recognized by the state of Connecticut, widowed, separated or divorced;
- (8) "mental disability" means one or more mental disorders, as defined in the most recent edition of the American Psychiatric Association's "Diagnostic and Statistical Manual of Mental Disorders", or a record of or regarding a person as having one or more such disorders;

- (9) "minority business enterprise" means any small contractor or supplier of materials fifty-one percent or more of the capital stock, if any, or assets of which is owned by a person or persons: (1) who are active in the daily affairs of the enterprise, (2) who have the power to direct the management and policies of the enterprise, and (3) who are members of a minority, as such term is defined in subsection (a) of Connecticut General Statutes § 32-9n; and
- (10) "public works contract" means any agreement between any individual, firm or corporation and the State or any political subdivision of the State other than a municipality for construction, rehabilitation, conversion, extension, demolition or repair of a public building, highway or other changes or improvements in real property, or which is financed in whole or in part by the State, including, but not limited to, matching expenditures, grants, loans, insurance or guarantees.

For purposes of this Section, the terms "Contract" and "contract" do not include a contract where each contractor is (1) a political subdivision of the State of Connecticut, including, but not limited to municipalities, unless the contract is a municipal public works contract or quasi-public agency project contract, (2) any other state of the United States, including but not limited to, the District of Columbia, Puerto Rico, U.S. territories and possessions, and federally recognized Indian tribal governments, as defined in Connecticut General Statutes § 1-267, (3) the federal government, (4) a foreign government, or (5) an agency of a subdivision, state or government described in subdivision (1), (2), (3), or (4) of this subsection.

- (b) (1) The Contractor agrees and warrants that in the performance of the Contract such Contractor will not discriminate or permit discrimination against any person or group of persons on the grounds of race, color, religious creed, age, marital status, national origin, ancestry, sex, gender identity or expression, status as a veteran, intellectual disability, mental disability or physical disability, including, but not limited to, blindness, unless it is shown by such Contractor that such disability prevents performance of the work involved, in any manner prohibited by the laws of the United States or of the State of Connecticut; and the Contractor further agrees to take affirmative action to insure that applicants with job-related qualifications are employed and that employees are treated when employed without regard to their race, color, religious creed, age, marital status, national origin, ancestry, sex, gender identity or expression, status as a veteran, intellectual disability, mental disability or physical disability, including, but not limited to, blindness, unless it is shown by the Contractor that such disability prevents performance of the work involved; (2) the Contractor agrees, in all solicitations or advertisements for employees placed by or on behalf of the Contractor, to state that it is an "affirmative action-equal opportunity employer" in accordance with regulations adopted by the Commission; (3) the Contractor agrees to provide each labor union or representative of workers with which the Contractor has a collective bargaining agreement or other contract or understanding and each vendor with which the Contractor has a contract or understanding, a notice to be provided by the Commission, advising the labor union or workers' representative of the Contractor's commitments under this section and to post copies of the notice in conspicuous places available to employees and applicants for employment; (4) the Contractor agrees to comply with each provision of this Section and Connecticut General Statutes §§ 46a-68e and 46a-68f and with each regulation or relevant order issued by said Commission pursuant to Connecticut General Statutes §§ 46a-56, 46a-68e and 46a-68f; and (5) the Contractor agrees to provide the Commission on Human Rights and Opportunities with such information requested by the Commission, and permit access to pertinent books, records and accounts, concerning the employment practices and procedures of the Contractor as relate to the provisions of this Section and Connecticut General Statutes § 46a-56. If the contract is a public works contract, the Contractor agrees and warrants that he will make good faith efforts to employ minority business enterprises as subcontractors and suppliers of materials on such public works projects.

- (c) Determination of the Contractor's good faith efforts shall include, but shall not be limited to, the following factors: The Contractor's employment and subcontracting policies, patterns and practices; affirmative advertising, recruitment and training; technical assistance activities and such other reasonable activities or efforts as the Commission may prescribe that are designed to ensure the participation of minority business enterprises in public works projects.
- (d) The Contractor shall develop and maintain adequate documentation, in a manner prescribed by the Commission, of its good faith efforts.
- (e) The Contractor shall include the provisions of subsection (b) of this Section in every subcontract or purchase order entered into in order to fulfill any obligation of a contract with the State and such provisions shall be binding on a subcontractor, vendor or manufacturer unless exempted by regulations or orders of the Commission. The Contractor shall take such action with respect to any such subcontract or purchase order as the Commission may direct as a means of enforcing such provisions including sanctions for noncompliance in accordance with Connecticut General Statutes §46a-56; provided if such Contractor becomes involved in, or is threatened with, litigation with a subcontractor or vendor as a result of such direction by the Commission, the Contractor may request the State of Connecticut to enter into any such litigation or negotiation prior thereto to protect the interests of the State and the State may so enter.
- (f) The Contractor agrees to comply with the regulations referred to in this Section as they exist on the date of this Contract and as they may be adopted or amended from time to time during the term of this Contract and any amendments thereto.
- (g) (1) The Contractor agrees and warrants that in the performance of the Contract such Contractor will not discriminate or permit discrimination against any person or group of persons on the grounds of sexual orientation, in any manner prohibited by the laws of the United States or the State of Connecticut, and that employees are treated when employed without regard to their sexual orientation; (2) the Contractor agrees to provide each labor union or representative of workers with which such Contractor has a collective bargaining agreement or other contract or understanding and each vendor with which such Contractor has a contract or understanding, a notice to be provided by the Commission on Human Rights and Opportunities advising the labor union or workers' representative of the Contractor's commitments under this section, and to post copies of the notice in conspicuous places available to employees and applicants for employment; (3) the Contractor agrees to comply with each provision of this section and with each regulation or relevant order issued by said Commission pursuant to Connecticut General Statutes § 46a-56; and (4) the Contractor agrees to provide the Commission on Human Rights and Opportunities with such information requested by the Commission, and permit access to pertinent books, records and accounts, concerning the employment practices and procedures of the Contractor which relate to the provisions of this Section and Connecticut General Statutes § 46a-56.
- (h) The Contractor shall include the provisions of the foregoing paragraph in every subcontract or purchase order entered into in order to fulfill any obligation of a contract with the State and such provisions shall be binding on a subcontractor, vendor or manufacturer unless exempted by regulations or orders of the Commission. The Contractor shall take such action with respect to any such subcontract or purchase order as the Commission may direct as a means of enforcing such provisions including sanctions for noncompliance in accordance with Connecticut General Statutes § 46a-56; provided, if such Contractor becomes involved in, or is threatened with, litigation with a subcontractor or vendor as a result of such direction by the Commission, the Contractor may request the State of Connecticut to enter into any such litigation or negotiation prior thereto to protect the interests of the State and the State may so enter.

Please be aware the Nondiscrimination Certifications can be found at the Office of Policy and Management website:

<https://portal.ct.gov/OPM/Fin-PSA/Forms/Nondiscrimination-Certification>

11. Whistleblower Provision

The following clause is applicable if the Contract has a value of Five Million Dollars (\$5,000,000) or more.

Whistleblowing. This Contract may be subject to the provisions of Section 4-61dd of the Connecticut General Statutes. In accordance with this statute, if an officer, employee or appointing authority of the Contractor takes or threatens to take any personnel action against any employee of the Contractor in retaliation for such employee's disclosure of information to any employee of the contracting state or quasi-public agency or the Auditors of Public Accounts or the Attorney General under the provisions of subsection (a) of such statute, the Contractor shall be liable for a civil penalty of not more than five thousand dollars for each offense, up to a maximum of twenty per cent of the value of this Contract. Each violation shall be a separate and distinct offense and in the case of a continuing violation, each calendar day's continuance of the violation shall be deemed to be a separate and distinct offense. The State may request that the Attorney General bring a civil action in the Superior Court for the Judicial District of Hartford to seek imposition and recovery of such civil penalty. In accordance with subsection (f) of such statute, each large state contractor, as defined in the statute, shall post a notice of the provisions of the statute relating to large state contractors in a conspicuous place which is readily available for viewing by the employees of the Contractor.

12. Connecticut Freedom of Information Act

- (a) **Disclosure of Records.** This Contract may be subject to the provisions of section 1-218 of the Connecticut General Statutes. In accordance with this statute, each contract in excess of two million five hundred thousand dollars between a public agency and a person for the performance of a governmental function shall (a) provide that the public agency is entitled to receive a copy of records and files related to the performance of the governmental function, and (b) indicate that such records and files are subject to FOIA and may be disclosed by the public agency pursuant to FOIA. No request to inspect or copy such records or files shall be valid unless the request is made to the public agency in accordance with FOIA. Any complaint by a person who is denied the right to inspect or copy such records or files shall be brought to the Freedom of Information Commission in accordance with the provisions of sections 1-205 and 1-206 of the Connecticut General Statutes.
- (b) **Confidential Information.** The State will afford due regard to the Contractor's request for the protection of proprietary or confidential information which the State receives from the Contractor. However, all materials associated with the Contract are subject to the terms of the FOIA and all corresponding rules, regulations and interpretations. In making such a request, the Contractor may not merely state generally that the materials are proprietary or confidential in nature and not, therefore, subject to release to third parties. Those particular sentences, paragraphs, pages or sections that the Contractor believes are exempt from disclosure under the FOIA must be specifically identified as such. Convincing explanation and rationale sufficient to justify each exemption consistent with the FOIA must accompany the request. The rationale and explanation must be stated in terms of the prospective harm to the competitive position of the Contractor that would result if the identified material were to be released and the reasons why the materials are legally exempt from release pursuant to the FOIA. To the extent that any other provision or part of the Contract conflicts or is in any way inconsistent with this section, this section controls and shall apply and the conflicting provision or part shall not be given effect. If the Contractor indicates that certain documentation is submitted in confidence, by specifically and clearly marking the documentation as "CONFIDENTIAL," DOT will first review the Contractor's claim for consistency with the FOIA (that is, review that the documentation is actually a trade secret or commercial or financial information and not required by statute), and if

determined to be consistent, will endeavor to keep such information confidential to the extent permitted by law. See, *e.g.*, Conn. Gen. Stat. §1-210(b)(5)(A-B). The State, however, has no obligation to initiate, prosecute or defend any legal proceeding or to seek a protective order or other similar relief to prevent disclosure of any information that is sought pursuant to a FOIA request. Should the State withhold such documentation from a Freedom of Information requester and a complaint be brought to the Freedom of Information Commission, the Contractor shall have the burden of cooperating with DOT in defense of that action and in terms of establishing the availability of any FOIA exemption in any proceeding where it is an issue. In no event shall the State have any liability for the disclosure of any documents or information in its possession which the State believes are required to be disclosed pursuant to the FOIA or other law.

13. Service of Process

The Contractor, if not a resident of the State of Connecticut, or, in the case of a partnership, the partners, if not residents, hereby appoints the Secretary of State of the State of Connecticut, and his successors in office, as agent for service of process for any action arising out of or as a result of this Contract; such appointment to be in effect throughout the life of this Contract and six (6) years thereafter.

14. Substitution of Securities for Retainages on State Contracts and Subcontracts

This Contract is subject to the provisions of Section 3-112a of the General Statutes of the State of Connecticut, as revised.

15. Health Insurance Portability and Accountability Act of 1996 (HIPAA)

The Contractor shall comply, if applicable, with the Health Insurance Portability and Accountability Act of 1996 and, pursuant thereto, the provisions attached at Exhibit D, and hereby made part of this Contract.

16. Forum and Choice of Law

Forum and Choice of Law. The parties deem the Contract to have been made in the City of Hartford, State of Connecticut. Both parties agree that it is fair and reasonable for the validity and construction of the Contract to be, and it shall be, governed by the laws and court decisions of the State of Connecticut, without giving effect to its principles of conflicts of laws. To the extent that any immunities provided by Federal law or the laws of the State of Connecticut do not bar an action against the State, and to the extent that these courts are courts of competent jurisdiction, for the purpose of venue, the complaint shall be made returnable to the Judicial District of Hartford only or shall be brought in the United States District Court for the District of Connecticut only, and shall not be transferred to any other court, provided, however, that nothing here constitutes a waiver or compromise of the sovereign immunity of the State of Connecticut. The Contractor waives any objection which it may now have or will have to the laying of venue of any Claims in any forum and further irrevocably submits to such jurisdiction in any suit, action or proceeding.

17. Summary of State Ethics Laws

Pursuant to the requirements of section 1-101qq of the Connecticut General Statutes, the summary of State ethics laws developed by the State Ethics Commission pursuant to section 1-81b of the Connecticut General Statutes is incorporated by reference into and made a part of the Contract as if the summary had been fully set forth in the Contract.

18. Audit and Inspection of Plants, Places of Business and Records

- (a) The State and its agents, including, but not limited to, the Connecticut Auditors of Public Accounts, Attorney General and State's Attorney and their respective agents, may, at reasonable hours, inspect and examine all of the parts of the Contractor's and Contractor Parties' plants and places of business which, in any way, are related to, or involved in, the performance of this Contract. For the purposes of this Section, "Contractor Parties" means the Contractor's members, directors, officers, shareholders, partners, managers, principal officers, representatives, agents, servants, consultants, employees or any one of them or any other person or entity with whom the Contractor is in privity of oral or written contract and the Contractor intends for such other person or entity to Perform under the Contract in any capacity.
- (b) The Contractor shall maintain, and shall require each of the Contractor Parties to maintain, accurate and complete Records. The Contractor shall make all of its and the Contractor Parties' Records available at all reasonable hours for audit and inspection by the State and its agents.
- (c) The State shall make all requests for any audit or inspection in writing and shall provide the Contractor with at least twenty-four (24) hours' notice prior to the requested audit and inspection date. If the State suspects fraud or other abuse, or in the event of an emergency, the State is not obligated to provide any prior notice.
- (d) The Contractor shall keep and preserve or cause to be kept and preserved all of its and Contractor Parties' Records until three (3) years after the latter of (i) final payment under this Agreement, or (ii) the expiration or earlier termination of this Agreement, as the same may be modified for any reason. The State may request an audit or inspection at any time during this period. If any Claim or audit is started before the expiration of this period, the Contractor shall retain or cause to be retained all Records until all Claims or audit findings have been resolved.
- (e) The Contractor shall cooperate fully with the State and its agents in connection with an audit or inspection. Following any audit or inspection, the State may conduct and the Contractor shall cooperate with an exit conference.
- (f) The Contractor shall incorporate this entire Section verbatim into any contract or other agreement that it enters into with any Contractor Party.

19. Campaign Contribution Restriction

For all State contracts, defined in Conn. Gen. Stat. §9-612(f)(1) as having a value in a calendar year of \$50,000 or more, or a combination or series of such agreements or contracts having a value of \$100,000 or more, the authorized signatory to this contract expressly acknowledges receipt of the State Elections Enforcement Commission's notice advising state contractors of state campaign contribution and solicitation prohibitions, and will inform its principals of the contents of the notice, as set forth in "Notice to Executive Branch State Contractors and Prospective State Contractors of Campaign Contribution and Solicitation Limitations," a copy of which is attached hereto and hereby made a part of this contract, attached as Exhibit E.

20. Tangible Personal Property

- (a) The Contractor on its behalf and on behalf of its Affiliates, as defined below, shall comply with the provisions of Conn. Gen. Stat. §12-411b, as follows:
 - (1) For the term of the Contract, the Contractor and its Affiliates shall collect and remit to the State of Connecticut, Department of Revenue Services, any Connecticut use tax due under the provisions of Chapter 219 of the Connecticut General Statutes for items of tangible personal property sold by the Contractor or by any of its Affiliates in the same manner as if the Contractor and such Affiliates were engaged in the business of selling tangible personal property for use in Connecticut and had sufficient nexus under the provisions of Chapter 219 to be required to collect Connecticut use tax;

- (2) A customer's payment of a use tax to the Contractor or its Affiliates relieves the customer of liability for the use tax;
 - (3) The Contractor and its Affiliates shall remit all use taxes they collect from customers on or before the due date specified in the Contract, which may not be later than the last day of the month next succeeding the end of a calendar quarter or other tax collection period during which the tax was collected;
 - (4) The Contractor and its Affiliates are not liable for use tax billed by them but not paid to them by a customer; and
 - (5) Any Contractor or Affiliate who fails to remit use taxes collected on behalf of its customers by the due date specified in the Contract shall be subject to the interest and penalties provided for persons required to collect sales tax under chapter 219 of the general statutes.
- (b) For purposes of this section of the Contract, the word "Affiliate" means any person, as defined in section 12-1 of the general statutes, that controls, is controlled by, or is under common control with another person. A person controls another person if the person owns, directly or indirectly, more than ten per cent of the voting securities of the other person. The word "voting security" means a security that confers upon the holder the right to vote for the election of members of the board of directors or similar governing body of the business, or that is convertible into, or entitles the holder to receive, upon its exercise, a security that confers such a right to vote. "Voting security" includes a general partnership interest.
- (c) The Contractor represents and warrants that each of its Affiliates has vested in the Contractor plenary authority to so bind the Affiliates in any agreement with the State of Connecticut. The Contractor on its own behalf and on behalf of its Affiliates shall also provide, no later than 30 days after receiving a request by the State's contracting authority, such information as the State may require to ensure, in the State's sole determination, compliance with the provisions of Chapter 219 of the Connecticut General Statutes, including, but not limited to, §12-411b.

21. Bid Rigging and/or Fraud – Notice to Contractor

The Connecticut Department of Transportation is cooperating with the U.S. Department of Transportation and the Justice Department in their investigation into highway construction contract bid rigging and/or fraud.

A toll-free "HOT LINE" telephone number 800-424-9071 has been established to receive information from contractors, subcontractors, manufacturers, suppliers or anyone with knowledge of bid rigging and/or fraud, either past or current. The "HOT LINE" telephone number will be available during normal working hours (8:00 am – 5:00 pm EST). Information will be treated confidentially and anonymity respected.

22. Consulting Agreement Affidavit

The Contractor shall comply with Connecticut General Statutes Section 4a-81(a) and 4a-81(b), as revised. Pursuant to Public Act 11-229, after the initial submission of the form, if there is a change in the information contained in the form, a contractor shall submit the updated form, as applicable, either (i) not later than thirty (30) days after the effective date of such change or (ii) prior to execution of any new contract, whichever is earlier.

The Affidavit/Form may be submitted in written format or electronic format through the Department of Administrative Services (DAS) website.

23. Cargo Preference Act Requirements (46 CFR 381.7(a)-(b)) – Use of United States Flag Vessels

The Contractor agrees to comply with the following:

(a) ***Agreement Clauses.***

- (1) Pursuant to Pub. L. 664 ([43 U.S.C. 1241\(b\)](#)) at least 50 percent of any equipment, materials or commodities procured, contracted for or otherwise obtained with funds granted, guaranteed, loaned, or advanced by the U.S. Government under this agreement, and which may be transported by ocean vessel, shall be transported on privately owned United States-flag commercial vessels, if available.
- (2) Within 20 days following the date of loading for shipments originating within the United States or within 30 working days following the date of loading for shipments originating outside the United States, a legible copy of a rated, ‘on-board’ commercial ocean bill-of-lading in English for each shipment of cargo described in paragraph (a)(1) of this section shall be furnished to both the Contracting Officer (through the prime contractor in the case of subcontractor bills-of-lading) and to the Division of National Cargo, Office of Market Development, Maritime Administration, Washington, DC 20590.

(b) ***Contractor and Subcontractor Clauses.*** The contractor agrees—

- (1) To utilize privately owned United States-flag commercial vessels to ship at least 50 percent of the gross tonnage (computed separately for dry bulk carriers, dry cargo liners, and tankers) involved, whenever shipping any equipment, material, or commodities pursuant to this contract, to the extent such vessels are available at fair and reasonable rates for United States-flag commercial vessels.
- (2) To furnish within 20 days following the date of loading for shipments originating within the United States or within 30 working days following the date of loading for shipments originating outside the United States, a legible copy of a rated, ‘on-board’ commercial ocean bill-of-lading in English for each shipment of cargo described in paragraph (b) (1) of this section to both the Contracting Officer (through the prime contractor in the case of subcontractor bills-of-lading) and to the Division of National Cargo, Office of Market Development, Maritime Administration, Washington, DC 20590.
- (3) To insert the substance of the provisions of this clause in all subcontracts issued pursuant to this contract.

EXHIBIT A

FHWA-1273 -- Revised May 1, 2012

REQUIRED CONTRACT PROVISIONS FEDERAL-AID CONSTRUCTION CONTRACTS

- I. General
- II. Nondiscrimination
- III. Nonsegregated Facilities
- IV. Davis-Bacon and Related Act Provisions
- V. Contract Work Hours and Safety Standards Act Provisions
- VI. Subletting or Assigning the Contract
- VII. Safety: Accident Prevention
- VIII. False Statements Concerning Highway Projects
- IX. Implementation of Clean Air Act and Federal Water Pollution Control Act
- X. Compliance with Governmentwide Suspension and Debarment Requirements
- XI. Certification Regarding Use of Contract Funds for Lobbying

I. GENERAL

1. Form FHWA-1273 must be physically incorporated in each construction contract funded under Title 23 (excluding emergency contracts solely intended for debris removal). The contractor (or subcontractor) must insert this form in each subcontract and further require its inclusion in all lower tier subcontracts (excluding purchase orders, rental agreements and other agreements for supplies or services).

The applicable requirements of Form FHWA-1273 are incorporated by reference for work done under any purchase order, rental agreement or agreement for other services. The prime contractor shall be responsible for compliance by any subcontractor, lower-tier subcontractor or service provider.

Form FHWA-1273 must be included in all Federal-aid design-build contracts, in all subcontracts and in lower tier subcontracts (excluding subcontracts for design services, purchase orders, rental agreements and other agreements for supplies or services). The design-builder shall be responsible for compliance by any subcontractor, lower-tier subcontractor or service provider.

Contracting agencies may reference Form FHWA-1273 in bid proposal or request for proposal documents, however, the Form FHWA-1273 must be physically incorporated (not referenced) in all contracts, subcontracts and lower-tier subcontracts (excluding purchase orders, rental agreements and other agreements for supplies or services related to a construction contract).

2. Subject to the applicability criteria noted in the following sections, these contract provisions shall apply to all work performed on the contract by the contractor's own organization and with the assistance of workers under the contractor's immediate superintendence and to all work performed on the contract by piecework, station work, or by subcontract.

3. A breach of any of the stipulations contained in these Required Contract Provisions may be sufficient grounds for withholding of progress payments, withholding of final payment, termination of the contract, suspension / debarment or any other action determined to be appropriate by the contracting agency and FHWA.

4. Selection of Labor: During the performance of this contract, the contractor shall not use convict labor for any purpose within the limits of a construction project on a Federal-aid highway unless it is labor performed by convicts who are on parole, supervised release, or probation. The term Federal-aid highway does not include roadways functionally classified as local roads or rural minor collectors.

II. NONDISCRIMINATION

The provisions of this section related to 23 CFR Part 230 are applicable to all Federal-aid construction contracts and to all related construction subcontracts of \$10,000 or more. The provisions of 23 CFR Part 230 are not applicable to material supply, engineering, or architectural service contracts.

In addition, the contractor and all subcontractors must comply with the following policies: Executive Order 11246, 41 CFR 60, 29 CFR 1625-1627, Title 23 USC Section 140, the Rehabilitation Act of 1973, as amended (29 USC 794), Title VI of the Civil Rights Act of 1964, as amended, and related regulations including 49 CFR Parts 21, 26 and 27; and 23 CFR Parts 200, 230, and 633.

The contractor and all subcontractors must comply with: the requirements of the Equal Opportunity Clause in 41 CFR 60-1.4(b) and, for all construction contracts exceeding \$10,000, the Standard Federal Equal Employment Opportunity Construction Contract Specifications in 41 CFR 60-4.3.

Note: The U.S. Department of Labor has exclusive authority to determine compliance with Executive Order 11246 and the policies of the Secretary of Labor including 41 CFR 60, and 29 CFR 1625-1627. The contracting agency and the FHWA have the authority and the responsibility to ensure compliance with Title 23 USC Section 140, the Rehabilitation Act of 1973, as amended (29 USC 794), and Title VI of the Civil Rights Act of 1964, as amended, and related regulations including 49 CFR Parts 21, 26 and 27; and 23 CFR Parts 200, 230, and 633.

The following provision is adopted from 23 CFR 230, Appendix A, with appropriate revisions to conform to the U.S. Department of Labor (US DOL) and FHWA requirements.

1. Equal Employment Opportunity: Equal employment opportunity (EEO) requirements not to discriminate and to take affirmative action to assure equal opportunity as set forth under laws, executive orders, rules, regulations (28 CFR 35, 29 CFR 1630, 29 CFR 1625-1627, 41 CFR 60 and 49 CFR 27) and orders of the Secretary of Labor as modified by the provisions prescribed herein, and imposed pursuant to 23 U.S.C. 140 shall constitute the EEO and specific affirmative action standards for the contractor's project activities under this contract. The provisions of the Americans with Disabilities Act of 1990 (42 U.S.C. 12101 et seq.) set forth under 28 CFR 35 and 29 CFR 1630 are incorporated by reference in this contract. In the execution of this contract, the contractor agrees to comply with the following minimum specific requirement activities of EEO:

a. The contractor will work with the contracting agency and the Federal Government to ensure that it has made every good faith effort to provide equal opportunity with respect to all of its terms and conditions of employment and in their review of activities under the contract.

b. The contractor will accept as its operating policy the following statement:

"It is the policy of this Company to assure that applicants are employed, and that employees are treated during employment, without regard to their race, religion, sex, color, national origin, age or disability. Such action shall include: employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship, pre-apprenticeship, and/or on-the-job training."

2. EEO Officer: The contractor will designate and make known to the contracting officers an EEO Officer who will have the responsibility for and must be capable of effectively administering and promoting an active EEO program and who must be assigned adequate authority and responsibility to do so.

3. Dissemination of Policy: All members of the contractor's staff who are authorized to hire, supervise, promote, and discharge employees, or who recommend such action, or who are substantially involved in such action, will be made fully cognizant of, and will implement, the contractor's EEO policy and contractual responsibilities to provide EEO in each grade and classification of employment. To ensure that the above agreement will be met, the following actions will be taken as a minimum:

a. Periodic meetings of supervisory and personnel office employees will be conducted before the start of work and then not less often than once every six months, at which time the contractor's EEO policy and its implementation will be reviewed and explained. The meetings will be conducted by the EEO Officer.

b. All new supervisory or personnel office employees will be given a thorough indoctrination by the EEO Officer, covering all major aspects of the contractor's EEO obligations within thirty days following their reporting for duty with the contractor.

c. All personnel who are engaged in direct recruitment for the project will be instructed by the EEO Officer in the contractor's procedures for locating and hiring minorities and women.

d. Notices and posters setting forth the contractor's EEO policy will be placed in areas readily accessible to employees, applicants for employment and potential employees.

e. The contractor's EEO policy and the procedures to implement such policy will be brought to the attention of employees by means of meetings, employee handbooks, or other appropriate means.

4. Recruitment: When advertising for employees, the contractor will include in all advertisements for employees the notation: "An Equal Opportunity Employer." All such advertisements will be placed in publications having a large circulation among minorities and women in the area from which the project work force would normally be derived.

a. The contractor will, unless precluded by a valid bargaining agreement, conduct systematic and direct recruitment through public and private employee referral sources likely to yield qualified minorities and women. To meet this requirement, the contractor will identify sources of potential minority group employees, and establish with such identified sources procedures whereby minority and women applicants may be referred to the contractor for employment consideration.

b. In the event the contractor has a valid bargaining agreement providing for exclusive hiring hall referrals, the contractor is expected to observe the provisions of that agreement to the extent that the system meets the contractor's compliance with EEO contract provisions. Where implementation of

such an agreement has the effect of discriminating against minorities or women, or obligates the contractor to do the same, such implementation violates Federal nondiscrimination provisions.

c. The contractor will encourage its present employees to refer minorities and women as applicants for employment. Information and procedures with regard to referring such applicants will be discussed with employees.

5. Personnel Actions: Wages, working conditions, and employee benefits shall be established and administered, and personnel actions of every type, including hiring, upgrading, promotion, transfer, demotion, layoff, and termination, shall be taken without regard to race, color, religion, sex, national origin, age or disability. The following procedures shall be followed:

a. The contractor will conduct periodic inspections of project sites to insure that working conditions and employee facilities do not indicate discriminatory treatment of project site personnel.

b. The contractor will periodically evaluate the spread of wages paid within each classification to determine any evidence of discriminatory wage practices.

c. The contractor will periodically review selected personnel actions in depth to determine whether there is evidence of discrimination. Where evidence is found, the contractor will promptly take corrective action. If the review indicates that the discrimination may extend beyond the actions reviewed, such corrective action shall include all affected persons.

d. The contractor will promptly investigate all complaints of alleged discrimination made to the contractor in connection with its obligations under this contract, will attempt to resolve such complaints, and will take appropriate corrective action within a reasonable time. If the investigation indicates that the discrimination may affect persons other than the complainant, such corrective action shall include such other persons. Upon completion of each investigation, the contractor will inform every complainant of all of their avenues of appeal.

6. Training and Promotion:

a. The contractor will assist in locating, qualifying, and increasing the skills of minorities and women who are applicants for employment or current employees. Such efforts should be aimed at developing full journey level status employees in the type of trade or job classification involved.

b. Consistent with the contractor's work force requirements and as permissible under Federal and State regulations, the contractor shall make full use of training programs, i.e., apprenticeship, and on-the-job training programs for the geographical area of contract performance. In the event a special provision for training is provided under this contract, this subparagraph will be superseded as indicated in the special provision. The contracting agency may reserve training positions for persons who receive welfare assistance in accordance with 23 U.S.C. 140(a).

c. The contractor will advise employees and applicants for employment of available training programs and entrance requirements for each.

d. The contractor will periodically review the training and promotion potential of employees who are minorities and women and will encourage eligible employees to apply for such training and promotion.

7. Unions: If the contractor relies in whole or in part upon unions as a source of employees, the contractor will use good faith efforts to obtain the cooperation of such unions to increase opportunities for minorities and women. Actions by the contractor, either directly or through a contractor's association acting as agent, will include the procedures set forth below:

- a. The contractor will use good faith efforts to develop, in cooperation with the unions, joint training programs aimed toward qualifying more minorities and women for membership in the unions and increasing the skills of minorities and women so that they may qualify for higher paying employment.
- b. The contractor will use good faith efforts to incorporate an EEO clause into each union agreement to the end that such union will be contractually bound to refer applicants without regard to their race, color, religion, sex, national origin, age or disability.
- c. The contractor is to obtain information as to the referral practices and policies of the labor union except that to the extent such information is within the exclusive possession of the labor union and such labor union refuses to furnish such information to the contractor, the contractor shall so certify to the contracting agency and shall set forth what efforts have been made to obtain such information.
- d. In the event the union is unable to provide the contractor with a reasonable flow of referrals within the time limit set forth in the collective bargaining agreement, the contractor will, through independent recruitment efforts, fill the employment vacancies without regard to race, color, religion, sex, national origin, age or disability; making full efforts to obtain qualified and/or qualifiable minorities and women. The failure of a union to provide sufficient referrals (even though it is obligated to provide exclusive referrals under the terms of a collective bargaining agreement) does not relieve the contractor from the requirements of this paragraph. In the event the union referral practice prevents the contractor from meeting the obligations pursuant to Executive Order 11246, as amended, and these special provisions, such contractor shall immediately notify the contracting agency.

8. Reasonable Accommodation for Applicants / Employees with Disabilities: The contractor must be familiar with the requirements for and comply with the Americans with Disabilities Act and all rules and regulations established there under. Employers must provide reasonable accommodation in all employment activities unless to do so would cause an undue hardship.

9. Selection of Subcontractors, Procurement of Materials and Leasing of Equipment: The contractor shall not discriminate on the grounds of race, color, religion, sex, national origin, age or disability in the selection and retention of subcontractors, including procurement of materials and leases of equipment. The contractor shall take all necessary and reasonable steps to ensure nondiscrimination in the administration of this contract.

- a. The contractor shall notify all potential subcontractors and suppliers and lessors of their EEO obligations under this contract.
- b. The contractor will use good faith efforts to ensure subcontractor compliance with their EEO obligations.

10. Assurance Required by 49 CFR 26.13(b):

- a. The requirements of 49 CFR Part 26, and the State DOT's U.S. DOT-approved DBE program are incorporated by reference.

b. The contractor or subcontractor 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 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 contracting agency deems appropriate.

11. Records and Reports: The contractor shall keep such records as necessary to document compliance with the EEO requirements. Such records shall be retained for a period of three years following the date of the final payment to the contractor for all contract work and shall be available at reasonable times and places for inspection by authorized representatives of the contracting agency and the FHWA.

a. The records kept by the contractor shall document the following:

(1) The number and work hours of minority and non-minority group members and women employed in each work classification on the project;

(2) The progress and efforts being made in cooperation with unions, when applicable, to increase employment opportunities for minorities and women; and

(3) The progress and efforts being made in locating, hiring, training, qualifying, and upgrading minorities and women;

b. The contractors and subcontractors will submit an annual report to the contracting agency each July for the duration of the project, indicating the number of minority, women, and non-minority group employees currently engaged in each work classification required by the contract work. This information is to be reported on [Form FHWA-1391](#). The staffing data should represent the project work force on board in all or any part of the last payroll period preceding the end of July. If on-the-job training is being required by special provision, the contractor will be required to collect and report training data. The employment data should reflect the work force on board during all or any part of the last payroll period preceding the end of July.

III. NONSEGREGATED FACILITIES

This provision is applicable to all Federal-aid construction contracts and to all related construction subcontracts of \$10,000 or more.

The contractor must ensure that facilities provided for employees are provided in such a manner that segregation on the basis of race, color, religion, sex, or national origin cannot result. The contractor may neither require such segregated use by written or oral policies nor tolerate such use by employee custom. The contractor's obligation extends further to ensure that its employees are not assigned to perform their services at any location, under the contractor's control, where the facilities are segregated. The term "facilities" includes waiting rooms, work areas, restaurants and other eating areas, time clocks, restrooms, washrooms, locker rooms, and other storage or dressing areas, parking lots, drinking fountains, recreation or entertainment areas, transportation, and housing provided for employees. The contractor shall provide separate or single-user restrooms and necessary dressing or sleeping areas to assure privacy between sexes.

IV. DAVIS-BACON AND RELATED ACT PROVISIONS

This section is applicable to all Federal-aid construction projects exceeding \$2,000 and to all related subcontracts and lower-tier subcontracts (regardless of subcontract size). The requirements apply to all projects located within the right-of-way of a roadway that is functionally classified as Federal-aid highway. This excludes roadways functionally classified as local roads or rural minor collectors, which are exempt. Contracting agencies may elect to apply these requirements to other projects.

The following provisions are from the U.S. Department of Labor regulations in 29 CFR 5.5 “Contract provisions and related matters” with minor revisions to conform to the FHWA-1273 format and FHWA program requirements.

1. Minimum wages

a. All laborers and mechanics employed or working upon the site of the work, will be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by regulations issued by the Secretary of Labor under the Copeland Act (29 CFR part 3)), the full amount of wages and bona fide fringe benefits (or cash equivalents thereof) due at time of payment computed at rates not less than those contained in the wage determination of the Secretary of Labor which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the contractor and such laborers and mechanics.

Contributions made or costs reasonably anticipated for bona fide fringe benefits under section 1(b)(2) of the Davis-Bacon Act on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of paragraph 1.d. of this section; also, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs which cover the particular weekly period, are deemed to be constructively made or incurred during such weekly period. Such laborers and mechanics shall be paid the appropriate wage rate and fringe benefits on the wage determination for the classification of work actually performed, without regard to skill, except as provided in 29 CFR 5.5(a)(4). Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein: Provided, That the employer's payroll records accurately set forth the time spent in each classification in which work is performed. The wage determination (including any additional classification and wage rates conformed under paragraph 1.b. of this section) and the Davis-Bacon poster (WH-1321) shall be posted at all times by the contractor and its subcontractors at the site of the work in a prominent and accessible place where it can be easily seen by the workers.

b. (1) The contracting officer shall require that any class of laborers or mechanics, including helpers, which is not listed in the wage determination and which is to be employed under the contract shall be classified in conformance with the wage determination. The contracting officer shall approve an additional classification and wage rate and fringe benefits therefore only when the following criteria have been met:

(i) The work to be performed by the classification requested is not performed by a classification in the wage determination; and

(ii) The classification is utilized in the area by the construction industry; and

(iii) The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination.

(2) If the contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and the contracting officer agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), a report of the action taken shall be sent by the contracting officer to the Administrator of the Wage and Hour Division, Employment Standards Administration, U.S. Department of Labor, Washington, DC 20210. The Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification action within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.

(3) In the event the contractor, the laborers or mechanics to be employed in the classification or their representatives, and the contracting officer do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), the contracting officer shall refer the questions, including the views of all interested parties and the recommendation of the contracting officer, to the Wage and Hour Administrator for determination. The Wage and Hour Administrator, or an authorized representative, will issue a determination within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.

(4) The wage rate (including fringe benefits where appropriate) determined pursuant to paragraphs 1.b.(2) or 1.b.(3) of this section, shall be paid to all workers performing work in the classification under this contract from the first day on which work is performed in the classification.

c. Whenever the minimum wage rate prescribed in the contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate, the contractor shall either pay the benefit as stated in the wage determination or shall pay another bona fide fringe benefit or an hourly cash equivalent thereof.

d. If the contractor does not make payments to a trustee or other third person, the contractor may consider as part of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program, Provided, That the Secretary of Labor has found, upon the written request of the contractor, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the contractor to set aside in a separate account assets for the meeting of obligations under the plan or program.

2. Withholding

The contracting agency shall upon its own action or upon written request of an authorized representative of the Department of Labor, withhold or cause to be withheld from the contractor under this contract, or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to Davis-Bacon prevailing wage requirements, which is held by the same prime contractor, so much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees, and helpers, employed by the contractor or any subcontractor the full amount of wages required by the contract. In the event of failure to pay any laborer or mechanic, including any apprentice, trainee, or helper, employed or working on the site of the work, all or part of the wages required by the contract, the contracting agency may, after written notice to the contractor, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased.

3. Payrolls and basic records

a. Payrolls and basic records relating thereto shall be maintained by the contractor during the course of the work and preserved for a period of three years thereafter for all laborers and mechanics working at the site of the work. Such records shall contain the name, address, and social security number of each such worker, his or her correct classification, hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof of the types described in section 1(b)(2)(B) of the Davis-Bacon Act), daily and weekly number of hours worked, deductions made and actual wages paid. Whenever the Secretary of Labor has found under 29 CFR 5.5(a)(1)(iv) that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in section 1(b)(2)(B) of the Davis-Bacon Act, the contractor shall maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, and that the plan or program has been communicated in writing to the laborers or mechanics affected, and records which show the costs anticipated or the actual cost incurred in providing such benefits. Contractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprenticeship programs and certification of trainee programs, the registration of the apprentices and trainees, and the ratios and wage rates prescribed in the applicable programs.

b. (1) The contractor shall submit weekly for each week in which any contract work is performed a copy of all payrolls to the contracting agency. The payrolls submitted shall set out accurately and completely all of the information required to be maintained under 29 CFR 5.5(a)(3)(i), except that full social security numbers and home addresses shall not be included on weekly transmittals. Instead the payrolls shall only need to include an individually identifying number for each employee (e.g. , the last four digits of the employee's social security number). The required weekly payroll information may be submitted in any form desired. Optional Form WH-347 is available for this purpose from the Wage and Hour Division Web site at <http://www.dol.gov/esa/whd/forms/wh347instr.htm> or its successor site. The prime contractor is responsible for the submission of copies of payrolls by all subcontractors. Contractors and subcontractors shall maintain the full social security number and current address of each covered worker, and shall provide them upon request to the contracting agency for transmission to the State DOT, the FHWA or the Wage and Hour Division of the Department of Labor for purposes of an investigation or audit of compliance with prevailing wage requirements. It is not a violation of this section for a prime contractor to require a subcontractor to provide addresses and social security numbers to the prime contractor for its own records, without weekly submission to the contracting agency..

(2) Each payroll submitted shall be accompanied by a "Statement of Compliance," signed by the contractor or subcontractor or his or her agent who pays or supervises the payment of the persons employed under the contract and shall certify the following:

(i) That the payroll for the payroll period contains the information required to be provided under §5.5 (a)(3)(ii) of Regulations, 29 CFR part 5, the appropriate information is being maintained under §5.5 (a)(3)(i) of Regulations, 29 CFR part 5, and that such information is correct and complete;

(ii) That each laborer or mechanic (including each helper, apprentice, and trainee) employed on the contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or indirectly from the full wages earned, other than permissible deductions as set forth in Regulations, 29 CFR part 3;

(iii) That each laborer or mechanic has been paid not less than the applicable wage rates and fringe benefits or cash equivalents for the classification of work performed, as specified in the applicable wage determination incorporated into the contract.

(3) The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH-347 shall satisfy the requirement for submission of the "Statement of Compliance" required by paragraph 3.b.(2) of this section.

(4) The falsification of any of the above certifications may subject the contractor or subcontractor to civil or criminal prosecution under section 1001 of title 18 and section 231 of title 31 of the United States Code.

c. The contractor or subcontractor shall make the records required under paragraph 3.a. of this section available for inspection, copying, or transcription by authorized representatives of the contracting agency, the State DOT, the FHWA, or the Department of Labor, and shall permit such representatives to interview employees during working hours on the job. If the contractor or subcontractor fails to submit the required records or to make them available, the FHWA may, after written notice to the contractor, the contracting agency or the State DOT, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds. Furthermore, failure to submit the required records upon request or to make such records available may be grounds for debarment action pursuant to 29 CFR 5.12.

4. Apprentices and trainees

a. Apprentices (programs of the USDOL).

Apprentices will be permitted to work at less than the predetermined rate for the work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training Administration, Office of Apprenticeship Training, Employer and Labor Services, or with a State Apprenticeship Agency recognized by the Office, or if a person is employed in his or her first 90 days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by the Office of Apprenticeship Training, Employer and Labor Services or a State Apprenticeship Agency (where appropriate) to be eligible for probationary employment as an apprentice.

The allowable ratio of apprentices to journeymen on the job site in any craft classification shall not be greater than the ratio permitted to the contractor as to the entire work force under the registered program. Any worker listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated above, shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any apprentice performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. Where a contractor is performing construction on a project in a locality other than that in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyman's hourly rate) specified in the contractor's or subcontractor's registered program shall be observed.

Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice's level of progress, expressed as a percentage of the journeymen hourly rate specified in the applicable wage determination. Apprentices shall be paid fringe benefits in accordance with the

provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator determines that a different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination.

In the event the Office of Apprenticeship Training, Employer and Labor Services, or a State Apprenticeship Agency recognized by the Office, withdraws approval of an apprenticeship program, the contractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

b. Trainees (programs of the USDOL).

Except as provided in 29 CFR 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification by the U.S. Department of Labor, Employment and Training Administration.

The ratio of trainees to journeymen on the job site shall not be greater than permitted under the plan approved by the Employment and Training Administration.

Every trainee must be paid at not less than the rate specified in the approved program for the trainee's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed on the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman wage rate on the wage determination which provides for less than full fringe benefits for apprentices. Any employee listed on the payroll at a trainee rate who is not registered and participating in a training plan approved by the Employment and Training Administration shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any trainee performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed.

In the event the Employment and Training Administration withdraws approval of a training program, the contractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

c. Equal employment opportunity. The utilization of apprentices, trainees and journeymen under this part shall be in conformity with the equal employment opportunity requirements of Executive Order 11246, as amended, and 29 CFR part 30.

d. Apprentices and Trainees (programs of the U.S. DOT).

Apprentices and trainees working under apprenticeship and skill training programs which have been certified by the Secretary of Transportation as promoting EEO in connection with Federal-aid highway construction programs are not subject to the requirements of paragraph 4 of this Section IV. The straight time hourly wage rates for apprentices and trainees under such programs will be established by the particular programs. The ratio of apprentices and trainees to journeymen shall not be greater than permitted by the terms of the particular program.

5. Compliance with Copeland Act requirements. The contractor shall comply with the requirements of 29 CFR part 3, which are incorporated by reference in this contract.

6. Subcontracts. The contractor or subcontractor shall insert Form FHWA-1273 in any subcontracts and also require the subcontractors to include Form FHWA-1273 in any lower tier subcontracts. The prime contractor shall be responsible for the compliance by any subcontractor or lower tier subcontractor with all the contract clauses in 29 CFR 5.5.

7. Contract termination: debarment. A breach of the contract clauses in 29 CFR 5.5 may be grounds for termination of the contract, and for debarment as a contractor and a subcontractor as provided in 29 CFR 5.12.

8. Compliance with Davis-Bacon and Related Act requirements. All rulings and interpretations of the Davis-Bacon and Related Acts contained in 29 CFR parts 1, 3, and 5 are herein incorporated by reference in this contract.

9. Disputes concerning labor standards. Disputes arising out of the labor standards provisions of this contract shall not be subject to the general disputes clause of this contract. Such disputes shall be resolved in accordance with the procedures of the Department of Labor set forth in 29 CFR parts 5, 6, and 7. Disputes within the meaning of this clause include disputes between the contractor (or any of its subcontractors) and the contracting agency, the U.S. Department of Labor, or the employees or their representatives.

10. Certification of eligibility.

a. By entering into this contract, the contractor certifies that neither it (nor he or she) nor any person or firm who has an interest in the contractor's firm is a person or firm ineligible to be awarded Government contracts by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

b. No part of this contract shall be subcontracted to any person or firm ineligible for award of a Government contract by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

c. The penalty for making false statements is prescribed in the U.S. Criminal Code, 18 U.S.C. 1001.

V. CONTRACT WORK HOURS AND SAFETY STANDARDS ACT

The following clauses apply to any Federal-aid construction contract in an amount in excess of \$100,000 and subject to the overtime provisions of the Contract Work Hours and Safety Standards Act. These clauses shall be inserted in addition to the clauses required by 29 CFR 5.5(a) or 29 CFR 4.6. As used in this paragraph, the terms laborers and mechanics include watchmen and guards.

1. Overtime requirements. No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics shall require or permit any such laborer or mechanic in any workweek in which he or she is employed on such work to work in excess of forty hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of forty hours in such workweek.

2. Violation; liability for unpaid wages; liquidated damages. In the event of any violation of the clause set forth in paragraph (1.) of this section, the contractor and any subcontractor responsible

therefor shall be liable for the unpaid wages. In addition, such contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the clause set forth in paragraph (1.) of this section, in the sum of \$10 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of forty hours without payment of the overtime wages required by the clause set forth in paragraph (1.) of this section.

3. Withholding for unpaid wages and liquidated damages. The FHWA or the contacting agency shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld, from any moneys payable on account of work performed by the contractor or subcontractor under any such contract or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to the Contract Work Hours and Safety Standards Act, which is held by the same prime contractor, such sums as may be determined to be necessary to satisfy any liabilities of such contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in paragraph (2.) of this section.

4. Subcontracts. The contractor or subcontractor shall insert in any subcontracts the clauses set forth in paragraph (1.) through (4.) of this section and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in paragraphs (1.) through (4.) of this section.

VI. SUBLETTING OR ASSIGNING THE CONTRACT

This provision is applicable to all Federal-aid construction contracts on the National Highway System.

1. The contractor shall perform with its own organization contract work amounting to not less than 30 percent (or a greater percentage if specified elsewhere in the contract) of the total original contract price, excluding any specialty items designated by the contracting agency. Specialty items may be performed by subcontract and the amount of any such specialty items performed may be deducted from the total original contract price before computing the amount of work required to be performed by the contractor's own organization (23 CFR 635.116).

a. The term “perform work with its own organization” refers to workers employed or leased by the prime contractor, and equipment owned or rented by the prime contractor, with or without operators. Such term does not include employees or equipment of a subcontractor or lower tier subcontractor, agents of the prime contractor, or any other assignees. The term may include payments for the costs of hiring leased employees from an employee leasing firm meeting all relevant Federal and State regulatory requirements. Leased employees may only be included in this term if the prime contractor meets all of the following conditions:

- (1) the prime contractor maintains control over the supervision of the day-to-day activities of the leased employees;
- (2) the prime contractor remains responsible for the quality of the work of the leased employees;
- (3) the prime contractor retains all power to accept or exclude individual employees from work on the project; and

(4) the prime contractor remains ultimately responsible for the payment of predetermined minimum wages, the submission of payrolls, statements of compliance and all other Federal regulatory requirements.

b. "Specialty Items" shall be construed to be limited to work that requires highly specialized knowledge, abilities, or equipment not ordinarily available in the type of contracting organizations qualified and expected to bid or propose on the contract as a whole and in general are to be limited to minor components of the overall contract.

2. The contract amount upon which the requirements set forth in paragraph (1) of Section VI is computed includes the cost of material and manufactured products which are to be purchased or produced by the contractor under the contract provisions.

3. The contractor shall furnish (a) a competent superintendent or supervisor who is employed by the firm, has full authority to direct performance of the work in accordance with the contract requirements, and is in charge of all construction operations (regardless of who performs the work) and (b) such other of its own organizational resources (supervision, management, and engineering services) as the contracting officer determines is necessary to assure the performance of the contract.

4. No portion of the contract shall be sublet, assigned or otherwise disposed of except with the written consent of the contracting officer, or authorized representative, and such consent when given shall not be construed to relieve the contractor of any responsibility for the fulfillment of the contract. Written consent will be given only after the contracting agency has assured that each subcontract is evidenced in writing and that it contains all pertinent provisions and requirements of the prime contract.

5. The 30% self-performance requirement of paragraph (1) is not applicable to design-build contracts; however, contracting agencies may establish their own self-performance requirements.

VII. SAFETY: ACCIDENT PREVENTION

This provision is applicable to all Federal-aid construction contracts and to all related subcontracts.

1. In the performance of this contract the contractor shall comply with all applicable Federal, State, and local laws governing safety, health, and sanitation (23 CFR 635). The contractor shall provide all safeguards, safety devices and protective equipment and take any other needed actions as it determines, or as the contracting officer may determine, to be reasonably necessary to protect the life and health of employees on the job and the safety of the public and to protect property in connection with the performance of the work covered by the contract.

2. It is a condition of this contract, and shall be made a condition of each subcontract, which the contractor enters into pursuant to this contract, that the contractor and any subcontractor shall not permit any employee, in performance of the contract, to work in surroundings or under conditions which are unsanitary, hazardous or dangerous to his/her health or safety, as determined under construction safety and health standards (29 CFR 1926) promulgated by the Secretary of Labor, in accordance with Section 107 of the Contract Work Hours and Safety Standards Act (40 U.S.C. 3704).

3. Pursuant to 29 CFR 1926.3, it is a condition of this contract that the Secretary of Labor or authorized representative thereof, shall have right of entry to any site of contract performance to inspect or investigate the matter of compliance with the construction safety and health standards and to carry out

the duties of the Secretary under Section 107 of the Contract Work Hours and Safety Standards Act (40 U.S.C.3704).

VIII. FALSE STATEMENTS CONCERNING HIGHWAY PROJECTS

This provision is applicable to all Federal-aid construction contracts and to all related subcontracts.

In order to assure high quality and durable construction in conformity with approved plans and specifications and a high degree of reliability on statements and representations made by engineers, contractors, suppliers, and workers on Federal-aid highway projects, it is essential that all persons concerned with the project perform their functions as carefully, thoroughly, and honestly as possible. Willful falsification, distortion, or misrepresentation with respect to any facts related to the project is a violation of Federal law. To prevent any misunderstanding regarding the seriousness of these and similar acts, Form FHWA-1022 shall be posted on each Federal-aid highway project (23 CFR 635) in one or more places where it is readily available to all persons concerned with the project:

18 U.S.C. 1020 reads as follows:

"Whoever, being an officer, agent, or employee of the United States, or of any State or Territory, or whoever, whether a person, association, firm, or corporation, knowingly makes any false statement, false representation, or false report as to the character, quality, quantity, or cost of the material used or to be used, or the quantity or quality of the work performed or to be performed, or the cost thereof in connection with the submission of plans, maps, specifications, contracts, or costs of construction on any highway or related project submitted for approval to the Secretary of Transportation; or

Whoever knowingly makes any false statement, false representation, false report or false claim with respect to the character, quality, quantity, or cost of any work performed or to be performed, or materials furnished or to be furnished, in connection with the construction of any highway or related project approved by the Secretary of Transportation; or

Whoever knowingly makes any false statement or false representation as to material fact in any statement, certificate, or report submitted pursuant to provisions of the Federal-aid Roads Act approved July 1, 1916, (39 Stat. 355), as amended and supplemented;

Shall be fined under this title or imprisoned not more than 5 years or both."

IX. IMPLEMENTATION OF CLEAN AIR ACT AND FEDERAL WATER POLLUTION CONTROL ACT

This provision is applicable to all Federal-aid construction contracts and to all related subcontracts.

By submission of this bid/proposal or the execution of this contract, or subcontract, as appropriate, the bidder, proposer, Federal-aid construction contractor, or subcontractor, as appropriate, will be deemed to have stipulated as follows:

1. That any person who is or will be utilized in the performance of this contract is not prohibited from receiving an award due to a violation of Section 508 of the Clean Water Act or Section 306 of the Clean Air Act.

2. That the contractor agrees to include or cause to be included the requirements of paragraph (1) of this Section X in every subcontract, and further agrees to take such action as the contracting agency may direct as a means of enforcing such requirements.

X. CERTIFICATION REGARDING DEBARMENT, SUSPENSION, INELIGIBILITY AND VOLUNTARY EXCLUSION

This provision is applicable to all Federal-aid construction contracts, design-build contracts, subcontracts, lower-tier subcontracts, purchase orders, lease agreements, consultant contracts or any other covered transaction requiring FHWA approval or that is estimated to cost \$25,000 or more – as defined in 2 CFR Parts 180 and 1200.

1. Instructions for Certification – First Tier Participants:

a. By signing and submitting this proposal, the prospective first tier participant is providing the certification set out below.

b. The inability of a person to provide the certification set out below will not necessarily result in denial of participation in this covered transaction. The prospective first tier participant shall submit an explanation of why it cannot provide the certification set out below. The certification or explanation will be considered in connection with the department or agency's determination whether to enter into this transaction. However, failure of the prospective first tier participant to furnish a certification or an explanation shall disqualify such a person from participation in this transaction.

c. The certification in this clause is a material representation of fact upon which reliance was placed when the contracting agency determined to enter into this transaction. If it is later determined that the prospective participant knowingly rendered an erroneous certification, in addition to other remedies available to the Federal Government, the contracting agency may terminate this transaction for cause of default.

d. The prospective first tier participant shall provide immediate written notice to the contracting agency to whom this proposal is submitted if any time the prospective first tier participant learns that its certification was erroneous when submitted or has become erroneous by reason of changed circumstances.

e. The terms "covered transaction," "debarred," "suspended," "ineligible," "participant," "person," "principal," and "voluntarily excluded," as used in this clause, are defined in 2 CFR Parts 180 and 1200. "First Tier Covered Transactions" refers to any covered transaction between a grantee or subgrantee of Federal funds and a participant (such as the prime or general contract). "Lower Tier Covered Transactions" refers to any covered transaction under a First Tier Covered Transaction (such as subcontracts). "First Tier Participant" refers to the participant who has entered into a covered transaction with a grantee or subgrantee of Federal funds (such as the prime or general contractor). "Lower Tier Participant" refers any participant who has entered into a covered transaction with a First Tier Participant or other Lower Tier Participants (such as subcontractors and suppliers).

f. The prospective first tier participant agrees by submitting this proposal that, should the proposed covered transaction be entered into, it shall not knowingly enter into any lower tier covered transaction with a person who is debarred, suspended, declared ineligible, or voluntarily excluded from

participation in this covered transaction, unless authorized by the department or agency entering into this transaction.

g. The prospective first tier participant further agrees by submitting this proposal that it will include the clause titled "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion-Lower Tier Covered Transactions," provided by the department or contracting agency, entering into this covered transaction, without modification, in all lower tier covered transactions and in all solicitations for lower tier covered transactions exceeding the \$25,000 threshold.

h. A participant in a covered transaction may rely upon a certification of a prospective participant in a lower tier covered transaction that is not debarred, suspended, ineligible, or voluntarily excluded from the covered transaction, unless it knows that the certification is erroneous. A participant is responsible for ensuring that its principals are not suspended, debarred, or otherwise ineligible to participate in covered transactions. To verify the eligibility of its principals, as well as the eligibility of any lower tier prospective participants, each participant may, but is not required to, check the Excluded Parties List System website (<https://www.epls.gov/>), which is compiled by the General Services Administration.

i. Nothing contained in the foregoing shall be construed to require the establishment of a system of records in order to render in good faith the certification required by this clause. The knowledge and information of the prospective participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.

j. Except for transactions authorized under paragraph (f) of these instructions, if a participant in a covered transaction knowingly enters into a lower tier covered transaction with a person who is suspended, debarred, ineligible, or voluntarily excluded from participation in this transaction, in addition to other remedies available to the Federal Government, the department or agency may terminate this transaction for cause or default.

* * * * *

2. Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion – First Tier Participants:

a. The prospective first tier participant certifies to the best of its knowledge and belief, that it and its principals:

(1) Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participating in covered transactions by any Federal department or agency;

(2) Have not within a three-year period preceding this proposal been convicted of or had a civil judgment rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State or local) transaction or contract under a public transaction; violation of Federal or State antitrust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property;

(3) Are not presently indicted for or otherwise criminally or civilly charged by a governmental entity (Federal, State or local) with commission of any of the offenses enumerated in paragraph (a)(2) of this certification; and

(4) Have not within a three-year period preceding this application/proposal had one or more public transactions (Federal, State or local) terminated for cause or default.

b. Where the prospective participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

2. Instructions for Certification - Lower Tier Participants:

(Applicable to all subcontracts, purchase orders and other lower tier transactions requiring prior FHWA approval or estimated to cost \$25,000 or more - 2 CFR Parts 180 and 1200)

a. By signing and submitting this proposal, the prospective lower tier is providing the certification set out below.

b. The certification in this clause is a material representation of fact upon which reliance was placed when this transaction was entered into. If it is later determined that the prospective lower tier participant knowingly rendered an erroneous certification, in addition to other remedies available to the Federal Government, the department, or agency with which this transaction originated may pursue available remedies, including suspension and/or debarment.

c. The prospective lower tier participant shall provide immediate written notice to the person to which this proposal is submitted if at any time the prospective lower tier participant learns that its certification was erroneous by reason of changed circumstances.

d. The terms "covered transaction," "debarred," "suspended," "ineligible," "participant," "person," "principal," and "voluntarily excluded," as used in this clause, are defined in 2 CFR Parts 180 and 1200. You may contact the person to which this proposal is submitted for assistance in obtaining a copy of those regulations. "First Tier Covered Transactions" refers to any covered transaction between a grantee or subgrantee of Federal funds and a participant (such as the prime or general contract). "Lower Tier Covered Transactions" refers to any covered transaction under a First Tier Covered Transaction (such as subcontracts). "First Tier Participant" refers to the participant who has entered into a covered transaction with a grantee or subgrantee of Federal funds (such as the prime or general contractor). "Lower Tier Participant" refers any participant who has entered into a covered transaction with a First Tier Participant or other Lower Tier Participants (such as subcontractors and suppliers).

e. The prospective lower tier participant agrees by submitting this proposal that, should the proposed covered transaction be entered into, it shall not knowingly enter into any lower tier covered transaction with a person who is debarred, suspended, declared ineligible, or voluntarily excluded from participation in this covered transaction, unless authorized by the department or agency with which this transaction originated.

f. The prospective lower tier participant further agrees by submitting this proposal that it will include this clause titled "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion-Lower Tier Covered Transaction," without modification, in all lower tier covered transactions and in all solicitations for lower tier covered transactions exceeding the \$25,000 threshold.

g. A participant in a covered transaction may rely upon a certification of a prospective participant in a lower tier covered transaction that is not debarred, suspended, ineligible, or voluntarily excluded from the covered transaction, unless it knows that the certification is erroneous. A participant is responsible for ensuring that its principals are not suspended, debarred, or otherwise ineligible to participate in covered transactions. To verify the eligibility of its principals, as well as the eligibility of any lower tier prospective participants, each participant may, but is not required to, check the Excluded Parties List System website (<https://www.epls.gov/>), which is compiled by the General Services Administration.

h. Nothing contained in the foregoing shall be construed to require establishment of a system of records in order to render in good faith the certification required by this clause. The knowledge and information of participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.

i. Except for transactions authorized under paragraph e of these instructions, if a participant in a covered transaction knowingly enters into a lower tier covered transaction with a person who is suspended, debarred, ineligible, or voluntarily excluded from participation in this transaction, in addition to other remedies available to the Federal Government, the department or agency with which this transaction originated may pursue available remedies, including suspension and/or debarment.

* * * * *

Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion--Lower Tier Participants:

1. The prospective lower tier participant certifies, by submission of this proposal, that neither it nor its principals is presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participating in covered transactions by any Federal department or agency.

2. Where the prospective lower tier participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

* * * * *

XI. CERTIFICATION REGARDING USE OF CONTRACT FUNDS FOR LOBBYING

This provision is applicable to all Federal-aid construction contracts and to all related subcontracts which exceed \$100,000 (49 CFR 20).

1. The prospective participant certifies, by signing and submitting this bid or proposal, to the best of his or her knowledge and belief, that:

a. No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of any Federal agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.

b. If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any Federal agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.

2. This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by 31 U.S.C. 1352. Any person who fails to file the required certification shall be subject to a civil penalty of not less than \$10,000 and not more than \$100,000 for each such failure.

3. The prospective participant also agrees by submitting its bid or proposal that the participant shall require that the language of this certification be included in all lower tier subcontracts, which exceed \$100,000 and that all such recipients shall certify and disclose accordingly.

EXHIBIT B**TITLE VI CONTRACTOR ASSURANCES
APPENDIX A**

During the performance of this contract, the contractor, for itself, its assignees and successors in interest (hereinafter referred to as the "contractor") agrees as follows:

1. **Compliance with Regulations:** The contractor will comply with the Regulations relative to nondiscrimination in federally assisted programs of the United States Department of Transportation Federal Highway Administration, as they may be amended from time to time, which are herein incorporated by reference and made a part of this contract.
2. **Nondiscrimination:** The contractor, with regard to the work performed by it during the contract, will not discriminate on the grounds of race, color, national origin, sex, age, disability, income or Limited English Proficiency in the selection and retention of subcontractors, including procurements of materials and leases of equipment. The contractor will not participate directly or indirectly in the discrimination prohibited by the Acts and Regulations, including employment practices when the contract covers any activity, project, or program set forth in Appendix B of 49 CFR Part 21.
3. **Solicitations for Subcontracts, Including Procurements of Materials and Equipment:** In all solicitations, either by bidding, or negotiation made by the contractor for work to be performed under a subcontract, including procurements of materials, or leases of equipment, each potential subcontractor or supplier will be notified by the contractor of the contractor's obligations under this contract and Acts and the Regulations relative to Non-discrimination on the grounds of race, color, or national origin.
4. **Information and Reports:** The contractor will provide all information and reports required by the Acts, the Regulations, and directives issued pursuant thereto and will permit access to its books, records, accounts, other sources of information, and its facilities as may be determined by the Recipient or the Federal Highway Administration to be pertinent to ascertain compliance with such Acts, Regulations, and instructions. Where any information required of a contractor is in the exclusive possession of another who fails or refuses to furnish this information, the contractor will so certify to the Recipient or the Federal Highway Administration, as appropriate, and will set forth what efforts it has made to obtain the information.
5. **Sanctions for Non-compliance:** In the event of the contractor's non-compliance with the Non-discrimination provisions of this contract, the Recipient will impose such contract sanctions as it or the Federal Highway Administration may determine to be appropriate, including, but not limited to:
 - a. withholding contract payments to the contractor under the contract until the contractor complies; and/or
 - b. cancelling, terminating, or suspending a contract, in whole or in part.
6. **Incorporation of Provisions:** The contractor will include the provisions of paragraphs one through six in every subcontract, including procurements of materials and leases of equipment, unless exempt by the Acts, the Regulations and directives issued pursuant thereto. The contractor will take action with respect to any subcontract or procurement as the Recipient or the Federal Highway Administration may direct as a means of enforcing such provisions including sanctions for

noncompliance. Provided, that if the contractor becomes involved in, or is threatened with, litigation by a subcontractor, or supplier because of such direction, the contractor may request the Recipient to enter into any litigation to protect the interests of the Recipient. In addition, the contractor may request the United States to enter into the litigation to protect the interests of the United States.

TITLE VI CONTRACTOR ASSURANCES APPENDIX E

During the performance of this contract, the contractor, for itself, its assignees, and successors in interest (hereinafter referred to as the "contractor") agrees to comply with the following nondiscrimination statutes and authorities; including but not limited to:

- Title VI of the Civil Rights Act of 1964 (78 Stat. 252, 42 U.S.C. § 2000d et seq.), (prohibits discrimination on the basis of race, color, national origin), as implemented by 49 C.F.R. § 21.1 et seq. and 49 C.F.R. part 303;
- The Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, (42 U.S.C. § 4601) (prohibits unfair treatment of persons displaced or whose property has been acquired because of Federal or Federal-aid programs and projects);
- Federal-Aid Highway Act of 1973 (23 U.S.C. § 324 et seq.) (prohibits discrimination on the basis of sex);
- Section 504 of the Rehabilitation Act of 1973, as amended (29 U.S.C. § 794 et seq.) (prohibits discrimination on the basis of disability); and 49 C.F.R. part 27;
- The Age Discrimination Act of 1975, as amended (42 U.S.C. § 6101 et seq.) (prohibits discrimination on the basis of age);
- Airport and Airway Improvement Act of 1982 (Pub. L. 97-248 (1982)), as amended (prohibits discrimination based on race, creed, color, national origin, or sex);
- The Civil Rights Restoration Act of 1987 (102 Stat. 28) ("*... which restore[d] the broad scope of coverage and to clarify the application of Title IX of the Education Amendments of 1972, section 504 of the Rehabilitation Act of 1973, the Age Discrimination Act of 1975, and Title VI of the Civil Rights Act of 1964.*");
- Titles II and III of the Americans with Disabilities Act, which prohibit discrimination on the basis of disability in the operation of public entities, public and private transportation systems, places of public accommodation, and certain testing entities (42 U.S.C. §§ 12131 --12189), as implemented by Department of Justice regulations at 28 C.F.R. parts 35 and 36, and Department of Transportation regulations at 49 C.F.R. parts 37 and 38;
- The Federal Aviation Administration's Non-discrimination statute (49 U.S.C. § 47123) (prohibits discrimination on the basis of race, color, national origin, and sex);
- Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, which ensures non-discrimination against minority populations by discouraging programs, policies, and activities with disproportionately high and adverse human health or environmental effects on minority and low-income populations;
- Executive Order 13166, Improving Access to Services for Persons with Limited English Proficiency, and resulting agency guidance, national origin discrimination includes discrimination because of limited English proficiency (LEP). To ensure compliance with Title VI, you must take reasonable steps to ensure that LEP persons have meaningful access to your programs (70 Fed. Reg. at 74087 to 74100);
- Title of the Education Amendments of 1972, as amended, which prohibits you from discriminating because of sex in education programs or activities (20 U.S.C. § 1681 et seq).

EXHIBIT C**CONTRACTOR WORKFORCE UTILIZATION (FEDERAL EXECUTIVE ORDER 11246) /
EQUAL EMPLOYMENT OPPORTUNITY
(Federal - FHWA)****1. Project Workforce Utilization Goals:**

These goals are applicable to all the Contractor's construction work (whether or not it is Federal or Federally assisted or funded) performed in the covered area. If the contractor performs construction work in a geographical area located outside of the covered area, it shall apply the goals established for the geographical area where the work is actually performed.

Whenever the Contractor, or any Subcontractor at any tier, subcontracts a portion of the work involving any construction trade, it shall physically include in each subcontract in excess of \$10,000 the provisions of these specifications which contain the applicable goals for minority and female participation.

The goals for minority and female utilization are expressed in percentage terms for the contractor's aggregate work-force in each trade on all construction work in the covered area, are referenced in the attached Appendix A.

2. Executive Order 11246

The Contractor's compliance with Executive Order 11246 and 41-CFR Part 60-4 shall be based on its implementation of the specific affirmative action obligations required by the specifications set forth in 41 CFR 60-4.3(A) and its efforts to meet the goals established for the geographical area where the contract is to be performed. The hours of minority and female employment and training must be substantially uniform throughout the length of the contract, and in each trade, and the contractor shall make a good faith effort to employ minorities and women evenly on each of its projects. The transfer of minority or female employees or trainees from contractor to contractor or from project to project for the sole purpose of meeting the contractor's goals shall be a violation of the contract, the Executive Order and the regulations in 41 CFR Part 60-4. Compliance with the goals will be measured against the total work hour performed.

If the Contractor is participating (pursuant to 41 CFR 60-4.5) in a Hometown Plan approved by the U.S. Department of Labor in the covered area either individually or through an association, its affirmative action obligations on all work in the Plan area (including goals and timetables) shall be in accordance with that Plan for those trades which have unions participating in the Plan. Contractors must be able to demonstrate their participation in and compliance with the provisions of any such Hometown Plan. Each Contractor or Subcontractor participating in an approved Plan is individually required to comply with its obligations under the EEO clause, and to make a good faith effort to achieve each goal under the Plan in each trade in which it has employees. The overall good faith performance by other Contractors or subcontractors toward a goal in an approved Pan does not excuse any covered Contractor's or subcontractor's failure to take good faith efforts to achieve the plan goals and timetables.

The Contractor shall implement the specific affirmative action standards provided in a through p of these specifications. The goals set forth in the solicitation from which this contract resulted are expressed as percentages of the total hours of employment and training of minority and female utilization the Contractor should reasonably be able to achieve in each construction trade in

which it has employees in the covered area. Covered Construction contractors performing construction work in geographical areas where they do not have a federal or federally assisted construction contract shall apply the minority and female goals established for the geographical area where the work is being performed. Goals are published periodically in the Federal Register in notice form and such notices may be obtained from any Office of Federal Contract Compliance Programs (OFCCP) Office or from Federal procurement contracting officers. The Contractor is expected to make substantially uniform progress in meeting its goals in each craft during the period specified.

Neither the provisions of any collective bargaining agreement, nor the failure by a union with whom the Contractor has a collective bargaining agreement, to refer either minorities or women shall excuse the Contractor's obligations under these specifications, Executive Order 11246, or the regulations promulgated pursuant hereto.

In order for the nonworking training hours of apprentices and trainees to be counted in meeting the goals, such apprentices and trainees must be employed by the Contractor during the training period, and the Contractor must have made a commitment to employ the apprentices and trainees at the completion of their training, subject to the availability of employment opportunities. Trainees must be trained pursuant to training programs approved by the U.S. Department of Labor.

The Contractor shall take specific affirmative actions to ensure equal employment opportunity. The evaluation of the Contractor's compliance with these specifications shall be based upon its effort to achieve maximum results from its actions. The Contractor shall document these efforts fully, and shall implement affirmative action steps at least as extensive as the following:

- a. Ensure and maintain a working environment free of harassment, intimidation, and coercion at all sites; and in all facilities at which the Contractor's employees are assigned to work. The Contractor, where possible, will assign two or more women to each construction project. The Contractor shall specifically ensure that all foremen, superintendents, and other on-site supervisory personnel are aware of and carry out the Contractor's obligation to maintain such a working environment, with specific attention to minority or female individuals working at such sites or in such facilities.
- b. Establish and maintain a current list of minority and female recruitment sources, provide written notification to minority and female recruitment sources and to community organizations when the Contractor or its unions have employment opportunities available, and maintain a record of the organizations' responses.
- c. Maintain a current file of the names, addresses and telephone numbers of each minority and female off the street applicant and minority or female referral from a union, a recruitment source or community organization and of what action was taken with respect to each such individual. If such individual was sent to the union hiring hall for referral and was not referred back to the Contractor by the union or, if referred, not employed by the Contractor, this shall be documented in the file with the reason thereafter; along with whatever additional actions the Contractor may have taken.
- d. Provide immediate written notification to the Director when the Union or Unions with which the Contractor has a collective bargaining agreement has not referred to the Contractor a minority person or women sent by the Contractor, or when the Contractor has other

information that the Union referral process has impeded the Contractor's efforts to meet its obligations.

- e. Develop on-the-job training opportunities and/or participate in training programs for the area which expressly include minorities and women, including upgrading programs and apprenticeship and trainee programs relevant to the Contractor's employment needs, especially those programs funded or approved by the Department of Labor. The Contractor shall provide notice of these programs to the sources compiled under b above.
- f. Disseminate the Contractor's EEO policy by providing notice of the policy to unions and training programs and requesting their cooperation in assisting the Contractor in meeting its EEO obligations; by including it in any policy manual and collective bargaining agreement; by publicizing it in the company newspaper, annual report, etc.; by specific review of the policy with all management personnel and with all minority and female employees at least once a year; and by posting the company EEO Policy on bulletin boards accessible to all employees at each location where construction work is performed.
- g. Review, at least annually, the company EEO Policy and affirmative action obligations under these specifications with all employees having any responsibility for hiring, assignment, layoff, termination or other employment, decisions including specific Foreman, etc. prior to the initiation of construction work at any job site. A written record shall be made and maintained identifying the time and place of these meetings, persons attending, subject matter discussed, and disposition of the subject matter.
- h. Disseminate the Contractor's EEO Policy externally by including it in any advertising in the news media, specifically including minority and female news media, and providing written notification to and discussing the Contractor's EEO policy with other Contractors and subcontractors with whom the Contractor does or anticipates doing business.
- i. Direct its recruitment efforts, both oral and written, to minority female and community organizations, to schools with minority and female students and to minority and female recruitment and training organizations serving the Contractor's recruitment area and employment needs. Not later than one month prior to the date for the acceptance of applications for apprenticeship or other training by any recruitment source, the contractor shall send written notification to organizations such as the above, describing the openings, screening procedures and tests to be used in the selection process.
- j. Encourage present minority and female employees to recruit other minority persons and women and, where reasonable, provide after school, summer and vacation employment to minority and female youth both on the site and in other areas of a Contractor's work-force.
- k. Validate all tests and other selection requirements where there is an obligation to do so under 41 CFR Part 60-3.
- l. Conduct, at least annually, an inventory and evaluation at least of all minority and female personnel for promotional opportunities and encourage these employees to seek or to prepare for, through appropriate training, etc., such opportunities.
- m. Ensure that seniority practices, job classifications, work assignments and other personnel practices, do not have a discriminatory effect by continually monitoring all personnel and

employment related activities to ensure that the EEO policy and the Contractor's obligations under these specifications are being carried out.

- n. Ensure that all facilities and company activities are non-segregated except that separate or single user toilet and necessary changing facilities shall be provided to assure privacy between the sexes.
- o. Document and maintain a record of all solicitations of offers for subcontracts from minority and female construction contractors and suppliers, including circulation of solicitations to minority and female contractor associations and other business associations.
- p. Conduct a review at least annually of all supervisors' adherence to and performance under the Contractor's EEO policies and affirmative action obligations.

Contractors are encouraged to participate in voluntary associations which assist in fulfilling one or more of their affirmative action obligations (a through p). The efforts of a contractor association, joint contractor union, contractor community, or other similar group of which the contractor is a member and participant, may be asserted as fulfilling any one or more of its obligations under a through p of these specifications provided that the contractor actively participates in the group, makes every effort to assure that the group has a positive impact on the employment of minorities and women in the industry, ensures that the concrete benefits of the program are reflected in the Contractor's minority and female work-force participation, makes a good faith effort to meet with individual goals and timetables, and can provide access to documentation which demonstrates the effectiveness of actions taken on behalf of the Contractor. The obligation to comply, however, is the Contractor's and failure of such a group to fulfill an obligation shall not be a defense for the Contractor's noncompliance.

A single goal for minorities and a separate single goal for women have been established. The Contractor, however, is required to provide equal employment opportunity and to take affirmative action for all minority groups, both male and female, and all women, both minority and non-minority. Consequently, the Contractor may be in violation of Executive Order 11246 if a particular group is employed in a substantially disparate manner, (for example, even though the Contractor has achieved its goals for women generally, the Contractor may be in violation of the Executive Order if a specific minority group of women is under utilized).

The Contractor shall not use the goals and timetables or affirmative action standards to discriminate against any person because of race, color, religion, sex, or national origin.

The Contractor shall not enter into any Subcontract with any person or firm debarred from Government contracts pursuant to Executive Order 11246.

The Contractor shall carry out such sanctions and penalties for violation of these specifications and of the Equal Opportunity Clause, including suspension, termination and cancellation of existing subcontracts as may be imposed or ordered pursuant to Executive Order 11246, as amended, and its implementing regulations by the Office of Federal Contract Compliance Programs. Any Contractor who fails to carry out such sanctions and penalties shall be in violation of these specifications and Executive Order 11246, as amended.

The Contractor, in fulfilling its obligations under these specifications, shall implement specific affirmative action steps, at least as extensive as those standards prescribed in these

specifications, so as to achieve maximum results from its efforts to ensure equal employment opportunity. If the Contractor fails to comply with the requirements of the Executive Order, the implementing regulations, or these specifications, the Director shall proceed in accordance with 41 CFR 60-4.8.

The Contractor shall designate a responsible official to monitor all employment related activity to ensure that the company EEO policy is being carried out, to submit reports relating to the provisions hereof as may be required by the Government and to keep records. Records shall at least include for each employee the name, address, telephone numbers, construction trade, union affiliation if any, employee identification number when assigned, social security number, race, sex, status, (e.g. mechanic, apprentice, trainee, helper, or laborer) dates of changes in status, hours worked per week in the indicated trade, rate of pay, and locations at which the work was performed. Records shall be maintained in an easily understandable and retrievable form; however, to the degree that existing records satisfy this requirement, contractors shall not be required to maintain separate records.

Nothing herein provided shall be construed as a limitation upon the application of their laws which establish different standards of compliance or upon the application of requirements for the hiring of local or other area residents (e.g. those under the Public Works Employment Act of 1977 and the Community Development Block Grant Program).

The Director of the Office of Federal Contract Compliance Programs, from time to time, shall issue goals and timetables for minority and female utilization which shall be based on appropriate workforce, demographic or other relevant data and which shall cover construction projects or construction contracts performed in specific geographical areas. The goals, which shall be applicable to each construction trade in a covered contractor's or timetables, shall be published as notices in the Federal Register, and shall be inserted by the Contracting officers and applicants, as applicable, in the Notice required by 41 CFR 60-4.2.

FEDERALLY FUNDED OR ASSISTED PROJECTS
APPENDIX A
(Labor Market Goals)

Standard Metropolitan Statistical Area (SMSA)

Female

Minority

Bridgeport – Stamford – Norwalk – Danbury	10.2%
6.9%	

Bethel	Bridgeport	Brookfield	Danbury
Darien	Derby	Easton	Fairfield
Greenwich	Milford	Monroe	New Canaan
New Fairfield	Newton	Norwalk	Redding
Shelton	Stamford	Stratford	Trumbull
Weston	Westport	Wilton	

Hartford – Bristol – New Britain	6.9%
6.9%	

Andover	Avon	Berlin	Bloomfield
Bolton	Bristol	Burlington	Canton
Colchester	Columbia	Coventry	Cromwell
East Granby	East Hampton	East Hartford	East Windsor
Ellington	Enfield	Farmington	Glastonbury
Granby	Hartford	Hebron	Manchester
Marlborough	New Britain	New Hartford	Newington
Plainville	Plymouth	Portland	Rocky Hill
Simsbury	South Windsor	Southington	Stafford
Suffield	Tolland	Vernon	West Hartford
Wethersfield	Willington	Windsor	Windsor Locks

New Haven – Waterbury – Meriden	9.0%
6.9%	

Beacon Falls	Bethany	Branford	Cheshire
Clinton	East Haven	Guilford	Hamden
Madison	Meriden	Middlebury	Naugatuck
New Haven	North Branford	North Haven	Orange
Prospect	Southbury	Thomaston	Wallingford
Waterbury	Watertown	West Haven	Wolcott
Woodbridge	Woodbury		

New London – Norwich	4.5%
6.9%	

Bozrah	East Lyme	Griswold	Groton
Ledyard	Lisbon	Montville	New London
Norwich	Old Lyme	Old Saybrook	Preston
Sprague	Stonington	Waterford	

Non SMSA**Female****Minority**

Litchfield – Windham			5.9%
6.9%			
Abington	Ashford	Ballouville	Bantam
Barkhamsted	Bethlehem	Bridgewater	Brooklyn
Canaan	Canterbury	Central Village	Cahplin
Colebrook	Cornwall	Cornwall Bridge	Danielson
Dayville	East Canaan	East Killingly	East Woodstock
Eastford	Falls Village	Gaylordsville	Goshen
Grosvenor Dale	Hampton	Harwinton	Kent
Killigly	Lakeside	Litchfield	Moosup
Morris	New Milford	New Preston	New Preston Marble Dale
Norfolk	North Canaan	No. Grosvenordale	North Windham
Oneco	Pequabuck	Pine Meadow	Plainfield
Pleasant Valley	Pomfret	Pomfret Center	Putnam
Quinebaug	Riverton	Rogers	Roxbury
Salisbury	Scotland	Sharon	South Kent
South Woodstock	Sterling	Taconic	Terryville
Thompson	Torrington	Warren	Warrenville
Washington	Washington Depot	Wauregan	West Cornwall
Willimantic	Winchester	Winchester Center	Windham
Winsted	Woodstock	Woodstock Valley	

EXHIBIT D**Health Insurance Portability and Accountability Act of 1996 (“HIPAA”).**

- (a) If the Contactor is a Business Associate under the requirements of the Health Insurance Portability and Accountability Act of 1996 (“HIPAA”), the Contractor must comply with all terms and conditions of this Section of the Contract. If the Contractor is not a Business Associate under HIPAA, this Section of the Contract does not apply to the Contractor for this Contract.
- (b) The Contractor is required to safeguard the use, publication and disclosure of information on all applicants for, and all clients who receive, services under the Contract in accordance with all applicable federal and state law regarding confidentiality, which includes but is not limited to HIPAA, more specifically with the Privacy and Security Rules at 45 C.F.R. Part 160 and Part 164, subparts A, C, and E; and
- (c) The State of Connecticut Agency named on page 1 of this Contract (hereinafter the “Department”) is a “covered entity” as that term is defined in 45 C.F.R. § 160.103; and
- (d) The Contractor, on behalf of the Department, performs functions that involve the use or disclosure of “individually identifiable health information,” as that term is defined in 45 C.F.R. § 160.103; and
- (e) The Contractor is a “business associate” of the Department, as that term is defined in 45 C.F.R. § 160.103; and
- (f) The Contractor and the Department agree to the following in order to secure compliance with the HIPAA, the requirements of Subtitle D of the Health Information Technology for Economic and Clinical Health Act (hereinafter the HITECH Act), (Pub. L. 111-5, sections 13400 to 13423), and more specifically with the Privacy and Security Rules at 45 C.F.R. Part 160 and Part 164, subparts A, C, and E.
- (g) Definitions
 - (1) “Breach shall have the same meaning as the term is defined in section 13400 of the HITECH Act (42 U.S.C. §17921(1))
 - (2) “Business Associate” shall mean the Contractor.
 - (3) “Covered Entity” shall mean the Department of the State of Connecticut named on page 1 of this Contract.
 - (4) “Designated Record Set” shall have the same meaning as the term “designated record set” in 45 C.F.R. § 164.501.
 - (5) “Electronic Health Record” shall have the same meaning as the term is defined in section 13400 of the HITECH Act (42 U.S.C. §17921(5))

- (6) "Individual" shall have the same meaning as the term "individual" in 45 C.F.R. § 160.103 and shall include a person who qualifies as a personal representative as defined in 45 C.F.R. § 164.502(g).
 - (7) "Privacy Rule" shall mean the Standards for Privacy of Individually Identifiable Health Information at 45 C.F.R. part 160 and parts 164, subparts A and E.
 - (8) "Protected Health Information" or "PHI" shall have the same meaning as the term "protected health information" in 45 C.F.R. § 160.103, limited to information created or received by the Business Associate from or on behalf of the Covered Entity.
 - (9) "Required by Law" shall have the same meaning as the term "required by law" in 45 C.F.R. § 164.103.
 - (10) "Secretary" shall mean the Secretary of the Department of Health and Human Services or his designee.
 - (11) "More stringent" shall have the same meaning as the term "more stringent" in 45 C.F.R. § 160.202.
 - (12) "This Section of the Contract" refers to the HIPAA Provisions stated herein, in their entirety.
 - (13) "Security Incident" shall have the same meaning as the term "security incident" in 45 C.F.R. § 164.304.
 - (14) "Security Rule" shall mean the Security Standards for the Protection of Electronic Protected Health Information at 45 C.F.R. part 160 and parts 164, subpart A and C.
 - (15) "Unsecured protected health information" shall have the same meaning as the term as defined in section 13402(h)(1)(A) of HITECH. Act. (42 U.S.C. §17932(h)(1)(A)).
- (h) Obligations and Activities of Business Associates.
- (1) Business Associate agrees not to use or disclose PHI other than as permitted or required by this Section of the Contract or as Required by Law.
 - (2) Business Associate agrees to use appropriate safeguards to prevent use or disclosure of PHI other than as provided for in this Section of the Contract.
 - (3) Business Associate agrees to use administrative, physical and technical safeguards that reasonably and appropriately protect the confidentiality, integrity, and availability of electronic protected health information that it creates, receives, maintains, or transmits on behalf of the Covered Entity.
 - (4) Business Associate agrees to mitigate, to the extent practicable, any harmful effect that is known to the Business Associate of a use or disclosure of PHI by Business Associate in violation of this Section of the Contract.

- (5) Business Associate agrees to report to Covered Entity any use or disclosure of PHI not provided for by this Section of the Contract or any security incident of which it becomes aware.
- (6) Business Associate agrees to insure that any agent, including a subcontractor, to whom it provides PHI received from, or created or received by Business Associate, on behalf of the Covered Entity, agrees to the same restrictions and conditions that apply through this Section of the Contract to Business Associate with respect to such information.
- (7) Business Associate agrees to provide access, at the request of the Covered Entity, and in the time and manner agreed to by the parties, to PHI in a Designated Record Set, to Covered Entity or, as directed by Covered Entity, to an Individual in order to meet the requirements under 45 C.F.R. § 164.524.
- (8) Business Associate agrees to make any amendments to PHI in a Designated Record Set that the Covered Entity directs or agrees to pursuant to 45 C.F.R. § 164.526 at the request of the Covered Entity, and in the time and manner agreed to by the parties.
- (9) Business Associate agrees to make internal practices, books, and records, including policies and procedures and PHI, relating to the use and disclosure of PHI received from, or created or received by, Business Associate on behalf of Covered Entity, available to Covered Entity or to the Secretary in a time and manner agreed to by the parties or designated by the Secretary, for purposes of the Secretary determining Covered Entity's compliance with the Privacy Rule.
- (10) Business Associate agrees to document such disclosures of PHI and information related to such disclosures as would be required for Covered Entity to respond to a request by an Individual for an accounting of disclosures of PHI in accordance with 45 C.F.R. § 164.528 and section 13405 of the HITECH Act (42 U.S.C. § 17935) and any regulations promulgated thereunder.
- (11) Business Associate agrees to provide to Covered Entity, in a time and manner agreed to by the parties, information collected in accordance with clause h. (10) of this Section of the Contract, to permit Covered Entity to respond to a request by an Individual for an accounting of disclosures of PHI in accordance with 45 C.F.R. § 164.528 and section 13405 of the HITECH Act (42 U.S.C. § 17935) and any regulations promulgated thereunder. Business Associate agrees at the Covered Entity's direction to provide an accounting of disclosures of PHI directly to an individual in accordance with 45 C.F.R. § 164.528 and section 13405 of the HITECH Act (42 U.S.C. § 17935) and any regulations promulgated thereunder.
- (12) Business Associate agrees to comply with any state or federal law that is more stringent than the Privacy Rule.
- (13) Business Associate agrees to comply with the requirements of the HITECH Act relating to privacy and security that are applicable to the Covered Entity and with the requirements of 45 C.F.R. sections 164.504(e), 164.308, 164.310, 164.312, and 164.316.

- (14) In the event that an individual requests that the Business Associate (a) restrict disclosures of PHI; (b) provide an accounting of disclosures of the individual's PHI; or (c) provide a copy of the individual's PHI in an electronic health record, the Business Associate agrees to notify the covered entity, in writing, within two business days of the request.
- (15) Business Associate agrees that it shall not, directly or indirectly, receive any remuneration in exchange for PHI of an individual without (1) the written approval of the covered entity, unless receipt of remuneration in exchange for PHI is expressly authorized by this Contract and (2) the valid authorization of the individual, except for the purposes provided under section 13405(d)(2) of the HITECH Act,(42 U.S.C. § 17935(d)(2)) and in any accompanying regulations

(16) Obligations in the Event of a Breach

- A. The Business Associate agrees that, following the discovery of a breach of unsecured protected health information, it shall notify the Covered Entity of such breach in accordance with the requirements of section 13402 of HITECH (42 U.S.C. 17932(b) and the provisions of this Section of the Contract.
- B. Such notification shall be provided by the Business Associate to the Covered Entity without unreasonable delay, and in no case later than 30 days after the breach is discovered by the Business Associate, except as otherwise instructed in writing by a law enforcement official pursuant to section 13402 (g) of HITECH (42 U.S.C. 17932(g)) . A breach is considered discovered as of the first day on which it is, or reasonably should have been, known to the Business Associate. The notification shall include the identification and last known address, phone number and email address of each individual (or the next of kin of the individual if the individual is deceased) whose unsecured protected health information has been, or is reasonably believed by the Business Associate to have been, accessed, acquired, or disclosed during such breach.
- C. The Business Associate agrees to include in the notification to the Covered Entity at least the following information:
1. A brief description of what happened, including the date of the breach and the date of the discovery of the breach, if known.
 2. A description of the types of unsecured protected health information that were involved in the breach (such as full name, Social Security number, date of birth, home address, account number, or disability code).
 3. The steps the Business Associate recommends that individuals take to protect themselves from potential harm resulting from the breach.
 4. A detailed description of what the Business Associate is doing to investigate the breach, to mitigate losses, and to protect against any further breaches.
 5. Whether a law enforcement official has advised either verbally or in writing the Business Associate that he or she has determined that notification or notice to

individuals or the posting required under section 13402 of the HITECH Act would impede a criminal investigation or cause damage to national security and; if so, include contact information for said official.

- D. Business Associate agrees to provide appropriate staffing and have established procedures to ensure that individuals informed by the Covered Entity of a breach by the Business Associate have the opportunity to ask questions and contact the Business Associate for additional information regarding the breach. Such procedures shall include a toll-free telephone number, an e-mail address, a posting on its Web site and a postal address. Business Associate agrees to include in the notification of a breach by the Business Associate to the Covered Entity, a written description of the procedures that have been established to meet these requirements. Costs of such contact procedures will be borne by the Contractor.
 - E. Business Associate agrees that, in the event of a breach, it has the burden to demonstrate that it has complied with all notifications requirements set forth above, including evidence demonstrating the necessity of a delay in notification to the Covered Entity.
- (i) Permitted Uses and Disclosure by Business Associate.
- (1) General Use and Disclosure Provisions Except as otherwise limited in this Section of the Contract, Business Associate may use or disclose PHI to perform functions, activities, or services for, or on behalf of, Covered Entity as specified in this Contract, provided that such use or disclosure would not violate the Privacy Rule if done by Covered Entity or the minimum necessary policies and procedures of the Covered Entity.
 - (2) Specific Use and Disclosure Provisions
 - (A) Except as otherwise limited in this Section of the Contract, Business Associate may use PHI for the proper management and administration of Business Associate or to carry out the legal responsibilities of Business Associate.
 - (B) Except as otherwise limited in this Section of the Contract, Business Associate may disclose PHI for the proper management and administration of Business Associate, provided that disclosures are Required by Law, or Business Associate obtains reasonable assurances from the person to whom the information is disclosed that it will remain confidential and used or further disclosed only as Required by Law or for the purpose for which it was disclosed to the person, and the person notifies Business Associate of any instances of which it is aware in which the confidentiality of the information has been breached.
 - (C) Except as otherwise limited in this Section of the Contract, Business Associate may use PHI to provide Data Aggregation services to Covered Entity as permitted by 45 C.F.R. § 164.504(e)(2)(i)(B).
- (j) Obligations of Covered Entity.

- (1) Covered Entity shall notify Business Associate of any limitations in its notice of privacy practices of Covered Entity, in accordance with 45 C.F.R. § 164.520, or to the extent that such limitation may affect Business Associate's use or disclosure of PHI.
 - (2) Covered Entity shall notify Business Associate of any changes in, or revocation of, permission by Individual to use or disclose PHI, to the extent that such changes may affect Business Associate's use or disclosure of PHI.
 - (3) Covered Entity shall notify Business Associate of any restriction to the use or disclosure of PHI that Covered Entity has agreed to in accordance with 45 C.F.R. § 164.522, to the extent that such restriction may affect Business Associate's use or disclosure of PHI.
- (k) Permissible Requests by Covered Entity. Covered Entity shall not request Business Associate to use or disclose PHI in any manner that would not be permissible under the Privacy Rule if done by the Covered Entity, except that Business Associate may use and disclose PHI for data aggregation, and management and administrative activities of Business Associate, as permitted under this Section of the Contract.
- (l) Term and Termination.
- (1) Term. The Term of this Section of the Contract shall be effective as of the date the Contract is effective and shall terminate when the information collected in accordance with clause h. (10) of this Section of the Contract is provided to the Covered Entity and all of the PHI provided by Covered Entity to Business Associate, or created or received by Business Associate on behalf of Covered Entity, is destroyed or returned to Covered Entity, or, if it is infeasible to return or destroy PHI, protections are extended to such information, in accordance with the termination provisions in this Section.
 - (2) Termination for Cause Upon Covered Entity's knowledge of a material breach by Business Associate, Covered Entity shall either:
 - (A) Provide an opportunity for Business Associate to cure the breach or end the violation and terminate the Contract if Business Associate does not cure the breach or end the violation within the time specified by the Covered Entity; or
 - (B) Immediately terminate the Contract if Business Associate has breached a material term of this Section of the Contract and cure is not possible; or
 - (C) If neither termination nor cure is feasible, Covered Entity shall report the violation to the Secretary.
 - (3) Effect of Termination
 - (A) Except as provided in (l)(2) of this Section of the Contract, upon termination of this Contract, for any reason, Business Associate shall return or destroy all PHI received from Covered Entity, or created or received by Business Associate on behalf of Covered Entity. Business Associate shall also provide the information collected in accordance with clause h. (10) of this Section of the Contract to the Covered Entity

within ten business days of the notice of termination. This provision shall apply to PHI that is in the possession of subcontractors or agents of Business Associate. Business Associate shall retain no copies of the PHI.

(B) In the event that Business Associate determines that returning or destroying the PHI is infeasible, Business Associate shall provide to Covered Entity notification of the conditions that make return or destruction infeasible. Upon documentation by Business Associate that return or destruction of PHI is infeasible, Business Associate shall extend the protections of this Section of the Contract to such PHI and limit further uses and disclosures of PHI to those purposes that make return or destruction infeasible, for as long as Business Associate maintains such PHI. Infeasibility of the return or destruction of PHI includes, but is not limited to, requirements under state or federal law that the Business Associate maintains or preserves the PHI or copies thereof.

(m) Miscellaneous Provisions.

(1) Regulatory References. A reference in this Section of the Contract to a section in the Privacy Rule means the section as in effect or as amended.

(2) Amendment. The Parties agree to take such action as is necessary to amend this Section of the Contract from time to time as is necessary for Covered Entity to comply with requirements of the Privacy Rule and the Health Insurance Portability and Accountability Act of 1996, Pub. L. No. 104-191.

(3) Survival. The respective rights and obligations of Business Associate shall survive the termination of this Contract.

(4) Effect on Contract. Except as specifically required to implement the purposes of this Section of the Contract, all other terms of the Contract shall remain in force and effect.

(5) Construction. This Section of the Contract shall be construed as broadly as necessary to implement and comply with the Privacy Standard. Any ambiguity in this Section of the Contract shall be resolved in favor of a meaning that complies, and is consistent with, the Privacy Standard.

(6) Disclaimer. Covered Entity makes no warranty or representation that compliance with this Section of the Contract will be adequate or satisfactory for Business Associate's own purposes. Covered Entity shall not be liable to Business Associate for any claim, civil or criminal penalty, loss or damage related to or arising from the unauthorized use or disclosure of PHI by Business Associate or any of its officers, directors, employees, contractors or agents, or any third party to whom Business Associate has disclosed PHI contrary to the provisions of this Contract or applicable law. Business Associate is solely responsible for all decisions made, and actions taken, by Business Associate regarding the safeguarding, use and disclosure of PHI within its possession, custody or control.

(7) Indemnification. The Business Associate shall indemnify and hold the Covered Entity harmless from and against any and all claims, liabilities, judgments, fines, assessments, penalties, awards and any statutory damages that may be imposed or assessed pursuant to HIPAA, as amended or the

HITECH Act, including, without limitation, attorney's fees, expert witness fees, costs of investigation, litigation or dispute resolution, and costs awarded thereunder, relating to or arising out of any violation by the Business Associate and its agents, including subcontractors, of any obligation of Business Associate and its agents, including subcontractors, under this section of the contract, under HIPAA, the HITECH Act, the Privacy Rule and the Security Rule.

Notice to Executive Branch State Contractors and Prospective State Contractors of Campaign Contribution and Solicitation Limitations

This notice is provided under the authority of Connecticut General Statutes §9-612(g)(2), as amended by P.A. 10-1, and is for the purpose of informing state contractors and prospective state contractors of the following law (*italicized words are defined on the reverse side of this page*).

CAMPAIGN CONTRIBUTION AND SOLICITATION LIMITATIONS

No *state contractor, prospective state contractor, principal of a state contractor or principal of a prospective state contractor*, with regard to a *state contract or state contract solicitation* with or from a state agency in the executive branch or a quasi-public agency or a holder, or principal of a holder of a valid prequalification certificate, shall make a contribution to (i) an exploratory committee or candidate committee established by a candidate for nomination or election to the office of Governor, Lieutenant Governor, Attorney General, State Comptroller, Secretary of the State or State Treasurer, (ii) a political committee authorized to make contributions or expenditures to or for the benefit of such candidates, or (iii) a party committee (which includes town committees).

In addition, no holder or principal of a holder of a valid prequalification certificate, shall make a contribution to (i) an exploratory committee or candidate committee established by a candidate for nomination or election to the office of State senator or State representative, (ii) a political committee authorized to make contributions or expenditures to or for the benefit of such candidates, or (iii) a party committee.

On and after January 1, 2011, no state contractor, prospective state contractor, principal of a state contractor or principal of a prospective state contractor, with regard to a state contract or state contract solicitation with or from a state agency in the executive branch or a quasi-public agency or a holder, or principal of a holder of a valid prequalification certificate, shall **knowingly solicit** contributions from the state contractor's or prospective state contractor's employees or from a *subcontractor or principals of the subcontractor* on behalf of (i) an exploratory committee or candidate committee established by a candidate for nomination or election to the office of Governor, Lieutenant Governor, Attorney General, State Comptroller, Secretary of the State or State Treasurer, (ii) a political committee authorized to make contributions or expenditures to or for the benefit of such candidates, or (iii) a party committee.

DUTY TO INFORM

State contractors and prospective state contractors are required to inform their principals of the above prohibitions, as applicable, and the possible penalties and other consequences of any violation thereof.

PENALTIES FOR VIOLATIONS

Contributions or solicitations of contributions made in violation of the above prohibitions may result in the following civil and criminal penalties:

Civil penalties—Up to \$2,000 or twice the amount of the prohibited contribution, whichever is greater, against a principal or a contractor. Any state contractor or prospective state contractor which fails to make reasonable efforts to comply with the provisions requiring notice to its principals of these prohibitions and the possible consequences of their violations may also be subject to civil penalties of up to \$2,000 or twice the amount of the prohibited contributions made by their principals.

Criminal penalties—Any knowing and willful violation of the prohibition is a Class D felony, which may subject the violator to imprisonment of not more than 5 years, or not more than \$5,000 in fines, or both.

CONTRACT CONSEQUENCES

In the case of a state contractor, contributions made or solicited in violation of the above prohibitions may resulting the contract being voided.

In the case of a prospective state contractor, contributions made or solicited in violation of the above prohibitions shall result in the contract described in the state contract solicitation not being awarded to the prospective state contractor, unless the State Elections Enforcement Commission determines that mitigating circumstances exist concerning such violation.

The State shall not award any other state contract to anyone found in violation of the above prohibitions for a period of one year after the election for which such contribution is made or solicited, unless the State Elections Enforcement Commission determines that mitigating circumstances exist concerning such violation.

Additional information may be found on the website of the State Elections Enforcement Commission, www.ct.gov/seec. Click on the link to "Lobbyist/Contractor Limitations."

DEFINITIONS

“State contractor” means a person, business entity or nonprofit organization that enters into a state contract. Such person, business entity or nonprofit organization shall be deemed to be a state contractor until December thirty-first of the year in which such contract terminates. “State contractor” does not include a municipality or any other political subdivision of the state, including any entities or associations duly created by the municipality or political subdivision exclusively amongst themselves to further any purpose authorized by statute or charter, or an employee in the executive or legislative branch of state government or a quasi-public agency, whether in the classified or unclassified service and full or part-time, and only in such person’s capacity as a state or quasi-public agency employee.

“Prospective state contractor” means a person, business entity or nonprofit organization that (i) submits a response to a state contract solicitation by the state, a state agency or a quasi-public agency, or a proposal in response to a request for proposals by the state, a state agency or a quasi-public agency, until the contract has been entered into, or (ii) holds a valid prequalification certificate issued by the Commissioner of Administrative Services under section 4a-100. “Prospective state contractor” does not include a municipality or any other political subdivision of the state, including any entities or associations duly created by the municipality or political subdivision exclusively amongst themselves to further any purpose authorized by statute or charter, or an employee in the executive or legislative branch of state government or a quasi-public agency, whether in the classified or unclassified service and full or part-time, and only in such person’s capacity as a state or quasi-public agency employee.

“Principal of a state contractor or prospective state contractor” means (i) any individual who is a member of the board of directors of, or has an ownership interest of five per cent or more in, a state contractor or prospective state contractor, which is a business entity, except for an individual who is a member of the board of directors of a nonprofit organization, (ii) an individual who is employed by a state contractor or prospective state contractor, which is a business entity, as president, treasurer or executive vice president, (iii) an individual who is the chief executive officer of a state contractor or prospective state contractor, which is not a business entity, or if a state contractor or prospective state contractor has no such officer, then the officer who duly possesses comparable powers and duties, (iv) an officer or an employee of any state contractor or prospective state contractor who has *managerial or discretionary responsibilities with respect to a state contract*, (v) the spouse or a *dependent child* who is eighteen years of age or older of an individual described in this subparagraph, or (vi) a political committee established or controlled by an individual described in this subparagraph or the business entity or nonprofit organization that is the state contractor or prospective state contractor.

“State contract” means an agreement or contract with the state or any state agency or any quasi-public agency, let through a procurement process or otherwise, having a value of fifty thousand dollars or more, or a combination or series of such agreements or contracts having a value of one hundred thousand dollars or more in a calendar year, for (i) the rendition of services, (ii) the furnishing of any goods, material, supplies, equipment or any items of any kind, (iii) the construction, alteration or repair of any public building or public work, (iv) the acquisition, sale or lease of any land or building, (v) a licensing arrangement, or (vi) a grant, loan or loan guarantee. “State contract” does not include any agreement or contract with the state, any state agency or any quasi-public agency that is exclusively federally funded, an education loan, a loan to an individual for other than commercial purposes or any agreement or contract between the state or any state agency and the United States Department of the Navy or the United States Department of Defense.

“State contract solicitation” means a request by a state agency or quasi-public agency, in whatever form issued, including, but not limited to, an invitation to bid, request for proposals, request for information or request for quotes, inviting bids, quotes or other types of submittals, through a competitive procurement process or another process authorized by law waiving competitive procurement.

“Managerial or discretionary responsibilities with respect to a state contract” means having direct, extensive and substantive responsibilities with respect to the negotiation of the state contract and not peripheral, clerical or ministerial responsibilities.

“Dependent child” means a child residing in an individual’s household who may legally be claimed as a dependent on the federal income tax of such individual.

“Solicit” means (A) requesting that a contribution be made, (B) participating in any fund-raising activities for a candidate committee, exploratory committee, political committee or party committee, including, but not limited to, forwarding tickets to potential contributors, receiving contributions for transmission to any such committee or bundling contributions, (C) serving as chairperson, treasurer or deputy treasurer of any such committee, or (D) establishing a political committee for the sole purpose of soliciting or receiving contributions for any committee. Solicit does not include: (i) making a contribution that is otherwise permitted by Chapter 155 of the Connecticut General Statutes; (ii) informing any person of a position taken by a candidate for public office or a public official, (iii) notifying the person of any activities of, or contact information for, any candidate for public office; or (iv) serving as a member in any party committee or as an officer of such committee that is not otherwise prohibited in this section.

“Subcontractor” means any person, business entity or nonprofit organization that contracts to perform part or all of the obligations of a state contractor’s state contract. Such person, business entity or nonprofit organization shall be deemed to be a subcontractor until December thirty first of the year in which the subcontract terminates. “Subcontractor” does not include (i) a municipality or any other political subdivision of the state, including any entities or associations duly created by the municipality or political subdivision exclusively amongst themselves to further any purpose authorized by statute or charter, or (ii) an employee in the executive or legislative branch of state government or a quasi-public agency, whether in the classified or unclassified service and full or part-time, and only in such person’s capacity as a state or quasi-public agency employee.

“Principal of a subcontractor” means (i) any individual who is a member of the board of directors of, or has an ownership interest of five per cent or more in, a subcontractor, which is a business entity, except for an individual who is a member of the board of directors of a nonprofit organization, (ii) an individual who is employed by a subcontractor, which is a business entity, as president, treasurer or executive vice president, (iii) an individual who is the chief executive officer of a subcontractor, which is not a business entity, or if a subcontractor has no such officer, then the officer who duly possesses comparable powers and duties, (iv) an officer or an employee of any subcontractor who has managerial or discretionary responsibilities with respect to a subcontract with a state contractor, (v) the spouse or a dependent child who is eighteen years of age or older of an individual described in this subparagraph, or (vi) a political committee established or controlled by an individual described in this subparagraph or the business entity or nonprofit organization that is the subcontractor.

EXHIBIT F

(Federal wage rate package will be inserted here for final executed contract only. Refer to NTC – Federal Wage Determinations)

EXHIBIT G

(State wages will be inserted here)

Project: State Project No. 82-312

**Minimum Rates and Classifications
for Heavy/Highway Construction**

**Connecticut Department of Labor
Wage and Workplace Standards Division**

ID#: H 26361

By virtue of the authority vested in the Labor Commissioner under provisions of Section 31-53 of the General Statutes of Connecticut, as amended, the following are declared to be the prevailing rates and welfare payments and will apply only where the contract is advertised for bid within 20 days of the date on which the rates are established. Any contractor or subcontractor not obligated by agreement to pay to the welfare and pension fund shall pay this amount to each employee as part of his/her hourly wages.

Project Number: 82-312

Project Town: Middletown

FAP Number:

State Number:

Project: State Project No. 82-312

CLASSIFICATION	Hourly Rate	Benefits
1) Boilermaker	33.79	34% + 8.96
1a) Bricklayer, Cement Masons, Cement Finishers, Plasterers, Stone Masons	34.72	32.15
2) Carpenters, Piledrivermen	33.53	25.66
2a) Diver Tenders	33.53	25.66

As of:

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3) Divers	41.99	25.66
03a) Millwrights	34.04	26.09
4) Painters: (Bridge Construction) Brush, Roller, Blasting (Sand, Water, etc.), Spray	49.75	21.05
4a) Painters: Brush and Roller	33.62	21.05
4b) Painters: Spray Only	36.62	21.05
4c) Painters: Steel Only	35.62	21.05
4d) Painters: Blast and Spray	36.62	21.05

As of:

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4e) Painters: Tanks, Tower and Swing	35.62	21.05
5) Electrician (Trade License required: E-1,2 L-5,6 C-5,6 T-1,2 L-1,2 V-1,2,7,8,9)	40.00	27.67+3% of gross wage
6) Ironworkers: Ornamental, Reinforcing, Structural, and Precast Concrete Erection	36.67	35.77 + a
7) Plumbers (Trade License required: (P-1,2,6,7,8,9 J-1,2,3,4 SP-1,2) and Pipefitters (Including HVAC Work) (Trade License required: S-1,2,3,4,5,6,7,8 B-1,2,3,4 D-1,2,3,4 G-1, G-2, G-8, G-9)	43.62	32.06
----LABORERS-----		
8) Group 1: Laborer (Unskilled), Common or General, acetylene burner, concrete specialist	30.75	20.84
9) Group 2: Chain saw operators, fence and guard rail erectors, pneumatic tool operators, powdermen	31.00	20.84

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10) Group 3: Pipelayers	31.25	20.84
11) Group 4: Jackhammer/Pavement breaker (handheld); mason tenders (cement/concrete), catch basin builders, asphalt rakers, air track operators, block paver, curb setter and forklift operators	31.25	20.84
12) Group 5: Toxic waste removal (non-mechanical systems)	32.75	20.84
13) Group 6: Blasters	32.50	20.84
Group 7: Asbestos/lead removal, non-mechanical systems (does not include leaded joint pipe)	31.75	20.84
Group 8: Traffic control signalmen	18.00	20.84
Group 9: Hydraulic Drills	29.30	18.90

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----LABORERS (TUNNEL CONSTRUCTION, FREE AIR). Shield Drive and
Liner Plate Tunnels in Free Air.----

13a) Miners, Motormen, Mucking Machine Operators, Nozzle Men, Grout Men, Shaft & Tunnel Steel & Rodmen, Shield & Erector, Arm Operator, Cable Tenders	32.98	20.84 + a
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13b) Brakemen, Trackmen	32.01	20.84 + a
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----CLEANING, CONCRETE AND CAULKING TUNNEL----

14) Concrete Workers, Form Movers, and Strippers	32.01	20.84 + a
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15) Form Erectors	32.34	20.84 + a
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----ROCK SHAFT LINING, CONCRETE, LINING OF SAME AND TUNNEL
IN FREE AIR:----

As of:

Friday, July 19, 2019

Project: State Project No. 82-312

16) Brakemen, Trackmen, Tunnel Laborers, Shaft Laborers	32.01	20.84 + a
17) Laborers Topside, Cage Tenders, Bellman	31.90	20.84 + a
18) Miners	32.98	20.84 + a
----TUNNELS, CAISSON AND CYLINDER WORK IN COMPRESSED AIR: ----		
18a) Blaster	39.47	20.84 + a
19) Brakemen, Trackmen, Groutman, Laborers, Outside Lock Tender, Gauge Tenders	39.27	20.84 + a
20) Change House Attendants, Powder Watchmen, Top on Iron Bolts	37.29	20.84 + a

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21) Mucking Machine Operator	40.06	20.84 + a
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----TRUCK DRIVERS----(*see note below)

Two axle trucks	29.51	24.52 + a
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Three axle trucks; two axle ready mix	29.62	24.52 + a
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Three axle ready mix	29.67	24.52 + a
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Four axle trucks, heavy duty trailer (up to 40 tons)	29.72	24.52 + a
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Four axle ready-mix	29.77	24.52 + a
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Heavy duty trailer (40 tons and over)	29.98	24.52 + a
Specialized earth moving equipment other than conventional type on-the road trucks and semi-trailer (including Euclids)	29.77	24.52 + a

---POWER EQUIPMENT OPERATORS---

Group 1: Crane handling or erecting structural steel or stone, hoisting engineer (2 drums or over), front end loader (7 cubic yards or over), Work Boat 26 ft. & Over, Tunnel Boring Machines. (Trade License Required)	40.97	24.80 + a
Group 2: Cranes (100 ton rate capacity and over); Excavator over 2 cubic yards; Piledriver (\$3.00 premium when operator controls hammer); Bauer Drill/Caisson. (Trade License Required)	40.64	24.80 + a
Group 3: Excavator/Backhoe under 2 cubic yards; Cranes (under 100 ton rated capacity), Gradall; Master Mechanic; Hoisting Engineer (all types of equipment where a drum and cable are used to hoist or drag material regardless of motive power of operation), Rubber Tire Excavator (Drott-1085 or similar); Grader Operator; Bulldozer Fine Grade (slopes, shaping, laser or GPS, etc.). (Trade License Required)	39.88	24.80 + a
Group 4: Trenching Machines; Lighter Derrick; Concrete Finishing Machine; CMI Machine or Similar; Koehring Loader (Skooper)	39.48	24.80 + a

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Group 5: Specialty Railroad Equipment; Asphalt Paver; Asphalt Spreader; Asphalt Reclaiming Machine; Line Grinder; Concrete Pumps; Drills with Self Contained Power Units; Boring Machine; Post Hole Digger; Auger; Pounder; Well Digger; Milling Machine (over 24" Mandrell)	38.87	24.80 + a
Group 5 continued: Side Boom; Combination Hoe and Loader; Directional Driller.	38.87	24.80 + a
Group 6: Front End Loader (3 up to 7 cubic yards); Bulldozer (rough grade dozer).	38.55	24.80 + a
Group 7: Asphalt Roller; Concrete Saws and Cutters (ride on types); Vermeer Concrete Cutter; Stump Grinder; Scraper; Snooper; Skidder; Milling Machine (24" and Under Mandrel).	38.20	24.80 + a
Group 8: Mechanic, Grease Truck Operator, Hydroblaster, Barrier Mover, Power Stone Spreader; Welder; Work Boat under 26 ft.; Transfer Machine.	37.79	24.80 + a
Group 9: Front End Loader (under 3 cubic yards), Skid Steer Loader regardless of attachments (Bobcat or Similar); Fork Lift, Power Chipper; Landscape Equipment (including hydroseeder).	37.34	24.80 + a
Group 10: Vibratory Hammer, Ice Machine, Diesel and Air Hammer, etc.	35.24	24.80 + a

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Group 11: Conveyor, Earth Roller; Power Pavement Breaker (whiphammer), Robot Demolition Equipment.	35.24	24.80 + a
Group 12: Wellpoint Operator.	35.18	24.80 + a
Group 13: Compressor Battery Operator.	34.58	24.80 + a
Group 14: Elevator Operator; Tow Motor Operator (Solid Tire No Rough Terrain).	33.41	24.80 + a
Group 15: Generator Operator; Compressor Operator; Pump Operator; Welding Machine Operator; Heater Operator.	32.99	24.80 + a
Group 16: Maintenance Engineer/Oiler	32.32	24.80 + a
Group 17: Portable asphalt plant operator; portable crusher plant operator; portable concrete plant operator.	36.76	24.80 + a

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Group 18: Power Safety Boat; Vacuum Truck; Zim Mixer; Sweeper; (minimum for any job requiring CDL license).	34.26	24.80 + a
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**NOTE: SEE BELOW

---LINE CONSTRUCTION---(Railroad Construction and Maintenance)---

20) Lineman, Cable Splicer, Technician	48.19	6.5% + 22.00
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21) Heavy Equipment Operator	42.26	6.5% + 19.88
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22) Equipment Operator, Tractor Trailer Driver, Material Men	40.96	6.5% + 19.21
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23) Driver Groundmen	26.50	6.5% + 9.00
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23a) Truck Driver	40.96	6.5% + 17.76
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---LINE CONSTRUCTION---

24) Driver Groundmen	30.92	6.5% + 9.70
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25) Groundmen	22.67	6.5% + 6.20
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26) Heavy Equipment Operators	37.10	6.5% + 10.70
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27) Linemen, Cable Splicers, Dynamite Men	41.22	6.5% + 12.20
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28) Material Men, Tractor Trailer Drivers, Equipment Operators	35.04	6.5% + 10.45
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01) Asbestos/Toxic Waste Removal Laborers: Asbestos removal and encapsulation (except its removal from mechanical systems which are not to be scrapped), toxic waste removers, blasters. ****See Laborers Group 5 and 7****

Project: State Project No. 82-312

Welders: Rate for craft to which welding is incidental.

**Note: Hazardous waste removal work receives additional \$1.25 per hour for truck drivers.*

***Note: Hazardous waste premium \$3.00 per hour over classified rate*

ALL Cranes: When crane operator is operating equipment that requires a fully licensed crane operator to operate he receives an extra \$4.00 premium in addition to the hourly wage rate and benefit contributions:

- 1) Crane handling or erecting structural steel or stone; hoisting engineer (2 drums or over)***
- 2) Cranes (100 ton rate capacity and over) Bauer Drill/Caisson***
- 3) Cranes (under 100 ton rated capacity)***

Crane with 150 ft. boom (including jib) - \$1.50 extra
Crane with 200 ft. boom (including jib) - \$2.50 extra
Crane with 250 ft. boom (including jib) - \$5.00 extra
Crane with 300 ft. boom (including jib) - \$7.00 extra
Crane with 400 ft. boom (including jib) - \$10.00 extra

All classifications that indicate a percentage of the fringe benefits must be calculated at the percentage rate times the "base hourly rate".

Apprentices duly registered under the Commissioner of Labor's regulations on "Work Training Standards for Apprenticeship and Training Programs" Section 31-51-d-1 to 12, are allowed to be paid the appropriate percentage of the prevailing journeymen hourly base and the full fringe benefit rate, providing the work site ratio shall not be less than one full-time journeyman instructing and supervising the work of each apprentice in a specific trade.

~~Connecticut General Statute Section 31-55a: Annual Adjustments to wage rates by contractors doing state work ~~

The Prevailing wage rates applicable to this project are subject to annual adjustments each July 1st for the duration of the project.

Each contractor shall pay the annual adjusted prevailing wage rate that is in effect each July 1st, as posted by the Department of Labor.

It is the contractor's responsibility to obtain the annual adjusted prevailing wage rate increases directly from the Department of Labor's website.

The annual adjustments will be posted on the Department of Labor's Web page: www.ct.gov/dol.

The Department of Labor will continue to issue the initial prevailing wage rate schedule to the Contracting Agency for the project.

All subsequent annual adjustments will be posted on our Web Site for contractor access.

Contracting Agencies are under no obligation pursuant to State labor law to pay any increase due to the annual adjustment provision.

As of:

Friday, July 19, 2019

Project: State Project No. 82-312

Effective October 1, 2005 - Public Act 05-50: any person performing the work of any mechanic, laborer, or worker shall be paid prevailing wage

All Person who perform work ON SITE must be paid prevailing wage for the appropriate mechanic, laborer, or worker classification.

All certified payrolls must list the hours worked and wages paid to All Persons who perform work ON SITE regardless of their ownership i.e.: (Owners, Corporate Officers, LLC Members, Independent Contractors, et. al)

Reporting and payment of wages is required regardless of any contractual relationship alleged to exist between the contractor and such person.

~~Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clause (29 CFR 5.5 (a) (1) (ii)).

Please direct any questions which you may have pertaining to classification of work and payment of prevailing wages to the Wage and Workplace Standards Division, telephone (860)263-6790.

As of:

Friday, July 19, 2019

Connecticut Department of Labor
Wage and Workplace Standards Division
FOOTNOTES

Please Note: If the “Benefits” listed on the schedule for the following occupations includes a letter(s) (+ a or + a+b for instance), refer to the information below.

Benefits to be paid at the appropriate prevailing wage rate for the listed occupation.

If the “Benefits” section for the occupation lists only a dollar amount, disregard the information below.

Bricklayers, Cement Masons, Cement Finishers, Concrete Finishers, Stone Masons
(Building Construction) and
(Residential- Hartford, Middlesex, New Haven, New London and Tolland Counties)

- a. Paid Holiday: Employees shall receive 4 hours for Christmas Eve holiday provided the employee works the regularly scheduled day before and after the holiday. Employers may schedule work on Christmas Eve and employees shall receive pay for actual hours worked in addition to holiday pay.

Elevator Constructors: Mechanics

- a. Paid Holidays: New Year’s Day, Memorial Day, Independence Day, Labor Day, Veterans’ Day, Thanksgiving Day, Christmas Day, plus the Friday after Thanksgiving.
- b. Vacation: Employer contributes 8% of basic hourly rate for 5 years or more of service or 6% of basic hourly rate for 6 months to 5 years of service as vacation pay credit.

Glaziers

- a. Paid Holidays: Labor Day and Christmas Day.

Power Equipment Operators
(Heavy and Highway Construction & Building Construction)

- a. Paid Holidays: New Year’s Day, Good Friday, Memorial day, Independence Day, Labor Day, Thanksgiving Day and Christmas Day, provided the employee works 3 days during the week in which the holiday falls, if scheduled, and if scheduled, the working day before and the working day after the holiday. Holidays falling on Saturday may be observed on Saturday, or if the employer so elects, on the preceding Friday.

Ironworkers

- a. Paid Holiday: Labor Day provided employee has been on the payroll for the 5 consecutive work days prior to Labor Day.

Laborers (Tunnel Construction)

- a. Paid Holidays: New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day and Christmas Day. No employee shall be eligible for holiday pay when he fails, without cause, to work the regular work day preceding the holiday or the regular work day following the holiday.

Roofers

- a. Paid Holidays: July 4th, Labor Day, and Christmas Day provided the employee is employed 15 days prior to the holiday.

Sprinkler Fitters

- a. Paid Holidays: Memorial Day, July 4th, Labor Day, Thanksgiving Day and Christmas Day, provided the employee has been in the employment of a contractor 20 working days prior to any such paid holiday.

Truck Drivers

(Heavy and Highway Construction & Building Construction)

- a. Paid Holidays: New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, Christmas day, and Good Friday, provided the employee has at least 31 calendar days of service and works the last scheduled day before and the first scheduled day after the holiday, unless excused.

Information Bulletin ***Occupational Classifications***

The Connecticut Department of Labor has the responsibility to properly determine "job classification" on prevailing wage projects covered under C.G.S. Section 31-53(d).

Note: This information is intended to provide a sample of some occupational classifications for guidance purposes only. It is not an all-inclusive list of each occupation's duties. This list is being provided only to highlight some areas where a contractor may be unclear regarding the proper classification. If unsure, the employer should seek guidelines for CTDOL.

Below are additional clarifications of specific job duties performed for certain classifications:

- **ASBESTOS WORKERS**

Applies all insulating materials, protective coverings, coatings and finishes to all types of mechanical systems.

- **ASBESTOS INSULATOR**

Handle, install apply, fabricate, distribute, prepare, alter, repair, dismantle, heat and frost insulation, including penetration and fire stopping work on all penetration fire stop systems.

- **BOILERMAKERS**

Erects hydro plants, incomplete vessels, steel stacks, storage tanks for water, fuel, etc. Builds incomplete boilers, repairs heat exchanges and steam generators.

- **BRICKLAYERS, CEMENT MASONS, CEMENT FINISHERS, MARBLE MASONS, PLASTERERS, STONE MASONS, PLASTERERS. STONE MASONS, TERRAZZO WORKERS, TILE SETTERS**

Lays building materials such as brick, structural tile and concrete cinder, glass, gypsum, terra cotta block. Cuts, tools and sets marble, sets stone, finishes concrete, applies decorative steel, aluminum and plastic tile, applies cements, sand, pigment and marble chips to floors, stairways, etc.

- **CARPENTERS, MILLWRIGHTS. PILEDRIVERMEN. LATHERS. RESILEINT FLOOR LAYERS, DOCK BUILDERS, DIKERS, DIVER TENDERS**

Constructs, erects, installs and repairs structures and fixtures of wood, plywood and wallboard. Installs, assembles, dismantles, moves industrial machinery. Drives piling into ground to provide foundations for structures such as buildings and bridges, retaining walls for earth embankments, such as cofferdams. Fastens wooden, metal or rockboard lath to walls, ceilings and partitions of buildings, acoustical tile layer, concrete form builder. Applies firestopping materials on fire resistive joint systems only. Installation of curtain/window walls only where attached to wood or metal studs. Installation of insulated material of all types whether blown, nailed or attached in other ways to walls, ceilings and floors of buildings. Assembly and installation of modular furniture/furniture systems. Free-standing furniture is not covered. This includes free standing: student chairs, study top desks, book box desks, computer furniture, dictionary stand, atlas stand, wood shelving, two-position information access station, file cabinets, storage cabinets, tables, etc.

- **LABORER, CLEANING**

- The clean up of any construction debris and the general (heavy/light) cleaning, including sweeping, wash down, mopping, wiping of the construction facility and its furniture, washing, polishing, and dusting.

- **DELIVERY PERSONNEL**

- If delivery of supplies/building materials is to one common point and stockpiled there, prevailing wages are not required. If the delivery personnel are involved in the distribution of the material to multiple locations within the construction site then they would have to be paid prevailing wages for the type of work performed: laborer, equipment operator, electrician, ironworker, plumber, etc.

- An example of this would be where delivery of drywall is made to a building and the delivery personnel distribute the drywall from one "stockpile" location to further sub-locations on each floor. Distribution of material around a construction site is the job of a laborer or tradesman, and not a delivery personnel.

- **ELECTRICIANS**

Install, erect, maintenance, alteration or repair of any wire, cable, conduit, etc., which generates, transforms, transmits or uses electrical energy for light, heat, power or other purposes, including the Installation or maintenance of telecommunication, LAN wiring or computer equipment, and low voltage wiring. ****License required per Connecticut General Statutes: E-1,2 L-5,6 C-5,6 T-1,2 L-1,2 V-1,2,7,8,9.***

- **ELEVATOR CONSTRUCTORS**

Install, erect, maintenance and repair of all types of elevators, escalators, dumb waiters and moving walks. **License required by Connecticut General Statutes: R-1,2,5,6.*

- **FORK LIFT OPERATOR**

Laborers Group 4) Mason Tenders - operates forklift solely to assist a mason to a maximum height of nine (9) feet only.

Power Equipment Operator Group 9 - operates forklift to assist any trade, and to assist a mason to a height over nine (9) feet.

- **GLAZIERS**

Glazing wood and metal sash, doors, partitions, and 2 story aluminum storefronts. Installs glass windows, skylights, store fronts and display cases or surfaces such as building fronts, interior walls, ceilings and table tops and metal store fronts. Installation of aluminum window walls and curtain walls is the "joint" work of glaziers and ironworkers, which require equal composite workforce.

- **IRONWORKERS**

Erection, installation and placement of structural steel, precast concrete, miscellaneous iron, ornamental iron, metal curtain wall, rigging and reinforcing steel. Handling, sorting, and installation of reinforcing steel (rebar). Metal bridge rail (traffic), metal bridge handrail, and decorative security fence installation. Installation of aluminum window walls and curtain walls is the "joint" work of glaziers and ironworkers which require equal composite workforce.

- **INSULATOR**

- Installing fire stopping systems/materials for "Penetration Firestop Systems": transit to cables, electrical conduits, insulated pipes, sprinkler pipe penetrations, ductwork behind radiation, electrical cable trays, fire rated pipe penetrations, natural polypropylene, HVAC ducts, plumbing bare metal, telephone and communication wires, and boiler room ceilings.

- **LABORERS**

Acetylene burners, asphalt rakers, chain saw operators, concrete and power buggy operator, concrete saw operator, fence and guard rail erector (except metal bridge rail (traffic), decorative security fence (non-metal)).

installation.), hand operated concrete vibrator operator, mason tenders, pipelayers (installation of storm drainage or sewage lines on the street only), pneumatic drill operator, pneumatic gas and electric drill operator, powermen and wagon drill operator, air track operator, block paver, curb setters, blasters, concrete spreaders.

- **PAINTERS**

Maintenance, preparation, cleaning, blasting (water and sand, etc.), painting or application of any protective coatings of every description on all bridges and appurtenances of highways, roadways, and railroads. Painting, decorating, hardwood finishing, paper hanging, sign writing, scenic art work and drywall hhg for any and all types of building and residential work.

- **LEAD PAINT REMOVAL**

- Painter's Rate

1. Removal of lead paint from bridges.
2. Removal of lead paint as preparation of any surface to be repainted.
3. Where removal is on a Demolition project prior to reconstruction.

- Laborer's Rate

1. Removal of lead paint from any surface NOT to be repainted.
2. Where removal is on a *TOTAL* Demolition project only.

- **PLUMBERS AND PIPEFITTERS**

Installation, repair, replacement, alteration or maintenance of all plumbing, heating, cooling and piping. ****License required per Connecticut General Statutes: P-1,2,6,7,8,9 J-1,2,3,4 SP-1,2 S-1,2,3,4,5,6,7,8 B-1,2,3,4 D-1,2,3,4.***

- **POWER EQUIPMENT OPERATORS**

Operates several types of power construction equipment such as compressors, pumps, hoists, derricks, cranes, shovels, tractors, scrapers or motor graders, etc. Repairs and maintains equipment. ****License required, crane operators only, per Connecticut General Statutes.***

- **ROOFERS**

Covers roofs with composition shingles or sheets, wood shingles, slate or asphalt and gravel to waterproof roofs, including preparation of surface. (demolition or removal of any type of roofing and or clean-up of any and all areas where a roof is to be relaid.)

- **SHEETMETAL WORKERS**

Fabricate, assembles, installs and repairs sheetmetal products and equipment in such areas as ventilation, air-conditioning, warm air heating, restaurant equipment, architectural sheet metal work, sheetmetal roofing, and aluminum gutters. Fabrication, handling, assembling, erecting, altering, repairing, etc. of coated metal material panels and composite metal material panels when used on building exteriors and interiors as soffits, fascia, louvers, partitions, canopies, cornice, column covers, awnings, beam covers, cladding, sun shades, lighting troughs, spires, ornamental roofing, metal ceilings, mansards, copings, ornamental and ventilation hoods, vertical and horizontal siding panels, trim, etc. The sheet metal classification also applies to the vast variety of coated metal material panels and composite metal material panels that have evolved over the years as an alternative to conventional ferrous and non-ferrous metals like steel, iron, tin, copper, brass, bronze, aluminum, etc. Fabrication, handling, assembling, erecting, altering, repairing, etc. of architectural metal roof, standing seam roof, composite metal roof, metal and composite bathroom/toilet partitions, aluminum gutters, metal and composite lockers and shelving, kitchen equipment, and walk-in coolers. To include testing and air –balancing ancillary to installation and construction.

- **SPRINKLER FITTERS**

Installation, alteration, maintenance and repair of fire protection sprinkler systems.

****License required per Connecticut General Statutes: F-1,2,3,4.***

- **TILE MARBLE AND TERRAZZO FINISHERS**

Assists and tends the tile setter, marble mason and terrazzo worker in the performance of their duties.

- **TRUCK DRIVERS**

~How to pay truck drivers delivering asphalt is under REVISION~

Truck Drivers are requires to be paid prevailing wage for time spent "working" directly on the site. These drivers remain covered by the prevailing wage for any time spent transporting between the actual construction location and facilities (such as fabrication, plants, mobile factories, batch plant, borrow pits, job headquarters, tool yards, etc.) dedicated exclusively, or nearly so, to performance of the contract or project, which are so located in proximity to the actual construction location that it is reasonable to include them. ****License required, drivers only, per Connecticut General Statutes.***

For example:

- Material men and deliverymen are not covered under prevailing wage as long as they are not directly involved in the construction process. If, they unload the material, they would then be covered by prevailing wage for the classification they are performing work in: laborer, equipment operator, etc.
- Hauling material off site is not covered provided they are not dumping it at a location outlined above.
- Driving a truck on site and moving equipment or materials on site would be considered covered work, as this is part of the construction process.

➤ *Any questions regarding the proper classification should be directed to:*
Public Contract Compliance Unit
Wage and Workplace Standards Division
Connecticut Department of Labor
200 Folly Brook Blvd, Wethersfield, CT 06109
(860) 263-6543.

Statute 31-55a

Last Updated: June 02, 2008

You are here: [DOL Web Site](#) ▶ [Wage and Workplace Issues](#) ▶ Statute 31-55a

- Special Notice -

To All State and Political Subdivisions, Their Agents, and Contractors

Connecticut General Statute 31-55a - Annual adjustments to wage rates by contractors doing state work.

Each contractor that is awarded a contract on or after October 1, 2002, for (1) the construction of a state highway or bridge that falls under the provisions of section 31-54 of the general statutes, or (2) the construction, remodeling, refinishing, refurbishing, rehabilitation, alteration or repair of any public works project that falls under the provisions of section 31-53 of the general statutes shall contact the Labor Commissioner on or before July first of each year, for the duration of such contract, to ascertain the prevailing rate of wages on an hourly basis and the amount of payment or contributions paid or payable on behalf of each mechanic, laborer or worker employed upon the work contracted to be done, and shall make any necessary adjustments to such prevailing rate of wages and such payment or contributions paid or payable on behalf of each such employee, effective each July first.

- The prevailing wage rates applicable to any contract or subcontract awarded on or after October 1, 2002 are subject to annual adjustments each July 1st for the duration of any project which was originally advertised for bids on or after October 1, 2002.
- Each contractor affected by the above requirement shall pay the annual adjusted prevailing wage rate that is in effect each July 1st, as posted by the Department of Labor.
- It is the *contractor's* responsibility to obtain the annual adjusted prevailing wage rate increases directly from the Department of Labor's Web Site. The annual adjustments will be posted on the Department of Labor Web page: www.ctdol.state.ct.us. For those without internet access, please contact the division listed below.
- The Department of Labor will continue to issue the initial prevailing wage rate schedule to the Contracting Agency for the project. All subsequent annual adjustments will be posted on our Web Site for contractor access.

Any questions should be directed to the Contract Compliance Unit, Wage and Workplace

Standards Division, Connecticut Department of Labor, 200 Folly Brook Blvd.,
Wethersfield, CT 06109 at (860)263-6790.

[Workplace Laws](#)

Published by the Connecticut Department of Labor, Project Management Office

November 29, 2006

Notice
To All Mason Contractors and Interested Parties
Regarding Construction Pursuant to Section 31-53 of the
Connecticut General Statutes (Prevailing Wage)

The Connecticut Labor Department Wage and Workplace Standards Division is empowered to enforce the prevailing wage rates on projects covered by the above referenced statute.

Over the past few years the Division has withheld enforcement of the rate in effect for workers who operate a forklift on a prevailing wage rate project due to a potential jurisdictional dispute.

The rate listed in the schedules and in our Occupational Bulletin (see enclosed) has been as follows:

Forklift Operator:

- **Laborers (Group 4) Mason Tenders** - operates forklift solely to assist a mason to a maximum height of nine feet only.
- **Power Equipment Operator (Group 9)** - operates forklift to assist any trade and to assist a mason to a height over nine feet.

The U.S. Labor Department conducted a survey of rates in Connecticut but it has not been published and the rate in effect remains as outlined in the above Occupational Bulletin.

Since this is a classification matter and not one of jurisdiction, effective January 1, 2007 the Connecticut Labor Department will enforce the rate on each schedule in accordance with our statutory authority.

Your cooperation in filing appropriate and accurate certified payrolls is appreciated.

Informational Bulletin

THE 10-HOUR OSHA CONSTRUCTION SAFETY AND HEALTH COURSE

(applicable to public building contracts entered into *on or after July 1, 2007*, where the total cost of all work to be performed is at least \$100,000)

- (1) This requirement was created by Public Act No. 06-175, which is codified in Section 31-53b of the Connecticut General Statutes (pertaining to the prevailing wage statutes);
- (2) The course is required for public building construction contracts (projects funded in whole or in part by the state or any political subdivision of the state) entered into on or after July 1, 2007;
- (3) It is required of private employees (not state or municipal employees) and apprentices who perform manual labor for a general contractor or subcontractor on a public building project where the total cost of all work to be performed is at least \$100,000;
- (4) The ten-hour construction course pertains to the ten-hour Outreach Course conducted in accordance with federal OSHA Training Institute standards, and, for telecommunications workers, a ten-hour training course conducted in accordance with federal OSHA standard, 29 CFR 1910.268;
- (5) The internet website for the federal OSHA Training Institute is http://www.osha.gov/fso/ote/training/edcenters/fact_sheet.html;
- (6) The statutory language leaves it to the contractor and its employees to determine who pays for the cost of the ten-hour Outreach Course;
- (7) Within 30 days of receiving a contract award, a general contractor must furnish proof to the Labor Commissioner that all employees and apprentices performing manual labor on the project will have completed such a course;
- (8) Proof of completion may be demonstrated through either: (a) the presentation of a *bona fide* student course completion card issued by the federal OSHA Training Institute; *or* (2) the presentation of documentation provided to an employee by a trainer certified by the Institute pending the actual issuance of the completion card;
- (9) Any card with an issuance date more than 5 years prior to the commencement date of the construction project shall not constitute proof of compliance;

- (10) Each employer shall affix a copy of the construction safety course completion card to the certified payroll submitted to the contracting agency in accordance with Conn. Gen. Stat. § 31-53(f) on which such employee's name first appears;
- (11) Any employee found to be in non-compliance shall be subject to removal from the worksite if such employee does not provide satisfactory proof of course completion to the Labor Commissioner by the fifteenth day after the date the employee is determined to be in noncompliance;
- (12) Any such employee who is determined to be in noncompliance may continue to work on a public building construction project for a maximum of fourteen consecutive calendar days while bringing his or her status into compliance;
- (13) The Labor Commissioner may make complaint to the prosecuting authorities regarding any employer or agent of the employer, or officer or agent of the corporation who files a false certified payroll with respect to the status of an employee who is performing manual labor on a public building construction project;
- (14) The statute provides the minimum standards required for the completion of a safety course by manual laborers on public construction contracts; any contractor can exceed these minimum requirements; and
- (15) Regulations clarifying the statute are currently in the regulatory process, and shall be posted on the CTDOL website as soon as they are adopted in final form.
- (16) Any questions regarding this statute may be directed to the Wage and Workplace Standards Division of the Connecticut Labor Department via the internet website of <http://www.ctdol.state.ct.us/wgwkstnd/wgemenu.htm>; or by telephone at (860)263-6790.

THE ABOVE INFORMATION IS PROVIDED EXCLUSIVELY AS AN EDUCATIONAL RESOURCE, AND IS NOT INTENDED AS A SUBSTITUTE FOR LEGAL INTERPRETATIONS WHICH MAY ULTIMATELY ARISE CONCERNING THE CONSTRUCTION OF THE STATUTE OR THE REGULATIONS.

Sec. 31-53b. Construction safety and health course. Proof of completion required for employees on public building projects. Enforcement. Regulations. (a) Each contract entered into on or after July 1, 2007, for the construction, remodeling, refinishing, refurbishing, rehabilitation, alteration or repair of any public building project by the state or any of its agents, or by an political subdivision of the state or any of its agents, where the total cost of all work to be performed by all contractors and subcontractors in connection with the contract is at least one hundred thousand dollars, shall contain a provision requiring that, not later than thirty days after the date such contract is awarded, each contractor furnish proof to the Labor Commissioner that all employees performing manual labor on or in such public building, pursuant to such contract, have completed a course of at least ten hours in duration in construction safety and health approved by the federal Occupational Safety and Health Administration or, in the case of telecommunications employees, have completed at least ten hours of training in accordance with 29 CFR 1910.268.

(b) Any employee required to complete a construction safety and health course required under subsection (a) of this section who has not completed the course shall be subject to removal from the worksite if the employee does not provide documentation of having completed such course by the fifteenth day after the date the employee is found to be in noncompliance. The Labor Commissioner or said commissioner's designee shall enforce this section.

(c) Not later than January 1, 2007, the Labor Commissioner shall adopt regulations, in accordance with the provisions of chapter 54, to implement the provisions of subsections (a) and (b) of this section. Such regulations shall require that the ten-hour construction safety and health courses required under subsection (a) of this section be conducted in accordance with federal Occupational Safety and Health Administration Training Institute standards, or in accordance with 29 CFR 1910.268, as appropriate. The Labor Commissioner shall accept as sufficient proof of compliance with the provisions of subsection (a) or (b) of this section a student course completion card issued by the federal Occupational Safety and Health Administration Training Institute, or such other proof of compliance said commissioner deems appropriate, dated no earlier than five years before the commencement date of such public works project.

(d) For the purposes of this section, "public building" means a structure, paid for in whole or in part with state funds, within a roof and within exterior walls or fire walls, designed for the housing, shelter, enclosure and support or employment of people, animals or property of any kind, including, but not limited to, sewage treatment plants and water treatment plants, "Public building" does not include site work, roads or bridges, rail lines, parking lots or underground water, sewer or drainage systems including pump houses or other utility systems.

CONNECTICUT DEPARTMENT OF LABOR
WAGE AND WORKPLACE STANDARDS DIVISION

CONTRACTORS WAGE CERTIFICATION FORM

I, _____ of _____
Officer, Owner, Authorized Rep. Company Name

do hereby certify that the _____
Company Name

Street

City

and all of its subcontractors will pay all workers on the

Project Name and Number

Street and City

the wages as listed in the schedule of prevailing rates required for such project (a copy of which is attached hereto).

Signed

Subscribed and sworn to before me this _____ day of _____, 2004.

Notary Public

 Return to:

Connecticut Department of Labor
Wage & Workplace Standards Division
200 Folly Brook Blvd.
Wethersfield, CT 06109