

## **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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May 13, 2015  
FEDERAL AID PROJECT NO. 0025(124)  
STATE PROJECT NO. 0144-0193

Route 25 Update Highway Signs Route 8 to Route 111

Town of Trumbull  
Federal Aid Project No. 0025(124)

The State of Connecticut, Department of Transportation, Standard Specifications for Roads, Bridges and Incidental Construction, Form 816, 2004, as revised by the Supplemental Specifications dated July 2014 (otherwise referred to collectively as "ConnDOT Form 816") is hereby made part of this contract, as modified by the Special Provisions contained herein. . The State of Connecticut Department of Transportation's "Construction Contract Bidding and Award Manual" ("Manual"), May 14, 2010 edition or latest issue, is hereby made part of this contract. If the provisions of this Manual conflict with provisions of other Department documents (not including statutes or regulations), the provisions of the Manual will govern. The Manual is available upon request from the Transportation Manager of Contracts. The Special Provisions relate in particular to the Route 25 Update Highway Signs Route 8 to Route 111 in the Town of Trumbull.

## **CONTRACT TIME AND LIQUIDATED DAMAGES**

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

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

1. For this contract, an assessment per day for liquidated damages, at a rate Two Thousand Six Hundred Dollars (\$2,600.00) Dollars per day shall be applied to each calendar day the work runs in excess of the Two Hundred (200) allowed calendar days for the contract.
2. For this contract, an assessment per hour for liquidated damages shall be applied to each hour, or any portion thereof, in which the Contractor interferes with normal traffic operations during the restricted hours given in Article 1.08.04 of the Special Provisions. The liquidated damages shall be as shown in the following tables

entitled "Liquidated Damages Per Hour" for each hour, or any portion thereof, in which the Contractor interferes with normal traffic operations during the restricted hours.

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

1. Any portion of the travel lanes or shoulders is occupied by any personnel, equipment, materials, or supplies including signs.
2. The transition between the planes of pavement surfaces is at a rate of one inch in less than fifteen feet longitudinally.



**LIQUIDATED DAMAGES PER HOUR**

<b>Route 25 NORTHBOUND 3 Lane Section</b>		
<b>If Working Periods Extends Into</b>	<b>1 Lane Closure</b>	<b>2 Lane Closure</b>
1st Hour of Restrictive Period	\$ 500	\$ 500
2 <sup>nd</sup> Hour of Restrictive Period	\$ 500	\$ 3,000
3rd Hour or any Subsequent Hour of Restrictive Period	\$ 500	\$ 10,000
<b>Route 25 SOUTHBOUND 3 Lane Section</b>		
<b>If Working Periods Extends Into</b>	<b>1 Lane Closure</b>	<b>2 Lane Closure</b>
1st Hour of Restrictive Period	\$ 500	\$ 500
2nd Hour of Restrictive Period	\$ 500	\$ 7,000
3rd Hour or any Subsequent Hour of Restrictive Period	\$ 500	\$ 15,000

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

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

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

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

**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 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). Contact Mr. Philip J. Cohen at (860) 594-2744 of the Division of Traffic Engineering regarding any SIMS questions. Contact Mr. James R. Spencer at (860) 594-2014 of the Department's Bureau of Policy and Planning regarding any GPS questions. Refer to the special provision for Section 12.00 General Clauses For Highway Signing.

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

Limited hazardous materials site investigations have been conducted at thirteen (13) sign/support sites along Route 25 in Trumbull, Connecticut which are scheduled for removal/replacement. The scope of inspection was limited to the representative components projected for impact.

The results of these investigations indicated the presence of very low levels of lead based paint (LBP) confirmed present at Sign Support Nos. 20618, 20635, 20634, 20620, 20621, 20628, 20633, 20632, 20781 and 20622. No LBP is present on Sign Supports Nos. 20619, 20631 and 20625, as the supports are galvanized (not painted).

Projected paint waste debris was characterized as non-hazardous C&D bulky waste at Sign Nos. 20618, 20635, 20634, 20620, 20621, 20628, 20633, 20632, 20781 and 20622.

Suspect tar coatings at the base of the supports were taken at Sign Support Nos. 20621, 20622, 20632, 20633, 20634, 20781 and 20638 and were found to contain no asbestos.

All steel and metal components generated from the miscellaneous exterior 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.

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

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

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

- HazMat Inspection Letter, 13 Sign/Support Replacements on Route 25, Trumbull, CT, TRC Environmental Corporation, February 25, 2015.

## 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 – VOLUNTARY PARTNERING**

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

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

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

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

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

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

**NOTICE TO CONTRACTOR – USE OF STATE POLICE OFFICERS**

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

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

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

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



## **NOTICE TO CONTRACTOR – TRAFFIC DRUMS AND TRAFFIC CONES**

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

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

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

## **NOTICE TO CONTRACTOR – NCHRP 350 REQ. FOR WORK ZONE TRAFFIC CONTROL DEVICES**

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

Prior to using the Category 1 Devices on the project, the Contractor shall submit to the Engineer a copy of the manufacturer's self-certification that the devices conform to the requirements in National Cooperative Highway Research Program (NCHRP) Report 350 or the AASHTO Manual for Assessing Safety Hardware (MASH), as appropriate.

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

Prior to using Category 2 Devices on the project, the Contractor shall submit to the Engineer a copy of the Letter of Acceptance issued by the FHWA to the manufacturer documenting that the devices (both sign and portable support tested together) have been crash tested and have approval in writing from FHWA conforming to the requirements in National Cooperative Highway Research Program (NCHRP) Report 350 or the AASHTO Manual for Assessing Safety Hardware (MASH), as appropriate.

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

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

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

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

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

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

Prior to using Category 3 Devices on the project, the Contractor shall submit to the Engineer a copy of the Letter of Acceptance issued by the FHWA to the manufacturer documenting that the devices have been crash tested and have approval in writing from FHWA conforming to the requirements in National Cooperative Highway Research Program (NCHRP) Report 350 or the AASHTO Manual for Assessing Safety Hardware (MASH), as appropriate.

## **SECTION 1.02 – PROPOSAL REQUIREMENTS AND CONDITIONS**

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

*Replace the third sentence of the last paragraph with:*

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

## **SECTION 1.03 – AWARD AND EXECUTION OF CONTRACT**

### **Article 1.03.08 - 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 1.08 – PROSECUTION AND PROGRESS**

### **Article 1.08.04 - Limitation of Operations - Add the following:**

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

#### **Routes 25**

On the following State observed Legal Holidays:

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

The following restrictions also apply:

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

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

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

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

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

#### **During all other times**

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

The Contractor will be allowed to halt Route 25 traffic for a period not to exceed 10 minutes to perform necessary work for the erection and/or removal of overhead sign supports, as approved by the Engineer, between 12:01 a.m. and 5:00 a.m. on all non-Holiday days.

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

Route: 25 NB Location: Exit 9 – Trumbull Number of Through Lanes: 3								Route: 25 SB Location: Exit 9 – Trumbull Number of Through Lanes: 3							
Hour Beginning	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Hour Beginning	Mon	Tue	Wed	Thu	Fri	Sat	Sun
Mid	1	1	1	1	1	1	1	Mid	1	1	1	1	1	1	1
1 AM	1	1	1	1	1	1	1	1 AM	1	1	1	1	1	1	1
2 AM	1	1	1	1	1	1	1	2 AM	1	1	1	1	1	1	1
3 AM	1	1	1	1	1	1	1	3 AM	1	1	1	1	1	1	1
4 AM	1	1	1	1	1	1	1	4 AM	1	1	1	1	1	1	1
5 AM	1	1	1	1	1	1	1	5 AM	1	1	1	1	1	1	1
6 AM	E	E	E	E	E	1	1	6 AM	E	E	E	E	E	1	1
7 AM	E	E	E	E	E	1	1	7 AM	E	E	E	E	E	1	1
8 AM	E	E	E	E	E	2	1	8 AM	E	E	E	E	E	2	1
9 AM	1	1	1	1	1	2	2	9 AM	2	2	2	2	2	2	2
10 AM	1	1	1	1	1	2	2	10 AM	1	1	1	1	1	2	2
11 AM	1	1	1	1	1	2	2	11 AM	1	1	1	1	1	2	2
Noon	1	1	1	1	1	2	2	Noon	1	1	1	1	1	2	2
1 PM	1	1	1	1	1	2	2	1 PM	1	1	1	1	1	2	2
2 PM	1	1	1	1	1	2	2	2 PM	1	1	1	1	1	2	2
3 PM	E	E	E	E	E	2	2	3 PM	E	E	E	E	E	2	2
4 PM	E	E	E	E	E	2	2	4 PM	E	E	E	E	E	2	2
5 PM	E	E	E	E	E	2	2	5 PM	E	E	E	E	E	2	2
6 PM	2	2	2	2	2	2	2	6 PM	2	2	2	2	2	2	2
7 PM	1	1	1	1	1	1	2	7 PM	1	1	1	1	1	1	2
8 PM	1	1	1	1	1	1	1	8 PM	1	1	1	1	1	1	1
9 PM	1	1	1	1	1	1	1	9 PM	1	1	1	1	1	1	1
10 PM	1	1	1	1	1	1	1	10 PM	1	1	1	1	1	1	1
11 PM	1	1	1	1	1	1	1	11 PM	1	1	1	1	1	1	1

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

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

**Ramps and Turning Roadways on Route 25**

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

**All Other Roadways**

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

**Additional Lane Closure Restrictions**

It is anticipated that work on adjacent projects will be ongoing simultaneously with this project. The Contractor shall be aware of those projects and anticipate that coordination will be required to maintain proper traffic flow at all times on all project roadways, in a manner consistent with these specifications and acceptable to the Engineer. Project No. 173-351 may be ongoing simultaneously with this project.

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

\* \* \* \* \*

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

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

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

**Article 1.08.08 - Extension of Time:**

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

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

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

## **SECTION 1.10 ENVIRONMENTAL COMPLIANCE**

### **In Article 1.10.03-Water Pollution Control: BEST MANAGEMENT PRACTICES**

*Add the following after Best Management Practice Number 14:*

15. The Contractor is hereby notified that the State listed species of Special Concern Eastern box turtle (*Terrapene carolina*), is present within the Project limits. In Connecticut, this terrestrial turtle lives in a variety of habitats, including woodlands, field edges, thickets, marshes, bogs, and stream banks. Typically, however, Eastern box turtles are found in well-drained forest bottomlands and open deciduous forests. They will use wetland areas at various times during the season. During the hottest part of a summer day, they will wander to find springs and seepages where they can burrow into the moist soil. Eastern box turtles overwinter in upland forest, a few inches under the soil surface, typically covered by leaf litter or woody debris. As soil temperatures drop, the turtles burrow into soft ground.

If work must be done during the Eastern box turtle's active period (April 1 to November 1) the Department will require precautionary measures to protect the Eastern box turtle and Eastern box turtle habitat. All construction activities taking place within the turtle's active period will need to be coordinated with the Department.

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 discuss proper protocol for maintaining environmental commitments made to the protection of this species and habitat. OEP will provide oversight through the District to ensure that the following protocols are followed and maintained during the course of the Project:

- a. Exclusionary practices will be required in order to prevent any Eastern Box turtle access to construction areas. These measures will need to be installed at the limits of disturbance as shown on the plans.
- b. All staging and storage areas, outside of previously paved locations, regardless of the duration of time they will be utilized, must be reviewed by and receive written approval from OEP through the District.
- c. All construction personnel working within the Eastern box turtle habitat must be apprised of the species description and the possible presence of a listed species.
- d. In areas where silt fence is used for exclusion, it shall be removed as soon as the area is stable to allow for reptile and amphibian passage to resume.



- e. Any Eastern box turtles encountered within the immediate work area shall be carefully moved to an adjacent area outside of the excluded area and the field inspector must immediately contact OEP with the location.
- f. No heavy machinery or vehicles may be parked in any Eastern box turtle habitat.
- g. Special precautions must be taken to avoid degradation of wetland habitats including any wet meadows and seasonal pools.
- h. The Contractor must search the work area each morning for the presence of the listed species prior to any work being done.

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 Eastern box turtles in this area and be apprised of the laws protecting them. Photographs and the laws protecting Eastern box turtles (species ID sheets will be provided by OEP) shall be posted in the Contractor's and DOT field office. Any observations of this species are to be immediately reported to OEP at (860) 594-2937 or (860) 594-2938. If OEP staff cannot be reached at either of the above referenced phone numbers, the District environmental coordinator will need to be contacted to facilitate further coordination with OEP's Water and Noise Compliance Unit.

## **SECTION 12.00 – GENERAL CLAUSES FOR HIGHWAY SIGNING**

### **Description:**

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

#### **12.00.06 – Data Labels:**

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

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

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

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

#### **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 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. 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.

Field Number	Type	size	Description
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
# 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.

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

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

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

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

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

All Variable Legends To Be Included At Label Fabrication.

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

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

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

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

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

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

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

## **SECTION 12.08 – SIGN FACE-SHEET ALUMINUM**

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

**General:** Delete all references to parapet mounted sign supports.

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

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

**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 #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 paint removal, etc.

All activities shall be performed in accordance with the OSHA Lead in Construction Regulations (29 CFR 1926.62), the USEPA RCRA Hazardous Waste Regulations (40 CFR Parts 260 through 274), and the CTDEEP Hazardous Waste Regulations (RCSA 22a-209-1 and 22a-449(c)).

All activities shall be performed by individuals with appropriate levels of OSHA lead awareness and hazard communication training and shall supervised by the Contractors Competent Person on the job site at all times. The Contractors Competent Person is one who is capable of identifying existing and predictable hazards in the surroundings or working conditions which are unsanitary, hazardous or dangerous to employees, and who has authorization to take prompt corrective measures to eliminate them.

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

### **Materials:**

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

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

The following material requirements are to be met if to be used during the work:

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

Polyethylene disposable bags shall be minimum six (6) mils thick.

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

Cleaning Agents and detergent shall be lead specific, such as TriSodium Phosphate (TSP).

Chemical strippers and chemical neutralizers shall be compatible with the substrate as well as with each other. Such chemical stripper shall contain less than 50% Volatile Organic Compounds (VOCs) by weight in accordance with RCSA 22a-174-40 Table 40-1.

Labels and warning signs shall conform to 29 CFR 1926.62, 40 CFR 260 through 274 and 49 CFR 172 as appropriate.

Air filtration devices and vacuum units shall be equipped with High-Efficiency Particulate Air (HEPA) filters.

### **Construction Methods:**

#### **(1) Pre-Abatement Submittals and Notices**

A. Prior to the start of **any** work on a contiguous per site basis that will generate hazardous lead waste above conditionally exempt small quantities (greater than 100 kg/month or greater than 1000 kg at any time), the Contractor shall obtain from the Engineer on a contiguous per site basis a temporary EPA Hazardous Waste Generators ID number, unless otherwise directed by the Engineer.

B. Fifteen (15) working days prior to beginning work that impacts lead paint, the Contractor shall submit the following to the Engineer:

1. Work plan for work impacting lead paint including engineering controls, methods of containment of debris and work practices to be employed, as needed, to minimize employee exposure and prevent the spread of lead contamination outside the Regulated Area.
2. Copies of all employee certificates, dated within the previous twelve (12) months, relating to OSHA lead awareness and hazard communication training and training in the use of lead-safe work practices. SSPC training programs may be accepted as meeting these requirements if it can be demonstrated that such training addressed all required topics.

This information shall be updated and resubmitted annually, or as information changes, for the duration of the activities impacting lead to verify continued compliance.

3. Name and qualifications of Contractor's OSHA Competent Person under 29 CFR 1926.62.
4. Documentation from the Contractor, typed on company letterhead and signed by the Contractor, certifying that all employees listed therein have received the following:
  - a. medical monitoring within the previous twelve (12) months, as required in 29 CFR 1926.62;
  - b. biological monitoring within the previous six (6) months, as required in 29 CFR 1926.62;
  - c. respirator fit testing within the previous twelve (12) months, as required in 29 CFR 1910.134 (for those who don a tight-fitting face piece respirator)

This information shall be updated and resubmitted annually, or as information changes, for the duration of the activities impacting lead to verify continued compliance.

5. Names of the proposed non-hazardous construction and demolition (C&D) lead debris bulky waste disposal facility (CTDEEP-permitted Solid Waste landfill).
6. Names of the proposed scrap metal recycling facilities. The Contractor shall submit to the Engineer all documentation necessary to demonstrate the selected facility is able to accept lead-painted scrap metal.
7. 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.

Coordinate all power and fire alarm isolation with the appropriate representatives.

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  $30 \text{ ug/m}^3$ ,

whichever is larger, or if at any time visible emissions of lead paint extend out from the Regulated Area, an examination of the Regulated Area shall be conducted and the cause of such emissions corrected. Cleanup of surfaces outside the Regulated Area using HEPA vacuum equipment or wet cleaning techniques shall be done prior to resuming work.

Work outside the initial designated area(s) will not be paid for by the Engineer. The Contractor will be responsible for all costs incurred from these activities including repair of any damage.

#### B. Regulated Area

The Contractor shall establish a Regulated Area through the use of appropriate barrier tape or other means to control unauthorized access into the area where activities impacting lead paint are occurring. Warning signs meeting the requirements of 29 CFR 1926.62 shall be posted at all approaches to Regulated Areas. These signs shall read:

WARNING  
LEAD WORK AREA  
POISON  
NO SMOKING OR EATING

The Contractor shall implement appropriate engineering controls such as poly drop cloths, local exhaust ventilation, wet dust suppression methods, etc. as necessary, and as approved by the Engineer, to prevent the spread of lead contamination beyond the Regulated Area in accordance with the Contractor's approved work plan. Should the previously submitted work plan prove to be insufficient to contain the contamination, the Contractor shall modify its plan and submit it for review by the Engineer.

#### C. Wash Facilities:

The Contractor shall provide handwash facilities in compliance with 29 CFR 1926.51(f) and 29 CFR 1926.62 regardless of airborne lead exposure.

If employee exposure to airborne lead exceeds the OSHA Permissible Exposure Limit of 50 micrograms per cubic meter ( $\mu\text{g}/\text{m}^3$ ), shower rooms must be provided. The Shower Room shall be of sufficient capacity to accommodate the number of workers. One shower stall shall be provided for each eight (8) workers. Showers shall be equipped with hot and cold or warm running water. Shower water shall be collected and filtered using best available technology and disposed of in accordance with all Federal, State and local laws, regulations and ordinances.

#### D. Personal Protection:

The Contractor shall initially determine if any employee performing construction tasks impacting lead paint may be exposed to lead at or above the OSHA Action Level of  $30 \mu\text{g}/\text{m}^3$ . Assessments shall be based on initial air monitoring results as well as other relevant information.

The Contractor may rely on historical air monitoring data obtained within the past 12 months under workplace conditions closely resembling the process, type of material, control methods, work practices and environmental conditions used and prevailing in the Contractors current operations to satisfy the exposure assessment requirements. Monitoring shall continue as specified in the OSHA standard until a negative exposure assessment is developed.

Until a negative exposure assessment is developed for each task impacting lead paint, the Contractor shall ensure that all workers and authorized person entering the Regulated Area wear protective clothing and respirators in accordance with OSHA 29 CFR 1926.62. Protective clothing shall include impervious coveralls with elastic wrists and ankles, head covering, gloves and foot coverings. Sufficient quantities shall be provided to last throughout the duration of the project.

Protective clothing provided by the Contractor and used during chemical removal operations shall be impervious to caustic materials. Gloves provided by the Contractor and used during chemical removal shall be of neoprene composition with glove extenders.

Respiratory protective equipment shall be provided and selection shall conform to 42 CFR Part 84, 29 CFR Part 1910.134, and 29 CFR Part 1926.62. A formal respiratory protection program must be implemented in accordance with 29 CFR Part 1926.62 and Part 1910.134.

#### E. Air Monitoring Requirements

The Contractor shall:

1. Provide air monitoring equipment including sample filter cassettes of the type and quantity required to properly monitor operations and personnel exposure surveillance throughout the duration of the project.
2. Conduct initial exposure monitoring to determine if any employee performing construction tasks impacting lead paint may be exposed to lead at or above the OSHA Action Level of 30 micrograms per cubic meter. Monitoring shall continue as specified in the OSHA standard until a negative exposure assessment is developed.
3. Conduct personnel exposure assessment air sampling, as necessary, to assure that workers are using appropriate respiratory protection in accordance with OSHA Standard 1926.62. Documentation of air sampling results must be recorded at the work site within twenty-four (24) hours and shall be available for review until the job is complete.

#### F. Lead Abatement Procedures

The Contractor's Competent Person shall be at the job site at all times during work impacting lead.

Work impacting lead paint shall not begin until authorized by the Engineer, following a pre-work visual inspection by the Project Monitor or Engineer to verify existing conditions.

Any activity impacting lead painted surfaces shall be performed in a manner which minimizes the spread of lead dust contamination and generation of airborne lead.

**The Contractor shall conduct exposure assessments for all tasks which impact lead paint in accordance with 29 CFR 1926.62(d) and shall implement appropriate personal protective equipment until negative exposure assessments are developed.**

**All work impacting the materials identified below shall be conducted within an established Regulated Area with a remote wash facility/decontamination system in accordance with “C. Wash Facilities” and the OSHA Lead in Construction Standard. In accordance with 29 CFR 1926.62, engineering controls and work practices shall be utilized to prevent the spread of lead dust and debris beyond the Regulated Area and limit the generation of airborne lead. All wastes containing lead paint shall be properly contained and secured for storage, transportation and disposal.**

The Contractor shall ensure proper entry and exit procedures for workers and authorized persons who enter and leave the Regulated Area. All workers and authorized persons shall leave the Regulated Area and proceed directly to the wash or shower facilities where they will HEPA vacuum gross debris from work suit, remove and dispose of work suit, wash and dry face and hands, and vacuum clothes. Lead chips and dust must not be removed by blowing or shaking of clothing. Wash water shall be collected, filtered, and disposed of in accordance with Federal, State and local water discharge standards. Any permit required for such discharge shall be the responsibility of the Contractor.

No one shall eat, drink, smoke, chew gum or tobacco, or apply cosmetics while in the Regulated Area.

Data from the limited lead testing performed by the Engineer is documented in the reports listed in the “Notice to Contractor – Hazardous Materials Investigations” or is presented herein. Under no circumstances shall this information be the sole means used by the Contractor for determining the extent of lead painted materials. The Contractor shall be responsible for verification of all field conditions affecting performance of the work as described in these Specifications in accordance with OSHA, USEPA, USDOT and CTDEEP standards. Compliance with the applicable requirements is solely the responsibility of the Contractor.

The following details the extent of each phase of operation designated for this project. Phase areas may be combined or divided at the direction of the Engineer. Proceed through the sequencing of the work phases under the direction of the Engineer.

**Sign Support No. 20618 – Route 25 NB, Mile Marker 3.93, Trumbull**



- Lead paint was identified on the painted metal surfaces of Sign Support No. 20618. XRF results showed the paint to be lead based.

Sign Supports Bases & Bolts	Metal	Yellow	0.1 – 0.2 mg/cm <sup>2</sup>
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- TCLP waste stream sampling/analysis of the paint characterized the paint waste as non-hazardous C&D bulky waste.

Paint debris	0.61 mg/l
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**Sign Support No. 20619 – Route 25 NB, Mile Marker 4.11, Trumbull**

- No lead paint was identified on the metal surfaces of Sign Support No. 20619 (galvanized supports-no paint).

**Sign Support No. 20635 – Route 25 SB, Mile Marker 4.35, Trumbull**

- Lead paint was identified on the painted metal surfaces of Sign Support No. 20635. XRF results showed the paint to be lead based.

Sign Supports Bases & Bolts	Metal	Yellow	0.1 – 0.2 mg/cm <sup>2</sup>
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- TCLP waste stream sampling/analysis of the paint characterized the paint waste as non-hazardous C&D bulky waste.

Paint debris	3.6 mg/l
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**Sign Support No. 20634 – Route 25 SB, Mile Marker 4.63, Trumbull**

- Lead paint was identified on the painted metal surfaces of Sign Support No. 20634. XRF results showed the paint to be lead based.

Sign Supports Bases & Bolts	Metal	Yellow	0.1 mg/cm <sup>2</sup>
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- TCLP waste stream sampling/analysis of the paint characterized the paint waste as non-hazardous C&D bulky waste.

Paint debris	1.1 mg/l
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**Sign Support No. 20620 – Route 25 NB, Mile Marker 4.63, Trumbull**

- Lead paint was identified on the painted metal surfaces of Sign Support No. 20620. XRF results showed the paint to be lead based.

<b>Sign Supports Bases &amp; Bolts</b>	<b>Metal</b>	<b>Yellow</b>	<b>0.1 – 0.3 mg/cm<sup>2</sup></b>
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- TCLP waste stream sampling/analysis of the paint characterized the paint waste as non-hazardous C&D bulky waste.

<b>Paint debris</b>	<b>1.7 mg/l</b>
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**Sign Support No. 20621 – Route 25 NB, Mile Marker 5.26, Trumbull**

- Lead paint was identified on the painted metal surfaces of Sign Support No. 20621. XRF results showed the paint to be lead based.

<b>Sign Supports Bases &amp; Bolts</b>	<b>Metal</b>	<b>Yellow</b>	<b>0.1 mg/cm<sup>2</sup></b>
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- TCLP waste stream sampling/analysis of the paint characterized the paint waste as non-hazardous C&D bulky waste.

<b>Paint debris</b>	<b>2.3 mg/l</b>
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**Sign Support No. 20628 – Route 25 SB, Ramp, Trumbull**

- Lead paint was identified on the painted metal surfaces of Sign Support No. 20628. XRF results showed the paint to be lead based.

<b>Sign Supports Bases &amp; Bolts</b>	<b>Metal</b>	<b>Yellow</b>	<b>0.1 mg/cm<sup>2</sup></b>
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- TCLP waste stream sampling/analysis of the paint characterized the paint waste as non-hazardous C&D bulky waste.

<b>Paint debris</b>	<b>2.5 mg/l</b>
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**Sign Support No. 20633 – Route 25 SB, Mile Marker 5.04, Trumbull**

- Lead paint was identified on the painted metal surfaces of Sign Support No. 20633. XRF results showed the paint to be lead based.

Sign Supports Bases & Bolts	Metal	Yellow	0.1 mg/cm <sup>2</sup>
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- TCLP waste stream sampling/analysis of the paint characterized the paint waste as non-hazardous C&D bulky waste.

Paint debris	1.3 mg/l
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**Sign Support No. 20781 – Route 25 NB, Ramp, Trumbull**

- Lead paint was identified on the painted metal surfaces of Sign Support No. 20781. XRF results showed the paint to be lead based.

Sign Supports Bases & Bolts	Metal	Yellow	0.1 mg/cm <sup>2</sup>
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- Based on the color and same low levels of lead in the other nine (9) sign supports on Route 25, the paint waste at Sign Support 20781 is characterized as non-hazardous C&D bulky waste.

**Sign Support No. 20632 – Route 25 SB, Mile Marker 5.63, Trumbull**

- Lead paint was identified on the painted metal surfaces of Sign Support No. 20632. XRF results showed the paint to be lead based.

Sign Supports Bases & Bolts	Metal	Yellow	0.1 mg/cm <sup>2</sup>
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- TCLP waste stream sampling/analysis of the paint characterized the paint waste as non-hazardous C&D bulky waste.

Paint debris	2.1 mg/l
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**Sign Support No. 20622 – Route 25 SB, Trumbull**

- Lead paint was identified on the painted metal surfaces of Sign Support No. 20622. XRF results showed the paint to be lead based.

Sign Supports Bases & Bolts	Metal	Yellow	0.1 – 0.2 mg/cm <sup>2</sup>
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- TCLP waste stream sampling/analysis of the paint characterized the paint waste as non-hazardous C&D bulky waste.

Paint debris	2.8 mg/l
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**Sign Support No. 20631 – Route 25 SB, Trumbull**

- No lead paint was identified on the metal surfaces of Sign Support No. 20631 (galvanized supports-no paint).

**Sign Support No. 20625 – Route 25 SB, Mile Marker 7.63, Trumbull**

- No lead paint was identified on the metal surfaces of Sign Support No. 20625 (galvanized supports-no paint).

While conducting the work to remove/replace the signs/supports, 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 at Sign Support Nos. 20618, 20635, 20634, 20620, 20621, 20628, 20633, 20632, 20781 and 20622 as non-hazardous C&D bulky waste. Should the paint be removed from the components, the paint shall be disposed of as non-hazardous C&D bulky waste at the Contractor's previously submitted disposal facility under this Item 0020903A.**

**All steel and metal components generated from the miscellaneous exterior work tasks (painted or not) shall be segregated and recycled as scrap metal at the Contractor's previously submitted scrap metal recycling facility. 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. Paint Stabilization:

Remove surface dust, dirt, mildew, scale, rust or other debris by scrubbing with detergent (lead-specific detergent solution) and rinsing. Remove loose paint using wet scraping methods until a sound surface is achieved. Remove unsound substrate not firmly adhered and repair with an appropriate patching material. All excess liquids must be collected for characterization by the Engineer prior to disposal.

4. 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.

5. Component Removal/Replacement:

- a. Wet down components which are to be removed to reduce the amount of dust generated during the removal process.
- b. Remove components utilizing hand tools, and follow appropriate safety procedures during removal. Remove the components by approved methods which will provide the least disturbance to the substrate material. Do not damage adjacent surfaces.
- c. Clean up immediately after component removals have been completed. Remove any dust located behind the component removed.

#### G. Prohibited Removal Methods:

The use of heat guns in excess of 700 degrees Fahrenheit to remove lead paint is prohibited.

The use of sand, steel grit, air, CO<sub>2</sub>, baking soda, or any other blasting media to remove lead or lead paint without the use of a HEPA ventilated contained negative pressure enclosure is prohibited.

Power/pressure washing shall not be used to remove lead paint.

Compressed air shall not be utilized to remove lead paint.

Chemical strippers containing Methylene Chloride are prohibited. Any chemical stripping may be prohibited on a project by project basis.

Power tool assisted grinding, sanding, cutting, or wire brushing of lead paint without the use of cowled HEPA vacuum dust collection systems is prohibited.

Lead paint burning, busting of rivets painted with lead paint, welding of materials painted with lead paint, and torch cutting of materials painted with lead paint is prohibited. Where cutting, welding, busting, or torch cutting of materials is required, lead paint in the affected area must be removed first.

Chemical stripping of coatings from bridge components is generally prohibited unless specifically allowed on a project by project basis.

#### H. Clean-up and Visual Inspection:

The Contractor shall remove and containerize all lead waste material and visible accumulations of debris, paint chips and associated items.

During clean-up the Contractor shall utilize rags and sponges wetted with lead-specific detergent and water as well as HEPA filtered vacuum equipment.

The Engineer will conduct a visual inspection of the work areas in order to document that all surfaces have been maintained as free as practicable of accumulations of lead in accordance with 29 CFR 1926.62(h). If visible accumulations of waste, debris, lead paint chips or dust are found in the work area, the Contractor shall repeat the cleaning, at the Contractor's expense, until the area is in compliance. The visual inspection will detect incomplete work, damage caused by the abatement activity, and inadequate clean up of the work site.

I. Post-Work Regulated Area Deregulation:

Following an acceptable visual inspection, any engineering controls implemented may be removed.

A final visual inspection of the work area shall be conducted by the Competent Person and the Project Monitor or Engineer to ensure that all visible accumulations of suspect materials have been removed and that no equipment or materials associated with the lead paint removal remain. If this final visual inspection is acceptable, the Contractor will reopen the Regulated Area and remove all signage.

The Contractor shall restore all work areas and auxiliary areas utilized during work to conditions equal to or better than original. Any damage caused during the performance of the work activity shall be repaired by the Contractor at no additional expense to the State.

J. Waste Disposal/Recycling:

Non-metallic building debris waste materials tested and found to be non-hazardous Construction and Demolition (C&D) bulky waste shall be disposed of properly at a CTDEEP approved Solid Waste landfill as described Herein.

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 non-hazardous lead construction and demolition (C&D) bulky waste.

Final payment will not be made until all project closeout data submittals have been completed and provided to the Engineer. Once the completed package has been received in its entirety and accepted by the Engineer, final payment will be made to the Contractor.

<u>Pay Item</u>	<u>Pay Unit</u>
Lead Compliance for Miscellaneous Exterior Tasks	Lump Sum

END OF SECTION

## **ITEM #0952001A – SELECTIVE CLEARING AND THINNING**

Section 9.52 is amended as follows:

### **Article 9.52.03 – Construction Methods is supplemented as follows:**

Where directed by the Engineer, materials to be cut, trimmed or removed shall be those items that restrict visibility to an extruded aluminum sign to less than 800 ft (244 m). The entire sign will be visible for 800 ft (244 m) measured from the center of the right-travel lane approaching the sign, as viewed from a 3.5 ft (1.1 m) height above the roadway.

All trees scheduled to be removed shall be visibly marked or flagged by the Contractor at least seven days prior to the cutting of such trees.

The Engineer will inspect the identified trees and verify the limits of clearing and thinning prior to the Contractor proceeding with his cutting operation.

**ITEM #0969062A – CONSTRUCTION FIELD OFFICE, MEDIUM**

**Description:** Under the item included in the bid document, adequate weatherproof office quarters shall be provided by the Contractor for the duration of the work, and if required for a maximum of 90 days thereafter, at the discretion of the Engineer, 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.

**Materials:** Materials shall be in like new condition for the purpose intended and shall be approved by the Engineer.

**Office Requirements:** The Contractor shall furnish the office quarters and equipment as described below.

Description \ 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 Department 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 Department and will be kept in their possession while State personnel are using the office. Any access to the entrance ways shall meet applicable building codes, with appropriate handrails. Stairways shall be ADA/IBA 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.

Additional Equipment, Facilities and Services: The Contractor shall provide at the field Office at least the following to the satisfaction of the Engineer:

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 to serve the electrical requirements of the field office, including: lighting, general outlets, computer outlets, calculators etc., and meet the following minimum specifications:

- A. 120/240 volt, 1 phase, 3 wire.
- B. Ampacity necessary to serve all equipment. Service shall be a minimum 100 amp dedicated to the construction field office.
- C. The electrical panel shall include a main circuit breaker and branch circuit breakers of the size and quantity required.
- D. Additional 120 volt, single phase, 20 amp, isolated ground dedicated power circuit with dual NEMA 5-20 receptacles will be installed at each computer workstation location.
- E. Additional 120 volt, single phase, 20 amp, isolated ground dedicated power circuit with dual NEMA 5-20 receptacles will be installed, for use by the Telephone Company.
- F. Additional 120-volt circuits and duplex outlets as required meeting National Electric Code requirements.
- G. One exterior (outside) wall mounted GFI receptacle, duplex, isolated ground, 120 volt, straight blade.
- H. After work is complete and prior to energizing, the State's CTDOT electrical inspector, must be contacted at 860-594-2240. (Do Not Call Local Town Officials)
- I. Prior to field office removal the CTDOT Data Communications office must be notified to deactivate the communications equipment.

Heating, Ventilation and Air Conditioning (HVAC): The field office shall be equipped with sufficient heating, air conditioning and ventilation equipment to maintain a temperature range of 68°-80° Fahrenheit within the field office.

The following furnishings and equipment shall be provided in the applicable field office type:

Description \ Office Size	Qty.			
	Small	Med.	Large	Extra Large
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
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	-

Description \ Office Size	Qty.			
	Small	Med.	Large	Extra Large
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
Laser Copier/Scanner/Fax combination unit, network capable, as specified below under <u>Computer Hardware and Software</u> . All supplies, paper and maintenance shall be provided by the Contractor.	1	1	1	1
Computer System as specified below under <u>Computer Hardware and Software</u> . All supplies and maintenance shall be provided by the Contractor.	2	3	5	8
Digital Camera as specified below under <u>Computer Hardware and Software</u> . All supplies and maintenance shall be provided by the Contractor.	1	1	3	3
Video Projector as specified below under <u>Computer Hardware and Software</u> .	-	-	-	1
Smart Board as specified below under <u>Computer Hardware and Software</u> .	-	-	-	1
Infrared Thermometer, including third party certified calibration, case, and cleaning wipes.	1	1	1	2
Rain Gauge.	1	1	1	1
Concrete Curing Box as specified below under Concrete Testing Equipment.	1	1	1	1
Concrete Air Meter 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 as specified below under Concrete Testing Equipment.	1	1	1	1

The furnishings and equipment required herein shall remain the property of the Contractor. Any supplies required to maintain or operate the above listed equipment or furnishings shall be provided by the Contractor for the duration of the project.

Telephone Service: 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 except for out-of-state toll calls made by State personnel.

Data Communications Facility Wiring: Contractor shall install a Category 5e 468B patch panel in a central wiring location and Cat 5e cable from the patch panel to each PC station, terminating in a (category 5e 468B) wall or surface mount data jack. The central wiring location shall also house either the data circuit with appropriate power requirements or a category 5 cable run to the location of the installed data circuit. The central wiring location will be determined by the CTDOT Data Center staff in coordination with the designated field office personnel as soon as the facility is in place. The CTDOT Project Engineer will provide the Contractor with a copy of the current PC specifications, approved printer list and data wiring schematic as soon as possible after the contract is awarded.

For a Small, Medium and Large field office the Contractor shall run a CAT 5e LAN cable a minimum length of 25 feet for each computer to LAN switch area leaving an additional 10 feet of cable length on each side with terminated RJ45 connectors. For an Extra-Large field office the Contractor shall run CAT 5e LAN cables from workstations, install patch panel in data circuit demark area and terminate runs with RJ45 jacks at each computer location. Terminate runs to patch panel in LAN switch area. Each run / jack shall be clearly labeled with an identifying Jack Number.

The installation of a data communication circuit between the field office and the CTDOT Data Communication Center in Newington will be coordinated between the CTDOT District staff, CTDOT Office of Information Systems and the local phone company. The CTDOT District staff will coordinate the installation of the data communication service with CTDOT PC Support once the field office phone number is issued. The Contractor shall provide the field office telephone number(s) to the CTDOT Project Engineer as soon as possible to facilitate data line and computer installations.

Computer Hardware and Software: Laser Copier/Scanner/Fax, Computer Systems, Digital Camera(s) and Smart Board shall comply with the posted requirements at Departments web site [www.ct.gov/dot](http://www.ct.gov/dot) DOING BUSINEES WITH CTDOT > Contractor Resources > Computer Hardware and Software.

Before ordering the computer hardware and software, the Contractor must submit a copy of their proposed order(s) with catalog cuts and specifications for review by the CTDOT Data Center. Computer hardware and software proposed at a minimum must comply with requirements in place 30 days before submission.

Before any equipment is delivered to the Data Center, arrangements must be made at least one business day in advance by contacting person or unit name? 860-594-3500. All software, hardware and licenses provided shall be clearly labeled, specifying the (1) Project No., (2) Contractor Name, (3) Project Engineer's Name and (4) Project Engineer's Phone No., and shall be delivered to the CTDOT Data Center, 2710 Berlin Turnpike, Newington, CT, where it will be configured and prepared for field installation. Installation will then be coordinated with CTDOT field personnel and the computer system specified will be stationed in the Department's Project field office.

The computer system furnished shall have all software and hardware necessary for the complete installation of the latest versions of the software listed, and therefore supplements the minimum specifications below. The Engineer reserves the right to expand or relax the specification to adapt to the software and hardware limitations and availability, the compatibility with current agency systems, and to provide the Department with a computer system that can handle the needs of the Project. This requirement is to ensure that the rapid changing environment that computer systems have experienced does not leave the needs of the Project orphan to what has been specified. There will not be any price adjustment due to the change in the minimum system requirements.

The Contractor shall provide the Engineer with a licensed copy registered in the Department's name of the latest versions of the software listed and maintain customer support services offered by each software producer for the duration of the Contract. The Contractor shall deliver to the Engineer all supporting documentation for the software and hardware including any instructions or manuals. The Contractor shall provide original backup media for the software.

The Contractor shall provide the computer system with all required supplies, maintenance and repairs (including labor and parts) throughout the Contract life.

Once the Contract has been completed, the computer will remain the property of the Contractor. Prior to the return of any computer(s) to the Contractor, field personnel will coordinate with the Data Center personnel for the removal of Department owned equipment, software, data, and associated equipment.

A) Computer – Minimum Specification (Revised 3-1-15):

- Processor – Intel® Core i5 Processor (3.20 GHz, 1600 MHz FSB 6MB Cache)
- Memory – 8 GB DDR3 1600MHz.
- Monitor – Dual (2) 24.0 inch LCD color monitors.
- Graphics – Intel Integrated Graphics.
- Hard Drive – 500 GB 7200 RPM SATA or equivalent (Western Digital, IBM or Seagate).
- Optical Drive – CD-RW/DVD-RW.
- Multi-Card Reader – Must include SD
- Multimedia Package – Integrated Sound and speakers.
- Case – Small Form or Mid Tower, capable of vertical or horizontal orientation.
- Integrated Network Adapter



Keyboard – 104+ Keyboard.

Mouse – Optical 2-button mouse with scroll wheel.

Operating System – Windows 7 Professional 64-Bit Service Pack 1

Application Software – MS Office 2010 Professional Edition (or newer).

Additional Software (Latest Releases, including subscription services for the life of the Contract.–

- Symantec Endpoint Protection
- CD/DVD burning software (ROXIO or NERO)
- Blue-Beam **Revu eXtreme** (*Must be original purchased Licensed Media CD/DVD or authentic digital down load certificate*).
  - Adobe Acrobat Professional may be specified as an alternative to Blue-beam Revu eXtreme, upon request by administrating District (*Must be original purchased Licensed Media CD/DVD or authentic digital down load certificate*)

Resource or Driver CD/DVD – CD/DVD with all drivers and resource information so the computer can be restored to original prior to shipment back to the contractor.

Uninterrupted power supply – APC Back-UPS 500VA.

Note A1: All hardware components must be installed before delivery. All software documentation and CD-ROMs/DVD for Microsoft Windows 7 Professional, Microsoft Office 2010 Professional Edition, and other software required software must be provided. Computer Brands are limited to Dell (preferred) and HP (acceptable) brands only. No other brands will be accepted. The CTDOT Project Engineer will provide the Contractor with a copy of the current PC specifications and approved printer list as soon as possible after the contract is awarded.

B) Laser Printer – Minimum Specification:

Contact CTDOT Department of Technology Services (1-860-594-3500) for the current approved printer list.

Note B1: Laser printer brands are limited to Hewlett-Packard and Savin brands only. The CTDOT Project Engineer will provide the Contractor with a copy of the current PC specifications and approved printer list as soon as possible after the contract is awarded.

Note B2: It is acceptable to substitute a multi-function all-in-one printer/copier/scanner/fax machine listed on the approved printer list in place of the required laser printer and fax machine.

C) Digital Camera – Minimum Specification:

Optical – 5 megapixel, with 3x optical zoom.

Memory – 2 GB.

Features – Date/time stamp feature.

Connectivity – memory card reader.

Software – Must be compatible with Windows 7.

Power – Rechargeable battery and charger.

D) Smart Board or Video Projector (only applicable for Extra –large Office):

Contact CTDOT Office of Construction (1-860-594-2658) for the current approved smart board or Video Projector specifications.

The Contractor is responsible for service and repairs to all computer hardware. All repairs must be performed with-in 48 hours. If the repairs require more than a 48 hours then a replacement must be provided. All supplies, paper and maintenance for the computers, laptops, printers, copiers, and fax machines shall be provided by the Contractor.

Concrete Testing Equipment: If the Contract includes items that require compressive strength cylinders for concrete, in accordance with the Schedule of Minimum Testing Requirements for Sampling Materials for Test, the Contractor shall provide the following. All testing equipment will remain the property of the Contractor at the completion of the project.

- A) Concrete Cylinder Curing Box – meeting the requirements of Section 6.12 of the Standard Specifications.
- B) Air Meter – The air meter provided shall be in good working order and meet the requirements of AASHTO T 152.
- C) Slump Cone Mold – Slump cone, base plate, and tamping rod shall be provided in like-new condition and meet the requirements of AASHTO T119, Standard Test Method for Slump of Hydraulic-Cement Concrete.

Insurance Policy: The Contractor shall provide a separate insurance policy, with no deductible, in the minimum amount of 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 Department shall be an additional named insured on the policy. These losses shall include, but not be limited to: theft, fire, and physical damage. The Department will be responsible for all maintenance costs of Department owned computer hardware. In the event of loss, the Contractor shall provide replacement equipment in accordance with current Department equipment specifications, within seven days of notice of the loss. If the Contractor is unable to provide the required replacement equipment within seven days, the Department may provide replacement equipment and deduct the cost of the equipment from monies due or which may become due the Contractor under the Contract or under any other contract. The Contractor's financial liability under this paragraph shall be limited to the amount of the insurance coverage required by this paragraph. If the cost of equipment replacement required by this paragraph should exceed the required amount of the insurance coverage, the Department will reimburse the Contractor for replacement costs exceeding the amount of the required coverage.

Maintenance: During the occupancy by the Department, the Contractor shall maintain all facilities and furnishings provided under the above requirements, and shall maintain and keep the

office quarters clean through the use of weekly professional cleaning to include, but not limited to, washing & waxing floors, cleaning restrooms, removal of trash, etc. Exterior areas shall be mowed and clean of debris. A trash receptacle (dumpster) with weekly pickup (trash removal) shall be provided. Snow removal, sanding and salting of all parking, walkway, and entrance ways areas shall be accomplished during a storm if on a workday during work hours, immediately after a storm and prior to the start of a workday. If snow removal, salting and sanding are not completed by the specified time, the State will provide the service and all costs incurred will be deducted from the next payment estimate.

**Method of Measurement:** The furnishing and maintenance of the construction field office will be measured for payment by the number of calendar months that the office is in place and in operation, rounded up? to the nearest month.

There will not be any price adjustment due to any change in the minimum computer 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, utility services and work incidental thereto.

The cost of providing the parking area, external illumination, trash removal and snow and ice removal shall be included in the monthly unit price bid for the respective item “Construction Field Office, (Type).”

The State will be responsible for payment of data communication user fees and for toll calls by State personnel.

<u>Pay Item</u>	<u>Pay Unit</u>
Construction Field Office, (Type)	Month

**ITEM #0970007A – TRAFFICPERSON (UNIFORMED FLAGGER)**

**9.70.01—Description:** Under this item the Contractor shall provide the services of Trafficpersons of the type and number, and for such periods, as the Engineer approves for the control and direction of vehicular traffic and pedestrians. Traffic persons requested solely for the contractor's operational needs will not be approved for payment.

9.70.03—Construction Method: Prior to the start of operations on the project requiring the use of Trafficpersons, a meeting will be held with the Contractor, Trafficperson agency or firm, Engineer, and State Police, if applicable, to review the Trafficperson operations, lines of responsibility, and operating guidelines which will be used on the project. A copy of the municipality's billing rates for Municipal Police Officers and vehicles, if applicable, will be provided to the Engineer prior to start of work.

On a weekly basis, the Contractor shall inform the Engineer of their scheduled operations for the following week and the number of Trafficpersons requested. The Engineer shall review this schedule and approve the type and number of Trafficpersons required. In the event of an unplanned, emergency, or short term operation, the Engineer may approve the temporary use of properly clothed persons for traffic control until such time as an authorized Trafficperson may be obtained. In no case shall this temporary use exceed 8 hours for any particular operation.

If the Contractor changes or cancels any scheduled operations without prior notice of same as required by the agency providing the Trafficpersons, and such that Trafficperson services are no longer required, the Contractor will be responsible for payment at no cost to the Department of any show-up cost for any Trafficperson not used because of the change. Exceptions, as approved by the Engineer, may be granted for adverse weather conditions and unforeseeable causes beyond the control and without the fault or negligence of the Contractor.

Trafficpersons assigned to a work site are to only take direction from the Engineer.

Trafficpersons shall wear a high visibility safety garment that complies with OSHA, MUTCD, ASTM Standards and the safety garment shall have the words "Traffic Control" clearly visible on the front and rear panels (minimum letter size 2 inches (50 millimeters)). Worn/faded safety garments that are no longer highly visible shall not be used. The Engineer shall direct the replacement of any worn/faded garment at no cost to the State.

A Trafficperson shall assist in implementing the traffic control specified in the Maintenance and Protection of Traffic contained elsewhere in these specifications or as directed by the Engineer. Any situation requiring a Trafficperson to operate in a manner contrary to the Maintenance and Protection of Traffic specification shall be authorized in writing by the Engineer.

Trafficpersons shall consist of the following types:

**1. Uniformed Law Enforcement Personnel:** Law enforcement personnel shall wear the high visibility safety garment provided by their law enforcement agency. If no high visibility safety garment is provided, the Contractor shall provide the law enforcement personnel with a garment meeting the requirements stated for the Uniformed Flaggers' garment.

Law Enforcement Personnel may be also be used to conduct motor vehicle enforcement operations in and around work areas as directed and approved by the Engineer.

Municipal Police Officers: Uniformed Municipal Police Officers shall be sworn Municipal Police Officers or Uniformed Constables who perform criminal law enforcement duties from the Municipality in which the project is located. Their services will also include an official Municipal Police vehicle when requested by the Engineer. Uniformed Municipal Police Officers will be used on non-limited access highways. If Uniformed Municipal Police Officers are unavailable, other Trafficpersons may be used when authorized in writing by the Engineer. Uniformed Municipal Police Officers and requested Municipal Police vehicles will be used at such locations and for such periods as the Engineer deems necessary to control traffic operations and promote increased safety to motorists through the construction sites.

**2. Uniformed Flagger:** Uniformed Flaggers shall be persons who have successfully completed flagger training by the American Traffic Safety Services Association (ATSSA), National Safety Council (NSC) or other programs approved by the Engineer. A copy of the Flagger's training certificate shall be provided to the Engineer before the Flagger performs any work on the project. Uniformed Flaggers shall conform to Chapter 6E, Flagger Control, in the Manual of Uniformed Traffic Control Devices (MUTCD) and shall wear high-visibility safety apparel, use a STOP/SLOW paddle that is at least 18 inches (450 millimeters) in width with letters at least 6 inches (150 millimeters) high. The paddle shall be mounted on a pole of sufficient length to be 6 feet (1.8 meters) above the ground as measured from the bottom of the sign.

Uniformed Flaggers will only be used on non-limited access highways to control traffic operations when authorized in writing by the Engineer.

**9.70.04—Method of Measurement:** Services of Trafficpersons will be measured for payment by the actual number of hours for each person rendering services approved by the Engineer. These services shall include, however, only such trafficpersons as are employed within the limits of construction, project right of way of the project or along detours authorized by the Engineer to assist the motoring public through the construction work zone. Services for continued use of a detour or bypass beyond the limitations approved by the Engineer, for movement of construction vehicles and equipment, or at locations where traffic is unnecessarily restricted by the Contractor's method of operation, will not be measured for payment.

Trafficpersons shall not work more than twelve hours in any one 24 hour period. In case such services are required for more than twelve hours, additional Trafficpersons shall be furnished and measured for payment. In cases where the Trafficperson is an employee on the Contractor's payroll, payment under the item "Trafficperson (Uniformed Flagger)" will be made only for those hours when the Contractor's employee is performing Trafficperson services.

Travel time will not be measured for payment for services provided by Uniformed Municipal Police Officers or Uniformed Flaggers.

Mileage fees associated with Trafficperson services will not be measured for payment.

Safety garments and STOP/SLOW paddles will not be measured for payment.

**9.70.05—Basis of Payment:** Trafficpersons will be paid in accordance with the schedule described herein.

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

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

The Department will pay the Contractor its actual costs for "Trafficperson (Municipal Police Officer)" plus an additional 5% as reimbursement for the Contractor's administrative expense in connection with the services provided.

The invoice must include a breakdown of each officer's actual hours of work and actual rate applied. Mileage fees associated with Trafficperson services are not reimbursable expenses and are not to be included in the billing invoice. The use of a municipal police vehicle authorized by the Engineer will be paid at the actual rate charged by the municipality. Upon receipt of the invoice from the municipality, the Contractor shall forward a copy to the Engineer. The invoice will be reviewed and approved by the Engineer prior to any payments. *Eighty (80%) of the invoice will be paid upon completion of review and approval. The balance (20%) will be paid upon receipt of cancelled check or receipted invoice, as proof of payment.* The rate charged by the municipality for use of a uniformed municipal police officer and/or a municipal police vehicle shall not be greater than the rate it normally charges others for similar services.

**2. Uniformed Flagger:** Uniformed flaggers will be paid for at the contract unit price per hour for "Trafficperson (Uniformed Flagger)", which price shall include all compensation, insurance benefits and any other cost or liability incidental to the furnishing of the trafficpersons ordered.

Pay Item	Pay Unit
Trafficperson (Uniformed Flagger)	Hr.

## **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 25**

The Contractor shall maintain and protect the minimum number of through lanes and shoulders as dictated in the Special Provision for Section 1.08 - Prosecution and Progress "Limitations of Operations - Minimum Number of Lanes to Remain Open" Chart, on a paved travel path not less than 12 feet in width per lane.

The Contractor shall be allowed to halt traffic for a period of time not to exceed 10 minutes for the purpose of erecting and/or removing overhead sign supports. If more than one 10-minute period is required, the Contractor shall allow all stored vehicles to proceed through the work area prior to the next stoppage.

#### **Ramps and Turning Roadways on Route 25**

The Contractor shall maintain and protect existing traffic operations.

Excepted therefrom will be those periods, during the allowable periods, when the Contractor is actively working, at which time the Contractor shall be allowed to maintain and protect a minimum of one lane of traffic, on a paved travel path not less than 12 feet in width.

#### **All Other Roadways**

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

#### **Commercial and Residential Driveways**

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

**Article 9.71.03 - Construction Method is supplemented as follows:**

**General**

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.

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.

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

**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. 42-inch traffic cones and approved traffic drums are to be utilized for lane closures on expressways, and 36-inch traffic cones and traffic drums are allowed on all other roadways.

## **TRAFFIC CONTROL DURING CONSTRUCTION OPERATIONS**

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

### **TRAFFIC CONTROL PATTERNS**

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

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

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

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

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

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

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

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

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

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

### **PLACEMENT OF SIGNS**

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

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

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

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

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

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

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

**TABLE I – MINIMUM TAPER LENGTHS**

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

## **SECTION 1. WORK ZONE SAFETY MEETINGS**

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

## **SECTION 2. GENERAL**

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

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

### **SECTION 3. INSTALLING AND REMOVING TRAFFIC CONTROL PATTERNS**

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

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

**SECTION 4. USE OF HIGH MOUNTED INTERNALLY ILLUMINATED FLASHING ARROW**

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

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

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

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

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

## **SECTION 6. USE OF TRAFFIC DRUMS AND TRAFFIC CONES**

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

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

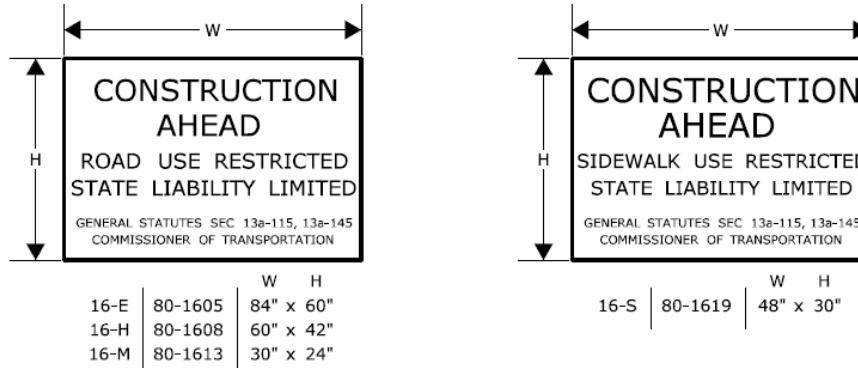
- 7.a) For lane closures on limited access roadways, one CMS shall be used in advance of the traffic control pattern. Prior to installing the pattern, the CMS shall be installed and in operation, displaying the appropriate lane closure information (i.e.: Left Lane Closed - Merge Right). The CMS shall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



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

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

### SERIES 16 SIGNS



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

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

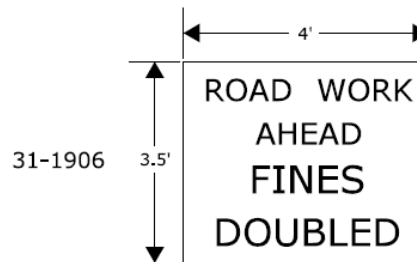
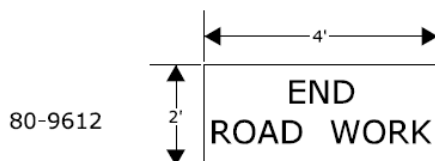
THE REGULATORY SIGN "ROAD WORK AHEAD FINES DOUBLED" SHALL BE INSTALLED FOR ALL WORK ZONES THAT OCCUR ON ANY STATE HIGHWAY IN CONNECTICUT WHERE THERE ARE WORKERS ON THE HIGHWAY OR WHEN THERE IS OTHER THAN EXISTING TRAFFIC OPERATIONS.

THE "ROAD WORK AHEAD FINES DOUBLED" REGULATORY SIGN SHALL NOT BE INSTALLED ON TOWN ROADS.

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

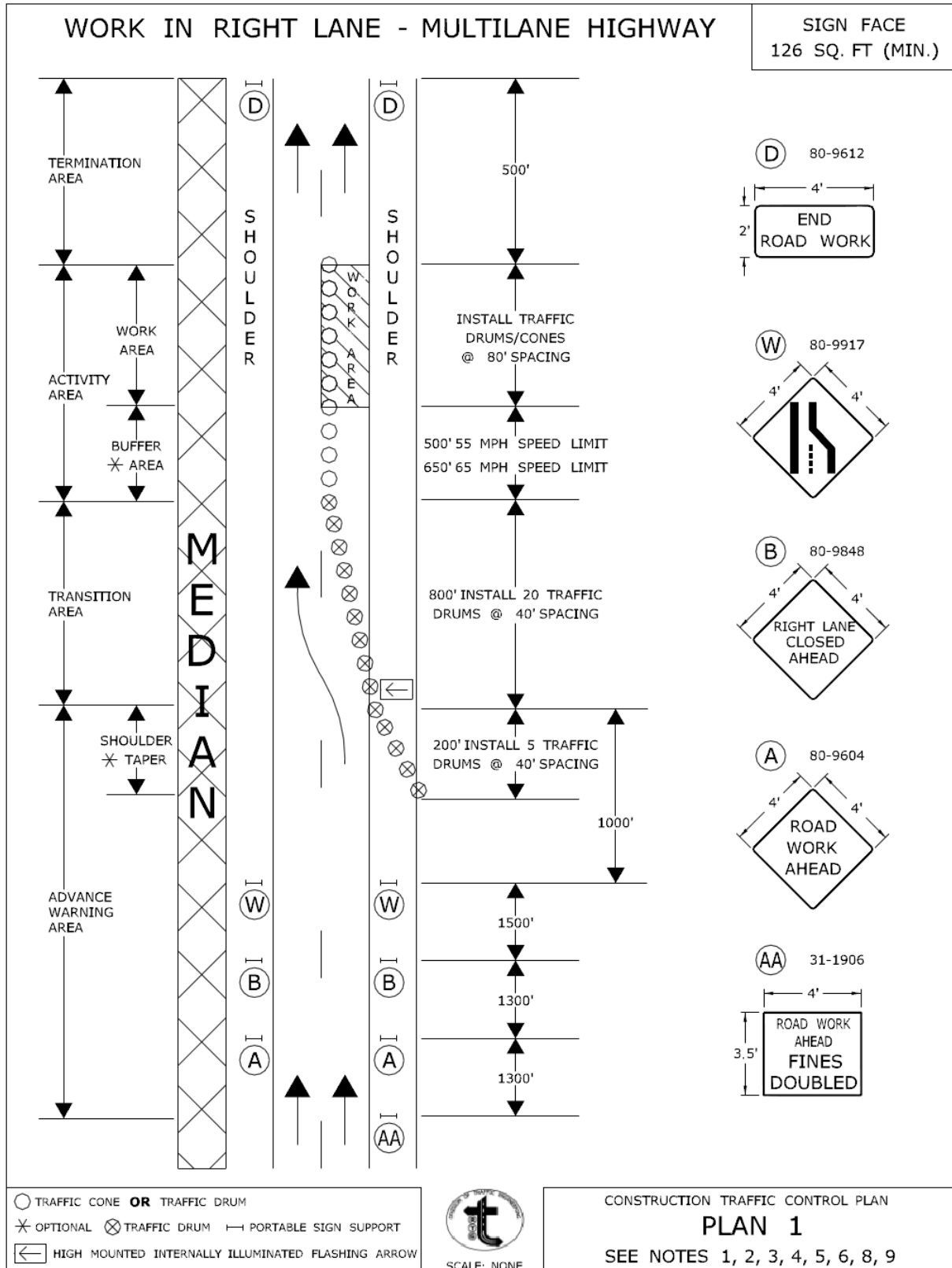
### CONSTRUCTION TRAFFIC CONTROL PLAN NOTES

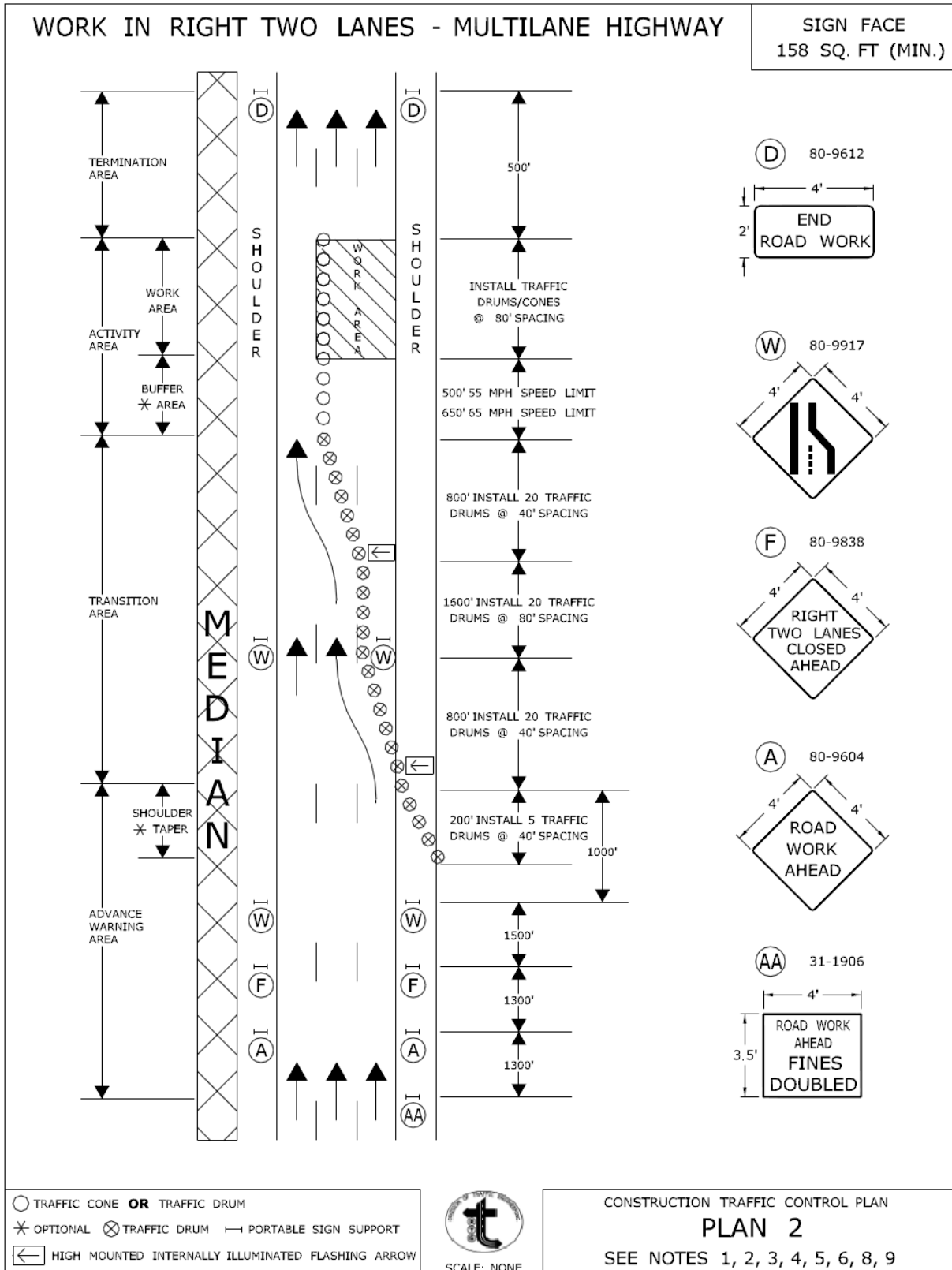
CONNECTICUT DEPARTMENT OF TRANSPORTATION  
BUREAU OF ENGINEERING & CONSTRUCTION

APPROVED

*Charles S. Harlow*  
PRINCIPAL ENGINEER

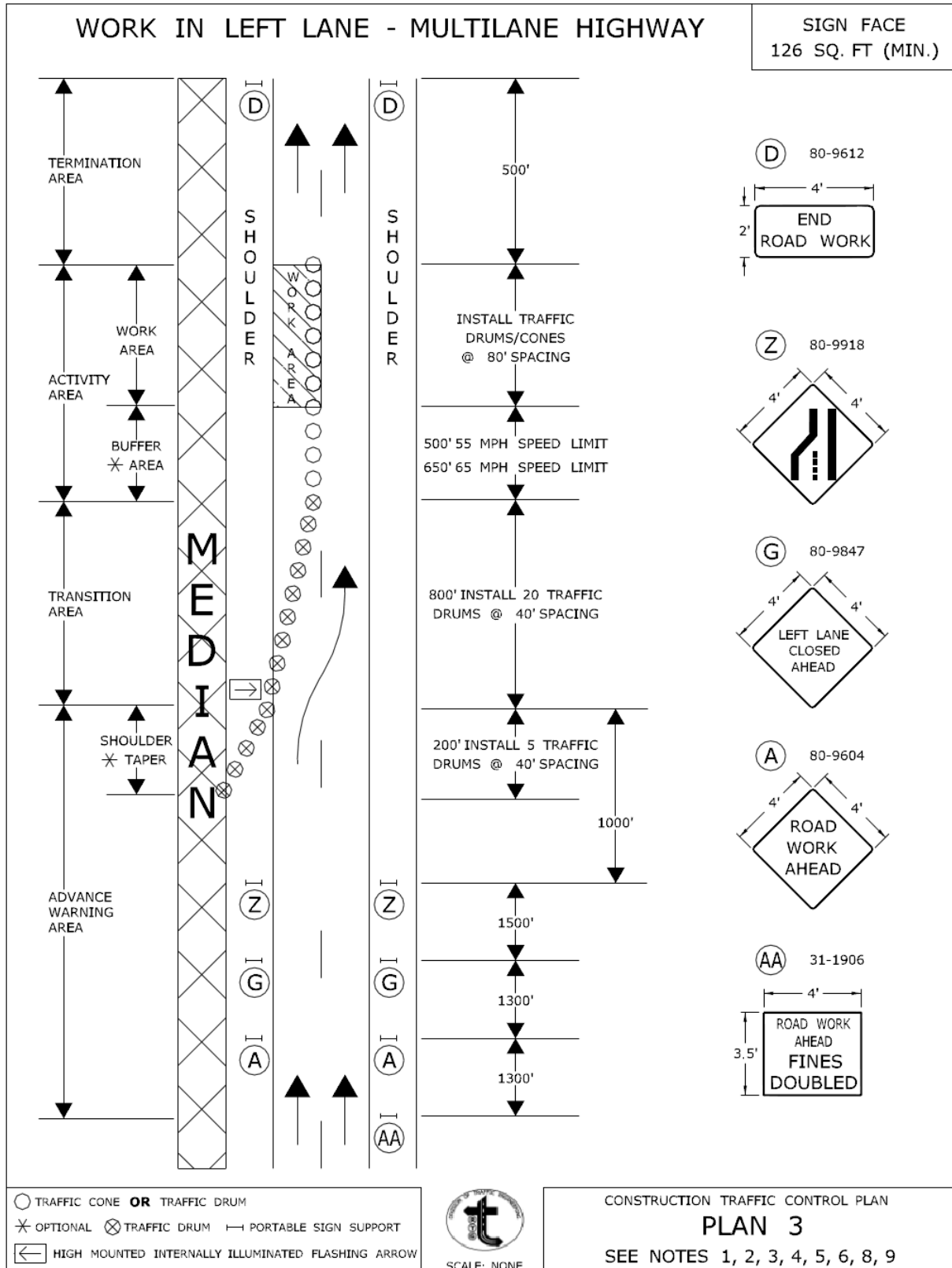
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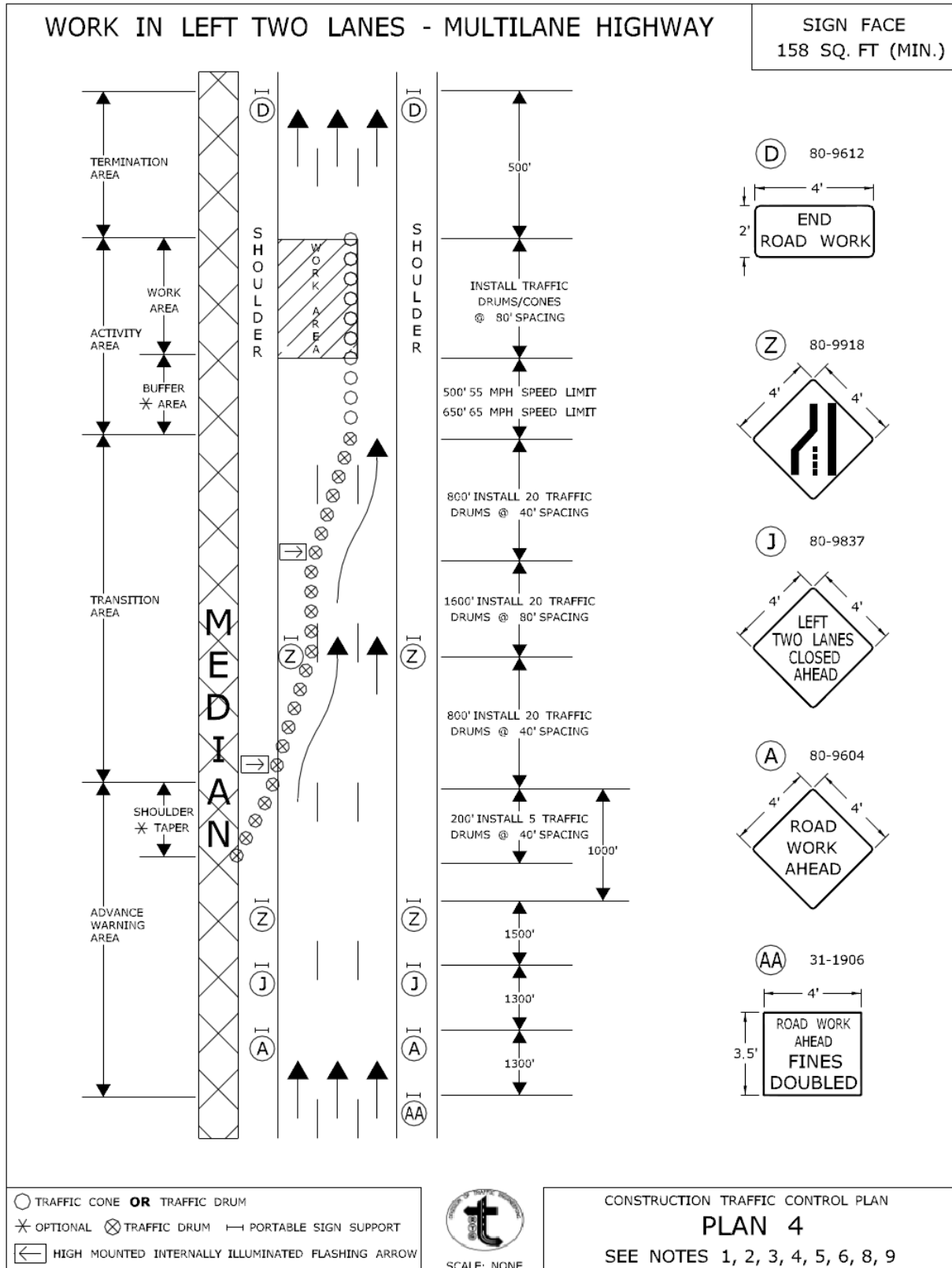
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BUREAU OF ENGINEERING & CONSTRUCTION

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 PRINCIPAL ENGINEER



CONNECTICUT DEPARTMENT OF TRANSPORTATION  
BUREAU OF ENGINEERING & CONSTRUCTION

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 Charles S. Harlow  
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 PRINCIPAL ENGINEER

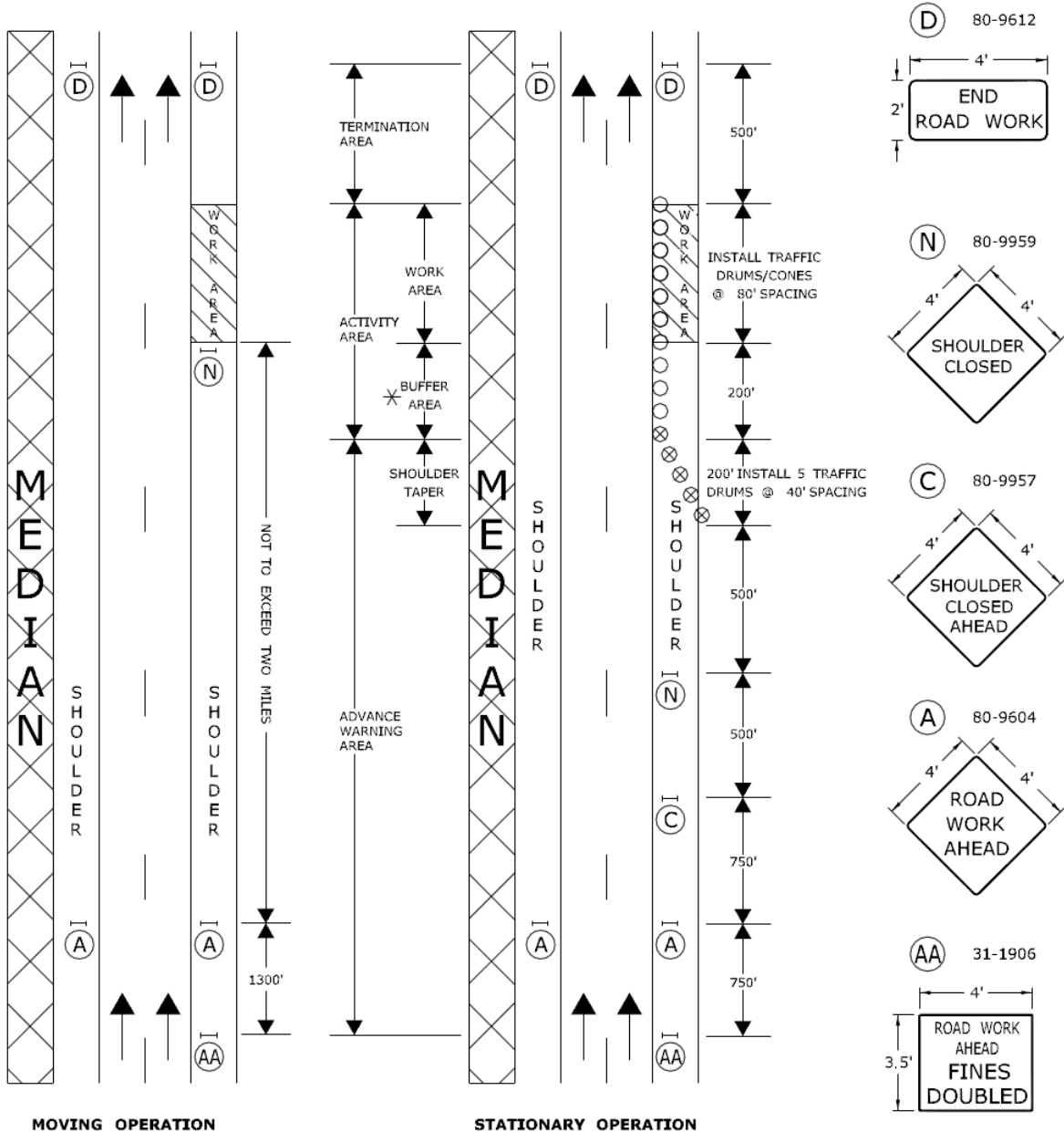


CONNECTICUT DEPARTMENT OF TRANSPORTATION  
BUREAU OF ENGINEERING & CONSTRUCTION

APPROVED *Charles S. Harlow*  
 Charles S. Harlow  
 2012.06.05 15:52:10-0400  
 PRINCIPAL ENGINEER

WORK IN SHOULDER AREA - MULTILANE HIGHWAY

SIGN FACE  
94 SQ. FT (MIN.)



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



SCALE: NONE

CONSTRUCTION TRAFFIC CONTROL PLAN

PLAN 6

SEE NOTES 1, 2, 4, 8

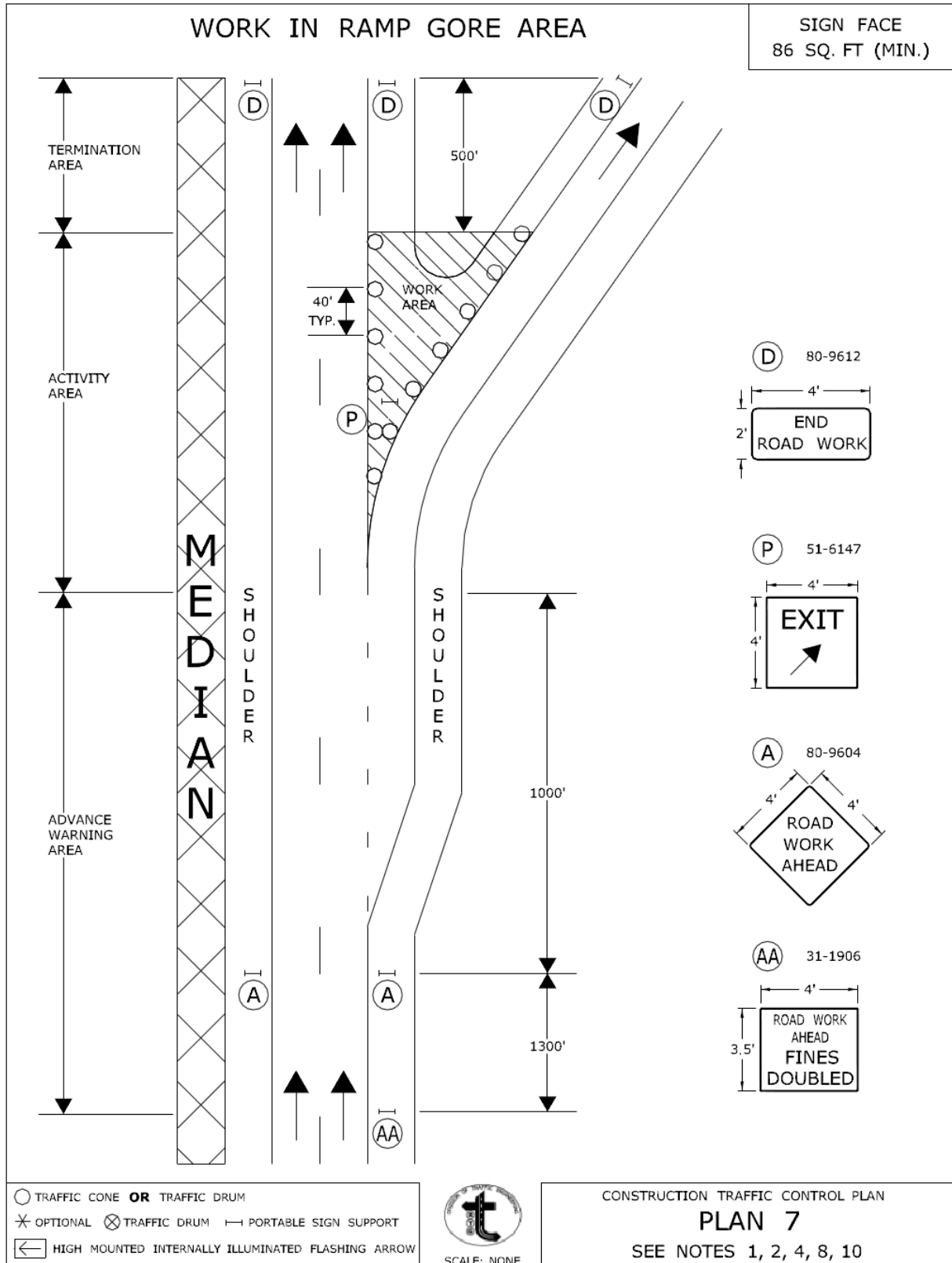
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BUREAU OF ENGINEERING & CONSTRUCTION

APPROVED

*Charles S. Harlow*  
PRINCIPAL ENGINEER

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2012.06.05 15:52:38-04'00"



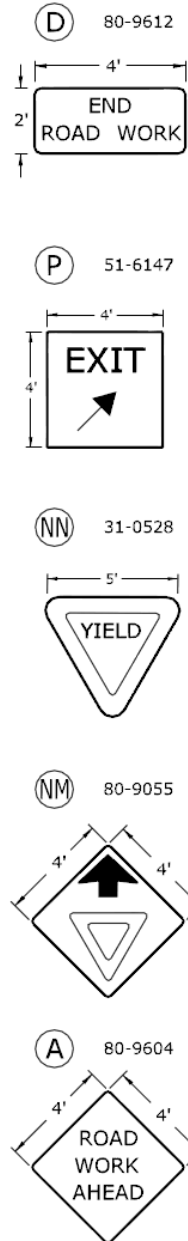
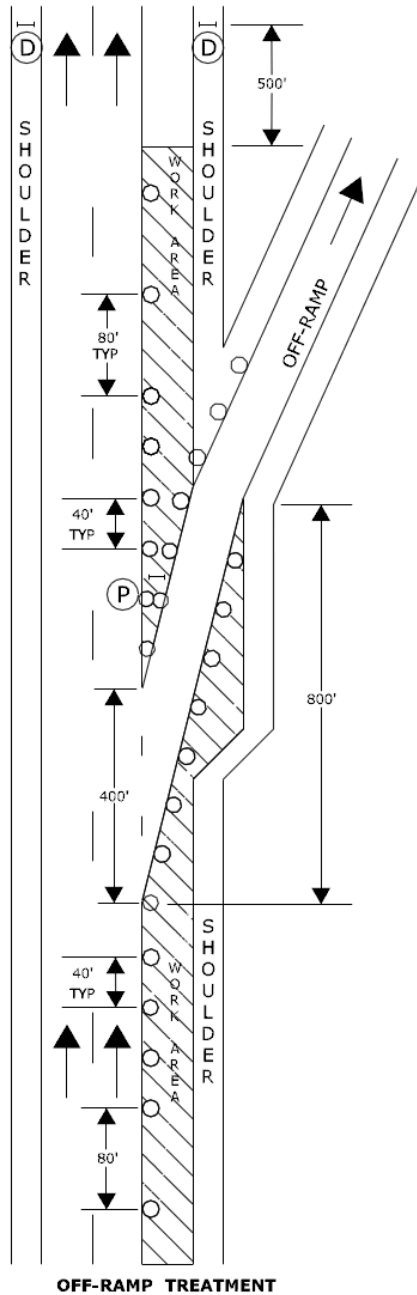
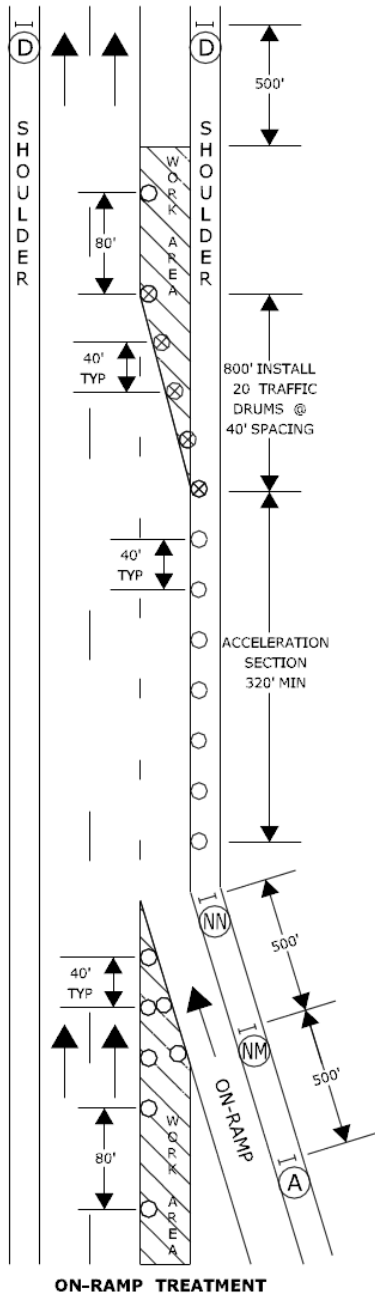


CONNECTICUT DEPARTMENT OF TRANSPORTATION  
 BUREAU OF ENGINEERING & CONSTRUCTION

APPROVED *Charles S. Harlow*  
 PRINCIPAL ENGINEER  
Charles S. Harlow  
 2012.06.05 15:53:03-0400

## TYPICAL RAMP TREATMENTS FOR MAINLINE LANE CLOSURE - MULTILANE HIGHWAY

SIGN FACE SQ. FT VARIES



USE TRAFFIC CONTROL PLAN 1 TO CLOSE THE RIGHT LANE

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



SCALE: NONE

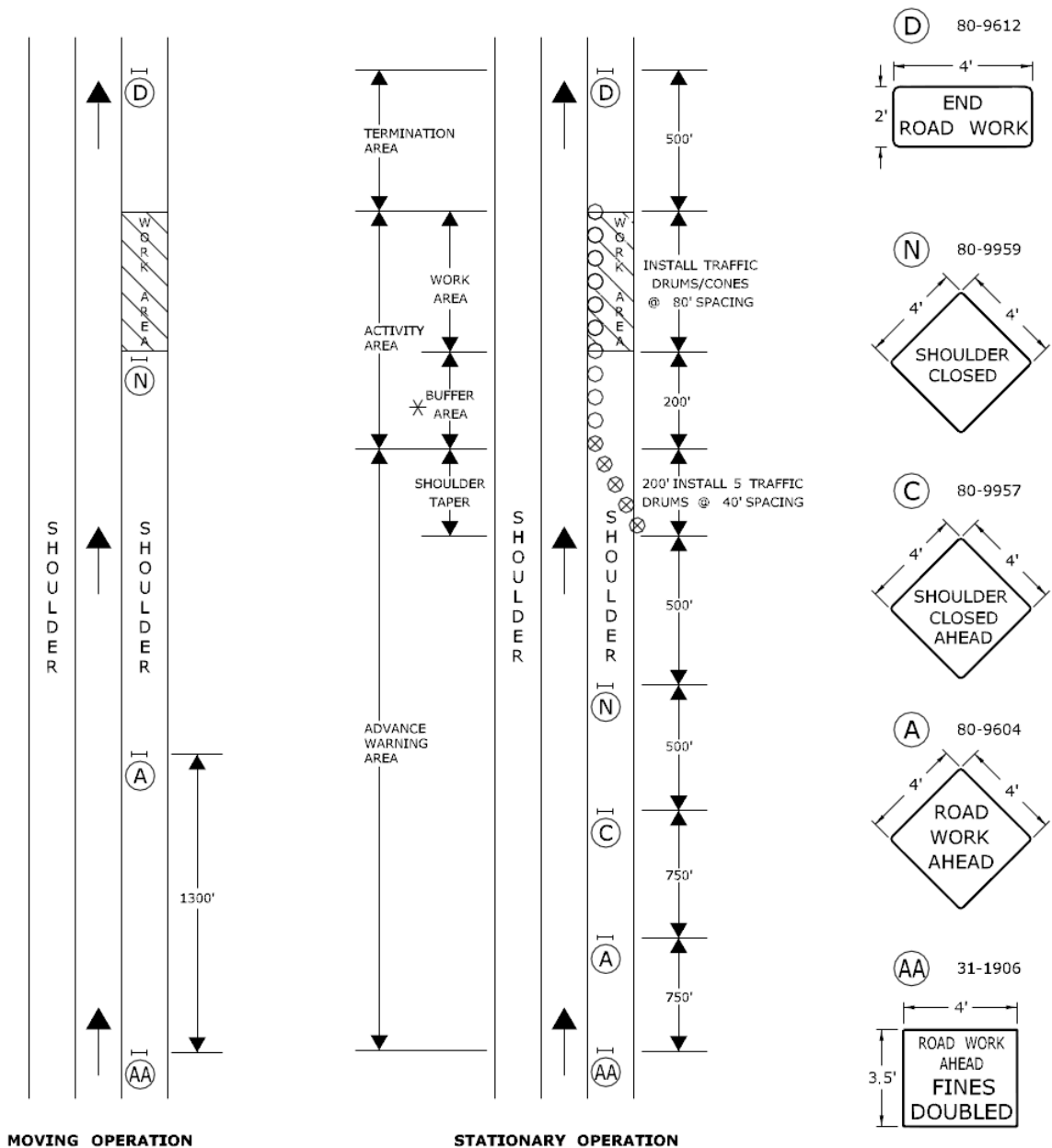
CONSTRUCTION TRAFFIC CONTROL PLAN  
**PLAN 8**  
SEE NOTES 1, 2, 3, 4, 5, 6, 8, 9, 10

CONNECTICUT DEPARTMENT OF TRANSPORTATION  
BUREAU OF ENGINEERING & CONSTRUCTION

APPROVED *Charles S. Harlow*  
PRINCIPAL ENGINEER  
Charles S. Harlow  
2012.06.05 15:53:31-0400

WORK IN SHOULDER AREA - TURNING ROADWAYS / RAMPS

SIGN FACE  
70 SQ. FT (MIN.)



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



SCALE: NONE

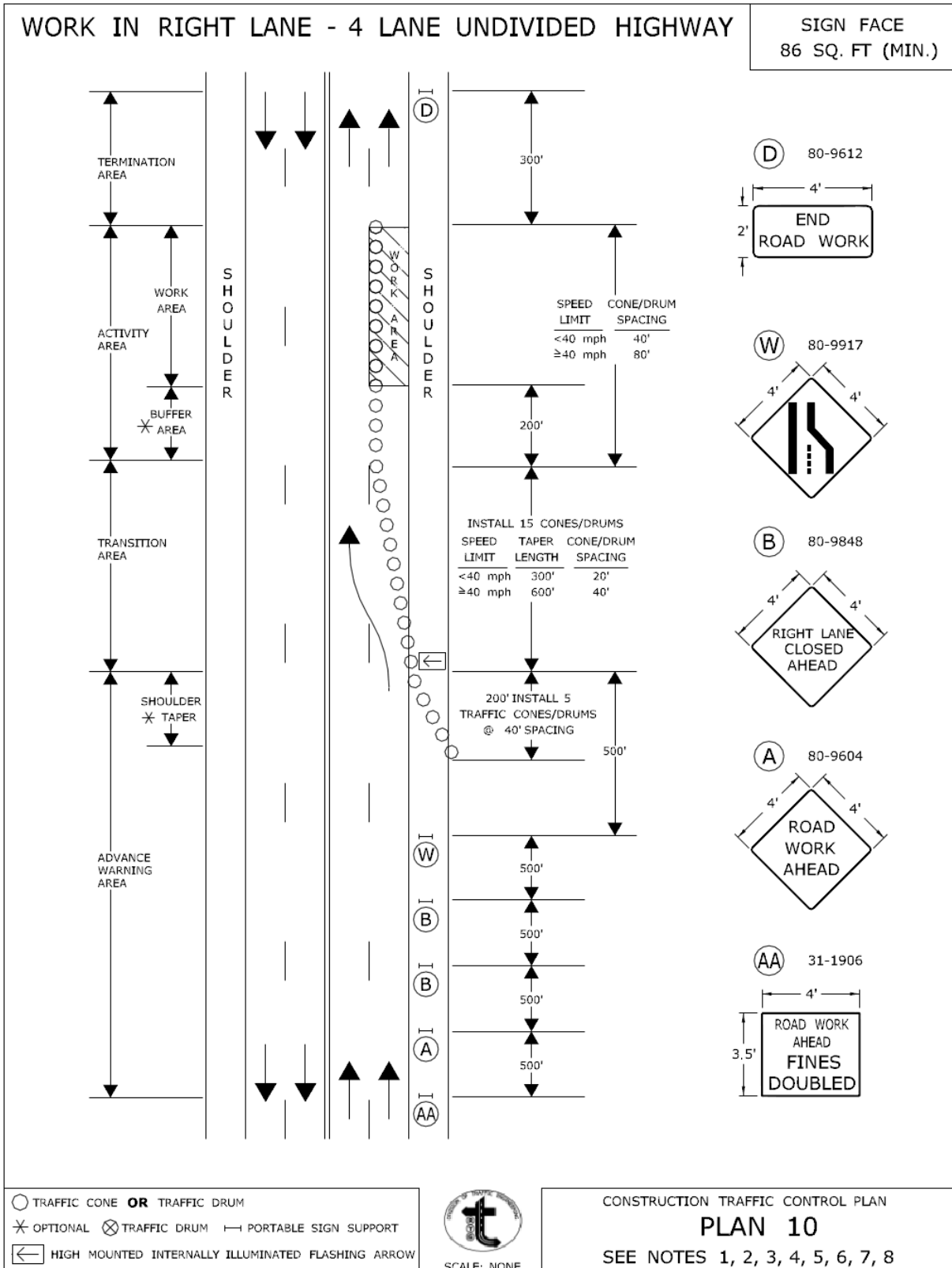
CONSTRUCTION TRAFFIC CONTROL PLAN

PLAN 9

SEE NOTES 1, 2, 4, 8

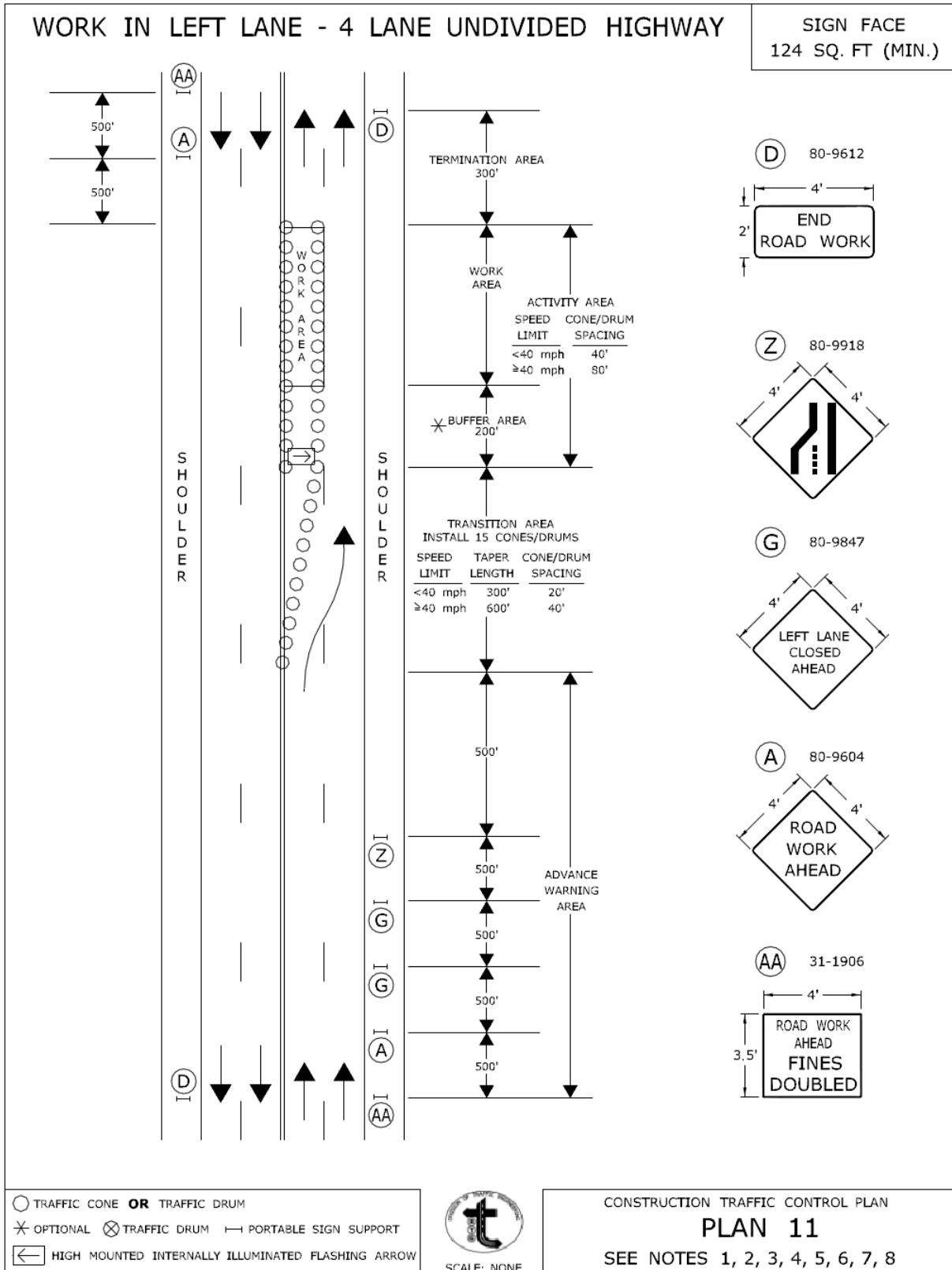
CONNECTICUT DEPARTMENT OF TRANSPORTATION  
BUREAU OF ENGINEERING & CONSTRUCTION

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



CONNECTICUT DEPARTMENT OF TRANSPORTATION  
BUREAU OF ENGINEERING & CONSTRUCTION

APPROVED *Charles S. Harlow* Charles S. Harlow  
2012.06.05 15:54:15-0400  
PRINCIPAL ENGINEER

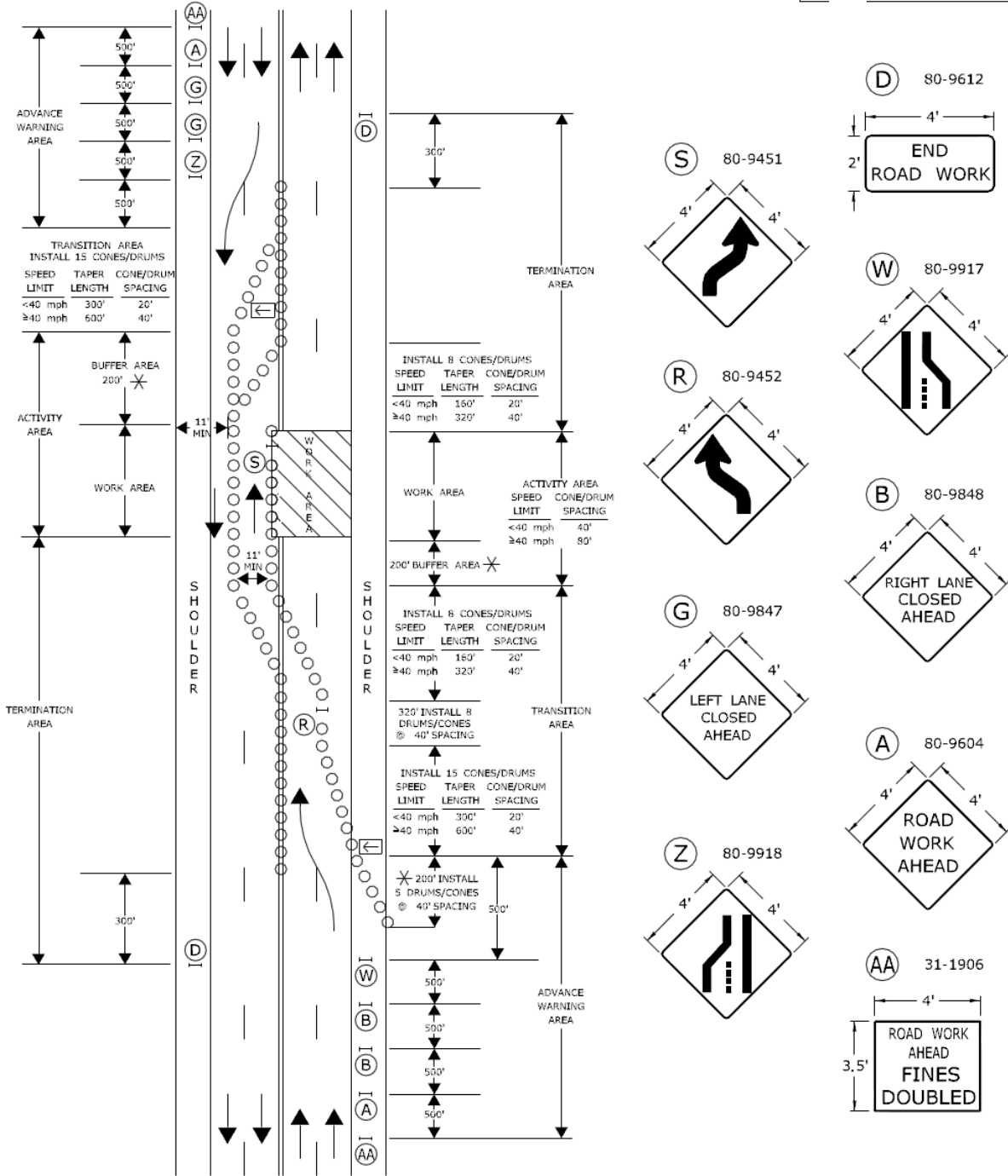


CONNECTICUT DEPARTMENT OF TRANSPORTATION  
BUREAU OF ENGINEERING & CONSTRUCTION

APPROVED *Charles S. Harlow*  
 Charles S. Harlow  
 2012.08.05 15:54:36-0400  
 PRINCIPAL ENGINEER

# 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

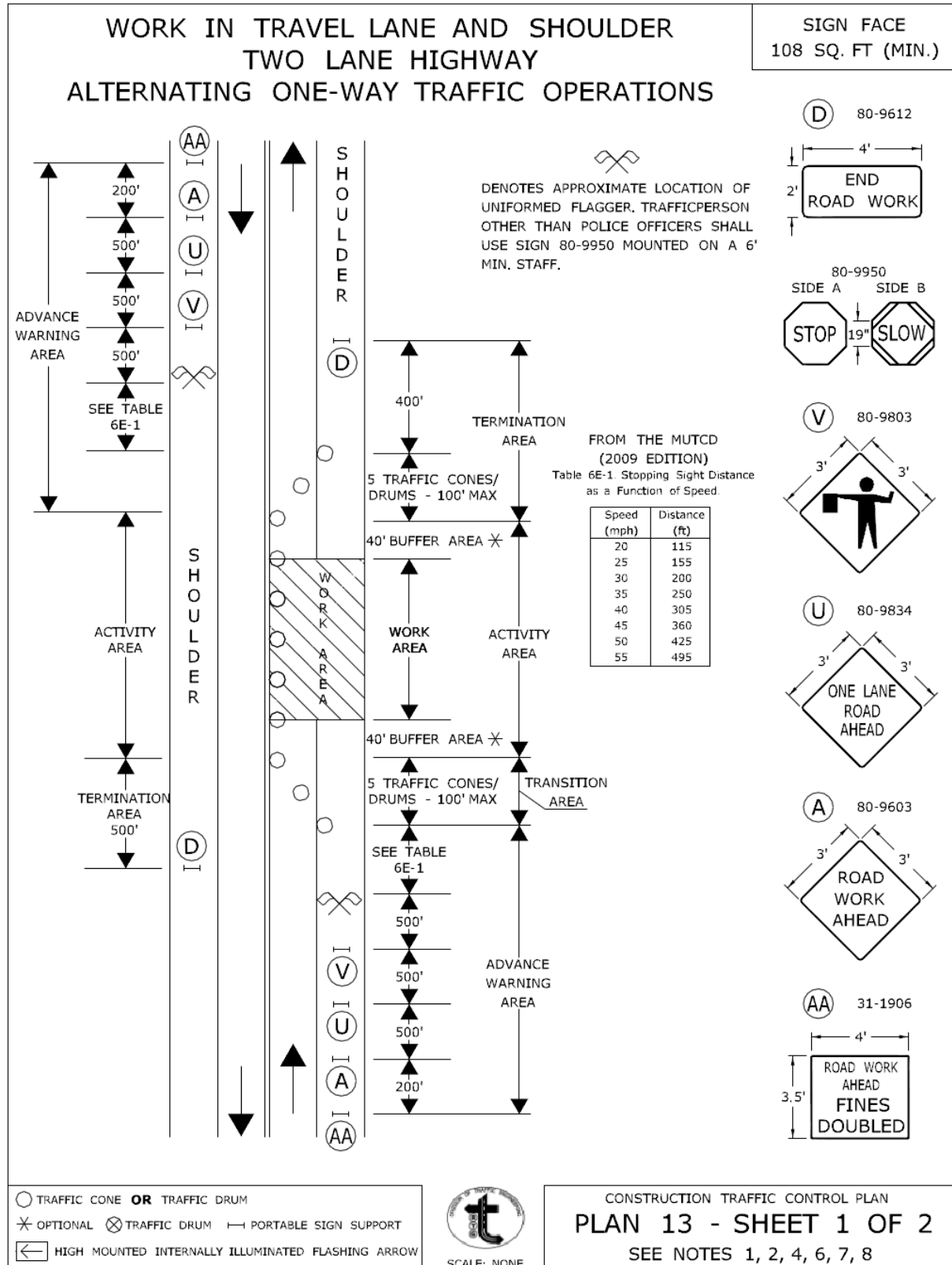


CONSTRUCTION TRAFFIC CONTROL PLAN  
**PLAN 12**  
SEE NOTES 1, 2, 3, 4, 5, 6, 7, 8

SCALE: NONE

CONNECTICUT DEPARTMENT OF TRANSPORTATION  
BUREAU OF ENGINEERING & CONSTRUCTION

APPROVED *Charles S. Harlow*  
PRINCIPAL ENGINEER  
2012.06.05 15:55:01-0400'



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



SCALE: NONE

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

CONNECTICUT DEPARTMENT OF TRANSPORTATION  
BUREAU OF ENGINEERING & CONSTRUCTION

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

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

SIGN FACE  
108 SQ. FT (MIN.)

## HAND SIGNAL METHODS TO BE USED BY UNIFORMED FLAGGERS

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

**A. TO STOP TRAFFIC**

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



**B. TO DIRECT TRAFFIC TO PROCEED**

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



**C. TO ALERT OR SLOW TRAFFIC**

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



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



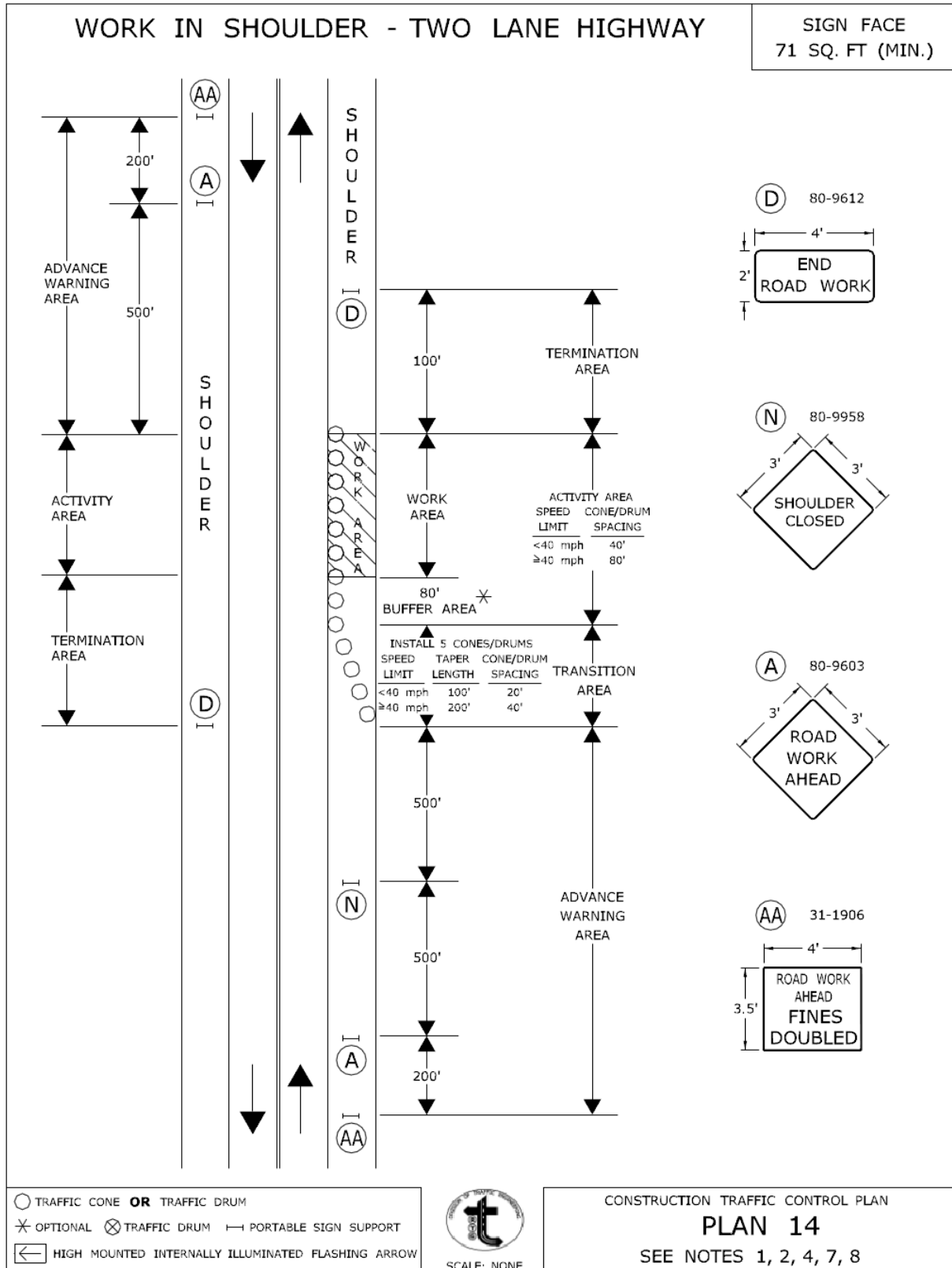
SCALE: NONE

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

CONNECTICUT DEPARTMENT OF TRANSPORTATION  
BUREAU OF ENGINEERING & CONSTRUCTION

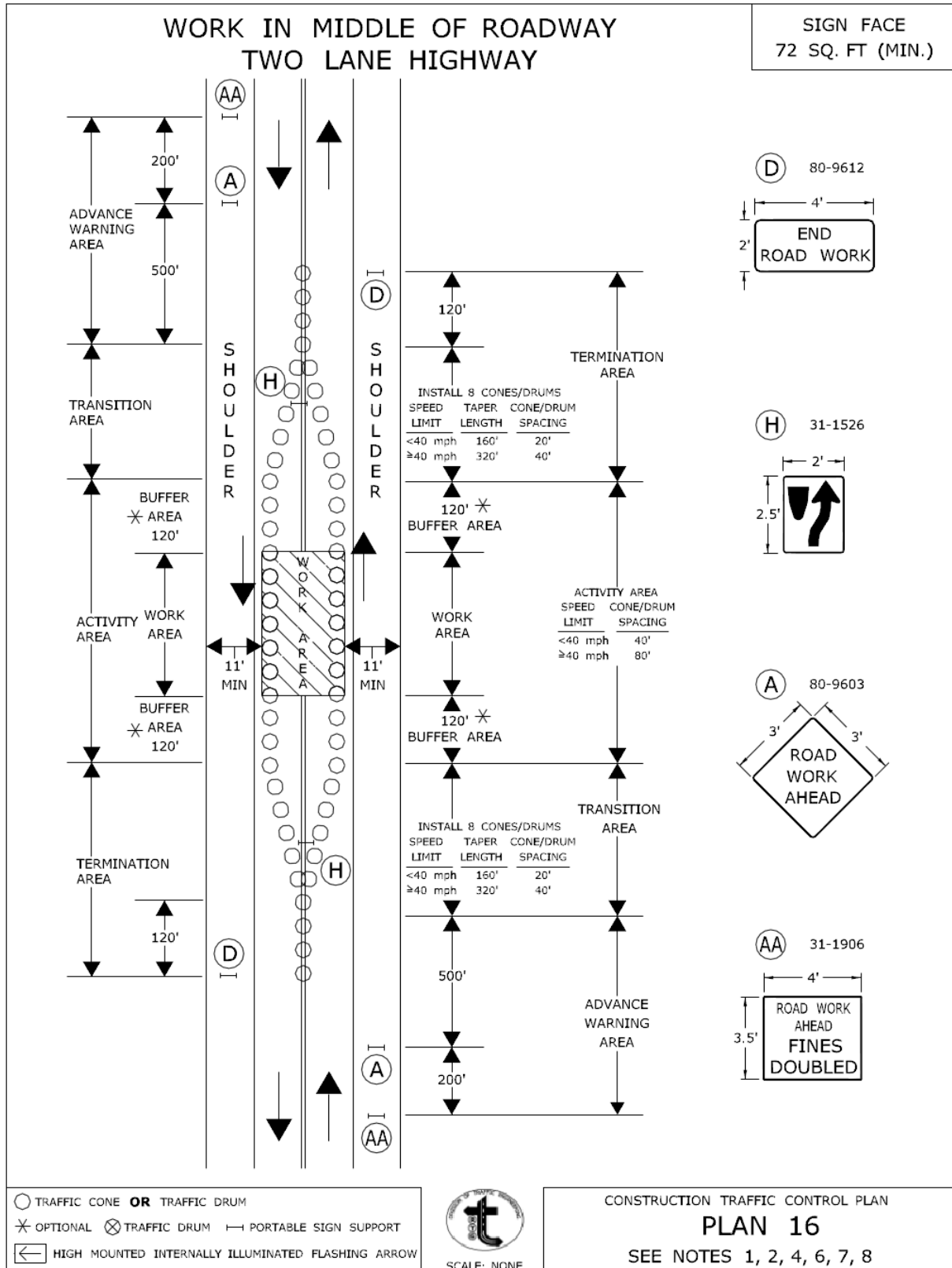
APPROVED Charles S. Harlow  
2012.06.05 15:55:45-04'00'  
PRINCIPAL ENGINEER





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'



CONNECTICUT DEPARTMENT OF TRANSPORTATION  
BUREAU OF ENGINEERING & CONSTRUCTION

APPROVED *Charles S. Harlow*  
 Charles S. Harlow  
 2012.08.05 15:56:51-04'00"  
 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 #0980001A – CONSTRUCTION STAKING**

**9.80.01—Description:** The work under this item shall consist of construction layout and reference staking necessary for the proper control and satisfactory completion of all work on the project, except property lines, highway lines, or non-access lines.

**9.80.02—Materials:** All stakes used for control staking shall be of the same quality as used by the Department for this purpose. For slope limits, pavement edges, gutter lines, etc., where so-called "green" or "working" stakes are commonly used, lesser quality stakes will be acceptable, provided the stakes are suitable for the intended purpose.

**9.80.03—Construction Methods:** The Department will furnish the Contractor such control points, bench marks, and other data as may be necessary for the construction staking and layout by qualified engineering or surveying personnel as noted elsewhere herein.

The Contractor shall be responsible for the placement and preservation of adequate ties to all control points, necessary for the accurate re-establishment of all base lines, center lines, and all critical grades as shown on the plans.

All stakes, references, and batter boards which may be required for construction operations, signing and traffic control shall be furnished, set and properly referenced by the Contractor. The Contractor shall be solely and completely responsible for the accuracy of the line and grade of all features of the work. Any errors or apparent discrepancies found in previous surveys, plans, specifications or special provisions shall be called to the Engineer's attention immediately for correction or interpretation prior to proceeding with the work.

During roadway construction (or site work), the Contractor shall provide and maintain for the periods needed, as determined by the Engineer, reference stakes at 100 foot intervals outside the slope limits. Further, the Contractor shall provide and maintain reference stakes at 50 foot intervals immediately prior to and during the formation of subgrade and the construction of all subsequent pavement layers. These stakes shall be properly marked as to station, offset and shall be referenced to the proposed grade, even if laser or GPS machine controls are used.

The Contractor shall provide and maintain reference stakes at drainage structures, including reference stakes for the determination of the structure alignments as may be needed for the proper construction of the drainage structure. The reference stakes shall be placed immediately prior to and maintained during the installation of the drainage structure. These stakes shall be properly marked as to station, offset and shall be referenced to the proposed grade.

The Contractor shall furnish copies of data used in setting and referencing stakes and other layout markings used by the Contractor after completion of each operation.

The Contractor shall provide safe facilities for convenient access by Department forces to control points, batter boards, and references.

All staking shall be performed by qualified engineering or surveying personnel who are trained, experienced and skilled in construction layout and staking of the type required under the contract. Prior to start of work, the Contractor shall submit for review and comment the qualifications of personnel responsible for construction staking on the project. On all projects with an original contract value greater than \$25 million and bridge rehabilitation and reconstruction projects greater than \$10 million, surveying shall be performed under the direct supervision of a Professional Surveyor licensed in the State of Connecticut. The submission shall

include a description of the experience and training which the proposed staff possesses and a list of state projects the personnel have worked on previously. All field layout and staking required for the project shall be performed under the direct supervision of a person, or persons, of engineering background experienced in the direction of such work and acceptable to the Engineer. If the personnel responsible for construction staking change during the course of the project, then a revised submittal will be required.

The Department may check the control of the work, as established by the Contractor, at any time as the work progresses. The Contractor will be informed of the results of these checks, but the Department by so doing in no way relieves the Contractor of responsibility for the accuracy of the layout work. The Contractor shall correct or replace, at the Contractor's own expense, any deficient layout and construction work which may be the result of the inaccuracies in the Contractor's staking operations or the failure to report such inaccuracies, or the Contractor's failure to report inaccuracies found in work done by the Department or by others. If, as a result of these inaccuracies, the Department is required to make further studies, redesign, or both, all expenses incurred by the Department due to such inaccuracies will be deducted from any monies due the Contractor.

The Contractor shall furnish all necessary personnel, engineering equipment and supplies, materials, transportation, and work incidental to the accurate and satisfactory completion of this work.

**For roadways where the existing pavement markings need to be reestablished:**

Prior to any resurfacing or obliteration of existing pavement markings, the Contractor and a representative of the Engineer must establish and document pavement marking control points from the existing markings. These control points shall be used to reestablish the positions of the lanes, the beginnings and endings of tapers, channelization lines for on and off ramps, lane use arrows, stop bars, and any lane transitions in the project area. The Contractor shall use these control points to provide appropriate premarking prior to the installation of the final markings.

The Contractor shall provide and maintain reference stakes and/or markings at 100 foot intervals immediately off the edge of pavement to be used to reestablish the existing pavement markings. The Contractor shall also provide and maintain reference stakes and/or markings at any point where there is a change in pavement markings to reestablish the existing pavement markings.

**For non-limited access roadways**

On non-limited access roadways it may be necessary to adjust the final locations of the pavement markings to accommodate pedestrians and bicyclists where feasible. Prior to any resurfacing or obliteration of existing pavement markings, the Contractor, a representative of the Engineer, and a representative of the Division of Traffic Engineering must establish and document pavement marking control points from the existing markings as described above. The control points at that time may be adjusted to provide minimum shoulder widths of 4 to 5 feet wherever possible while maintaining travel lane widths of no less than 11 feet and no more than 12 feet.

**9.80.04—Method of Measurement:** Construction staking will be at the Contract lump sum for construction staking.

When no price for "Construction Staking" is asked for on the proposal form, the cost of the work described above shall be included in the general cost of the work and no direct payment for "Construction Staking" will be made.

**9.80.05—Basis of Payment:** Construction staking will be paid for at the Contract lump sum price for "Construction Staking," which price shall include all materials, tools, equipment, labor and work incidental thereto. A schedule of values for payment shall be submitted to the Department for review and comment prior to payment.

Pay Item	Pay Unit
Construction Staking	l.s.

## **ITEM #1131002A – REMOTE CONTROL CHANGEABLE MESSAGE SIGN**

**Description:** Work under this item shall include furnishing and maintaining a trailer-mounted, “Remote Control Changeable Message Sign” at the locations indicated on the plans or as directed by the Engineer.

**Materials:** The full matrix, internally illuminated variable message sign shall consist of a LED, fiber optic, lamp matrix, or hybrid magnetically operated matrix – LED message board; and a computer operated interface, all mounted on a towable, heavy duty trailer.

The sign shall have a minimum horizontal dimension of 115 inches and rotate a complete 360 degrees atop the lift mechanism.

In the raised position, the bottom of the sign shall be at least 7 feet above the roadway. The messages displayed shall be visible from a distance of 1/2 mile and be clearly legible from a distance of 900 feet during both the day and night.

The lighting system shall be controlled both manually and by a photocell for automatic sign dimming during nighttime use.

The sign shall be capable of storing a minimum of 100 preprogrammed messages and be able to display any one of those messages upon call from the trailer mounted terminal and/or through the cellular telephone hookup for the remote controlled sign.

The sign shall be a full matrix sign that is able to display messages composed of any combination of alphanumeric text, punctuation symbols, and graphic images (notwithstanding NTCIP limitations). The display shall be capable of producing arrow functions. Full- matrix displays shall allow the use of graphics, traffic safety symbols and various character heights.

Standard messages shall be displayed in a three-line message format with 8 characters per line. The letter height shall not be less than 18 inches.

The sign shall utilize yellow green for the display with a black background. Each matrix shall have a minimum size of 6 x 9 pixels. Each pixel shall utilize a minimum of four high output yellow green LEDs or equivalent light source. The LEDs or light source shall have a minimum 1.4 candela luminance intensity, 22 degrees viewing angle, and wavelength of 590 (+/- 3) nanometers.

For hybrid magnetically operated matrix – LED matrix, each pixel shall have one single shutter faced with yellow green retro-reflective sheeting with a minimum of four high output yellow green LEDs or equivalent light source. The hybrid magnetically operated matrix – LED matrix sign shall be capable of operating in three display modes; shutter only, LED only, and both LED and shutter. These modes shall be automatically controlled by a photocell for day and night conditions and also capable of being manually controlled through the software.

The sign shall be controlled by an on-board computer. The sign shall automatically change to a preselected default message upon failure. That default message shall remain on display until the problem is corrected.

The sign shall include all necessary controls, including, but not limited to, personal computer, keyboard or alphanumeric hand-held keyboard, and software. The sign shall interface with PCs, cellular phones, and radar speed detection devices as required.

Controls shall be furnished for raising and lowering the message board, aligning the message board and, for solar powered units, a read-out of the battery bank charge.

Power shall be provided by a self-contained solar maintained power source or a diesel engine driven generator. Hardware for connection to a 110-volt power source shall also be provided.

Solar powered signs shall display programmed messages with the solar panel disconnected, in full night conditions, for a minimum of 30 consecutive days.

Remote Controlled Changeable Message Signs shall include one (1) industrial-grade cellular telephone and be equipped with a modem to control the sign and a security system to prevent unauthorized access. The security system shall allow access only through use of a code or password unique to that sign. If the proper code or password is not entered within 60 seconds of initial telephone contact, the call will be terminated. Remote control for the Remote Controlled Changeable Message Sign shall be by cellular telephone and touch tone modem decoder.

The radar equipped signs shall include a high-speed electronic control module (ECM-X), Radar SI transceiver, signal processing board and radar logging software.

The radar software will operate the sign in four modes:

- 1) The sign will display words "YOUR SPEED" followed by the speed (2 digits). The display will repeat the message as long as vehicles are detected. The sign will blank when no vehicles are present.
- 2) The sign will display a series of up to six messages (programmed by the user) when a preset speed (programmed by the user) is exceeded. The sign will blank when no vehicles are present.
- 3) Will perform like mode #2 with the addition of displaying the actual speed with it.
- 4) The sign will work as a standard Changeable Message Sign or Remote Controlled Changeable Message Sign with no radar.

**Construction Methods:** The Contractor shall furnish, place, operate, maintain and relocate the sign as required. When the sign is no longer required, it shall be removed and become the property of the Contractor. The cellular telephone required for the Remote Controlled Changeable Message Sign shall be provided to the Engineer for his use, and subsequently returned to the Contractor.

When the sign is not in use, it shall either be turned off with a blank display or turned from view.



Any signs that are missing, damaged, defaced or improperly functioning so that they are not effective, as determined by the Engineer and in accordance with the ATSSA guidelines contained in "Quality Standards for Work Zone Traffic Control Devices," shall be replaced by the Contractor at no cost to the State.

**Method of Measurement:** This work will be measured for payment for each "Remote Control Changeable Message Sign" furnished and installed, for the number of calendar days that the sign is in place and in operation, measured to the nearest day. When a sign is in operation for less than a day, such a period of time shall be considered to be a full day regardless of actual time in operation.

**Basis of Payment:** This work will be paid for at the Contract unit price per day for each "Remote Control Changeable Message Sign" which price shall include placing, maintaining, relocating and removing the sign and its appurtenances and all material, labor, tools and equipment incidental thereto. Additionally, for the "Remote Control Changeable Message Sign", the cellular telephone service and telephone charges shall be included.

<u>Pay Item</u>	<u>Pay Unit</u>
Remote Control Changeable Message Sign	Day

## **ITEM #1201801A – MONOTUBE BRIDGE SIGN STRUCTURE**

**Description:** Work under this item shall consist of designing, fabricating and installing a sign support structure to carry extruded aluminum traffic signs, on a prepared foundation, in accordance with the details shown on the plans, in accordance with these specifications and as ordered by the Engineer. For the purposes of this specification, the sign support structure shall be composed of a single linear tubular overhead span member supported on each end by a single linear tubular pole member.

**Materials:** The span and pole members shall be tubular members with either a round or multisided cross-section. The round tubular members shall be fabricated from steel pipe with a tabulated yield stress no less than 35,000 psi. The multisided tubular members shall be fabricated from steel plate conforming to the requirements of ASTM A709, Grade 50T2.

The structural plate components, such as the baseplates, connection/flange/splice plates, handhole frames and the plates in the span member to pole connection, shall be made of steel that conforms to the requirements of ASTM A709, Grade 50T2.

Anchorage plates shall conform to the requirements of ASTM A709, Grade 50T2.

The non-structural components, such as hand hole covers and cap plates, shall conform to the requirements of ASTM A709, Grade 50. Sign panel support members shall conform to the requirements of ASTM A709, Grade 50.

The use of steel plate or rolled shapes with a tabulated yield stress of less than 50 ksi is not permitted.

The steel for span and pole members, structural plate components, such as the baseplates, connection/flange/splice plates, gusset plates, handhole frames and the plates in the span member to pole connection, shall meet the following Charpy V-notch impact testing requirements:

<b>Yield Strength</b>	<b>Thickness in.</b>	<b>Minimum Test Value Energy ft.-lbs.</b>	<b>Minimum Average Energy, ft.-lbs.</b>
$F_y \leq 36 \text{ ksi}$	$\leq 4$	20	25 at 40°F
$36 \text{ ksi} < F_y \leq 50 \text{ ksi}$	$\leq 2$	20	25 at 40°F
$36 \text{ ksi} < F_y \leq 50 \text{ ksi}$	$2 < t \leq 4$	24	30 at 40°F
$50 \text{ ksi} < F_y \leq 70 \text{ ksi}$	$\leq 4$	28	35 at -10°F
Charpy V-notch sampling and testing shall be in accordance with ASTM A673, "P" piece frequency.			

The 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.

Compressible-washer-type direct tension indicators shall conform to ASTM F959, Type 325, and shall be galvanized in accordance with ASTM B695, Class 50.

U-bolts and threaded rods shall conform to ASTM A449. The nuts shall conform to ASTM A563, Grade DH. The washers shall conform to ASTM F436. The bolts, nuts and washers shall be galvanized in accordance with ASTM A153 or ASTM B695, Grade 50. The nuts shall be overtapped to the minimum amount required for the fastener assembly and all surfaces of the nuts shall be lubricated with a lubricant containing a visible dye of any color that contrasts with the color of the galvanizing. The threaded ends of all U-bolts and threaded rods shall be supplied with 1 washer and 2 nuts.

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.

Bare copper grounding conductor shall be #8 AWG stranded bare copper wire conforming to M.15.13. The grounding bolt shall be galvanized steel with a hex head.

All materials used in the finished structure shall be new. The use of materials that have been previously used in a structure or salvaged from a structure is not permitted.

The Contractor shall submit Certified Test Reports and Materials Certificates in conformance with Article 1.06.07 for the steel used in the support members and components, high-strength bolts (including nuts and washers), anchor bolts (including nuts and washers), U-bolts (including nuts and washers) and threaded rods (including nuts and washers). In addition, the following shall be submitted:

- a. Mill test reports that indicate the place where the material was melted and manufactured.
- b. High-strength bolt test results for proof load tests, wedge tests, and rotational-capacity tests that indicate where the tests were performed, date of tests, location of where the components were manufactured and lot numbers.
- c. Galvanized material test results that indicate the thickness of the galvanizing.

Prior to incorporation into the work, the Contractor shall submit samples in conformance with Article 1.06.02 for the steel used in the support members and components, high-strength bolts (including nuts and washers), anchor bolts (including nuts and washers), U-bolts (including nuts and washers) and threaded rods (including nuts and washers).

**Construction Methods:** The design and fabrication of the sign support structure, including its anchorage (into the foundation) and the hardware and structural members required to support the traffic appurtenances, shall conform to the requirements of the latest edition of the AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaries and Traffic Signals, including the latest interim specifications, available prior to the advertising date of the contract, amended as follows:

- The dead load of the sign panels, sign panel support members and hardware shall be no less than the 8 psf.
- The design wind speed shall be 120 mph. The computation of wind pressures in accordance with Appendix C is not permitted.
- The minimum design life for the structures shall be 50 years.
- The wind importance factor,  $I_r$ , for wind pressure shall be 1.00.
- The wind drag coefficient,  $C_d$ , for traffic signs shall be 1.3.

- The height and exposure factor,  $K_z$ , shall be determined based on the highest elevation of the structure or the supported sign panels. The factor shall be considered constant in all pressure calculations required for the design of the structure. The height and exposure factor shall be no less than 1.05.
- The sign structure shall be designed for fatigue category I for noncantilevered structures. The sign structure shall be designed for the wind load effects due to natural wind gusts and truck-induced gusts. The design pressure for the truck-induced gust shall be based on a truck speed of 65 mph. The sign structure shall be designed assuming that vibration mitigation devices will not be installed.
- The vertical deflection of the span member due to the wind load effects of truck-induced gusts shall not exceed 8".
- The minimum effective length factor,  $K$ , shall be as follows:

For the poles,  $k = 2.1$

For span member,  $k \geq 1.2$

- The maximum stress ratio (the ratio of the computed stress to the allowable stress) or combined stress ratio in any sign structure component due to each group load shall not exceed 0.85. The purpose for limiting the CSR is to allow for future additional sign panel configurations.
- The maximum vertical deflection of the overhead span member due to dead load and ice load effects shall be no greater than  $L/150$ , where  $L$  is the span length of the overhead member measured from centerline to centerline of the poles.
- The overhead span member shall be cambered to compensate for the dead load deflections. The overhead span member shall have a permanent camber no less than  $L/1000$  and no greater than  $L/500$ .  $L$  is the span length of the overhead member measured from centerline to centerline of the poles. The permanent camber is in addition to the dead load camber. The dead load camber shall be obtained with the use of a beveled connection/flange plate or a beveled shim plate in the pole to overhead member connection.
- The maximum span length of the overhead member shall be 125'-0", measured from centerline to centerline of the poles.
- The maximum diameter of the span and pole members shall be 2'-6".
- All tubular members on a structure shall have the same material designation.

- The span and pole members shall be tubular members with either round or multisided cross-sections. Span member components shall have the same cross-sectional shape. Multisided tubular members with other than 16 sides are not permitted. Multisided tubular members with fluted sides are not permitted.
- The minimum wall thickness of the tubular members shall be  $\frac{5}{16}$ ". The wall thickness of the component members shall be uniform throughout their lengths. The use of multiple plies (laminations) to obtain the required member thickness is not permitted. The use of shop-fabricated stepped members is not permitted.
- The tubular members may be fabricated from multiple pieces. The pieces shall be joined using a complete joint penetration groove weld with a backing ring. The complete joint penetration groove weld shall be ground smooth and flush with the adjacent base metal. 100% of the complete joint penetration groove weld shall be non-destructively tested by the ultrasonic method.
- Slip-type field splices are not permitted in any member.
- The tubular members may be fabricated with no more than 2 longitudinal seam welds. The seam welds shall be ground smooth and flush with the adjacent base metal. The use of external longitudinal reinforcement bars at longitudinal seam welds is not permitted. The use of spiral seam welds is not permitted.
- The longitudinal seam welds within 6" of the member ends shall be complete joint penetration groove welds.
- 100% of partial joint penetration longitudinal seam welds shall be non-destructively tested in accordance with the magnetic particle method. 100% of complete joint penetration seam welds shall be non-destructively tested in accordance with the ultrasonic method.
- All tubular member to transverse plate connections shall be made with a complete joint penetration groove weld with a backing ring attached to the plate with a continuous fillet weld. 100% of the complete joint penetration groove welds shall be non-destructively tested by the ultrasonic method after fabrication and prior to galvanizing. 100% of the complete joint penetration groove welds shall also be non-destructively tested by the ultrasonic method for toe cracks after galvanizing. 100% of backing ring fillet welds shall be non-destructively tested by the magnetic particle method after fabrication prior to galvanizing. After galvanizing, the joint between the backing ring and tubular member shall be sealed with silicone sealant to prevent the ingress of moisture.
- The use of stiffeners at tubular member to transverse plate connections is not permitted.

- The strength of a connection made with a complete joint penetration groove weld shall be no greater than the strength of the base metal. In connections joining base metal with different yield strengths, the base metal with the lower yield strength shall govern the design.
- The minimum connection/flange/splice thickness shall be 2". The determination of the plate thickness in the tubular member to transverse plate connections shall consider the potential for the plate to warp due to the heat from welding. Consideration should be given to the use of thicker plates to allow for subsequent machining of warped plates to a flat surface so that removal of material will not compromise the required strength of the plate.
- All high-strength bolted connections shall be designed as slip critical connections with standard holes, unless otherwise noted. The high-strength bolts shall conform to the maximum spacing requirements for sealing and stitch fasteners. The high-strength bolts shall conform to the edge distance requirement for fasteners. Consideration should be given to the use of smaller diameter bolts since they require lower specified minimum bolt tensions.
- The minimum number of high-strength bolts in flange splices shall be 8.
- The minimum thickness of the ring plates and gusset plates in the ring stiffened, built-up box connection shall be 1/2".
- The minimum size fillet weld shall be 1/4", except the minimum size fillet welds in the ring stiffened, built-up box connection shall be 5/16". The use of seal and tack welds is not permitted. No welding shall be performed after galvanizing.
- The minimum base plate thickness shall no less than 2 1/2" or at least as thick as the anchor bolt diameter, whichever is greater. The determination of the plate thickness in the tubular member to transverse plate connections shall consider the potential for the plate to warp due to the heat from welding. Consideration should be given to the use of thicker plates to allow for subsequent machining of warped plates to a flat surface so that removal of material will not compromise the required strength of the plate.
- The opening in the base plate shall be sized to allow for proper galvanizing and allow conduits projecting from the foundation to pass through it. The size of the opening shall be kept to a minimum to reduce the flexibility of the baseplate.
- The 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, 3/4" minimum thickness, to transmit loads from the pole base to the concrete

foundation. The use of hooked anchor bolts is not permitted. For poles less than 24" in diameter, the minimum number of anchor bolts shall be 8. For poles greater than or equal to 24, the minimum number of anchor bolts shall be 12. The minimum anchor bolt diameter shall be 2". The minimum anchor bolt embedment, the distance from the top of the foundation to the top of the embedded anchorage plate, shall be 3'-6" or the tension development length of the vertical foundation reinforcement plus the end concrete cover, whichever is greater. Each anchor bolt shall be supplied with 5 nuts and 4 washers. Washers shall be placed on the top and bottom surfaces of the pole base plate and anchorage plate. Welding to the anchor bolts is not permitted. The use of lock washers with the anchor bolt assembly is not permitted.

The approximate dimensions of the overhead span member and the pole heights are shown in plan and elevation on the traffic sheets. The actual sign support dimensions shall be determined by the Contractor based on the horizontal and vertical clearances shown on the plans, a field survey of the finished grade at the site, the elevation of the top of the finished foundation, the locations of overhead and subsurface utilities, the location of the drainage facilities and noise barrier wall locations.

The minimum vertical clearance from the top of the finished road to the bottom of the sign panels and the centerline of the span member shall be as shown on the sign structure drawings as amended by the sign structure elevation on the traffic sheets.

Sign panels shall be installed symmetrically about the centerline of the overhead member. The bottom of all signs shall be level. Sign panels shall be installed at an angle of 5° from the vertical, with the top edge tilting toward oncoming traffic.

The sign panels and crown panels, if applicable, shall be connected to sign panel support members. The support members shall extend full height of the sign and crown panels. The number and spacing of support members shall be determined by the Contractor based on the width of the sign and crown panels and the support member spacing parameters shown on the plans. Sign panels shall be supported by no less than 3 support members. Crown panels shall be supported by no less than 2 support members. The faying surface between the sign panel support member and the rear face of the sign panel shall be a flange so that panel clips may be placed on both sides of the flange to connect the panel. The outside support members for each sign panel shall include a sign stop at the bottom of the member and a sign hook at the top of the member to support and carry the sign panels.

The sign panel support members shall be designed to be vertically adjustable to compensate for the overhead member camber. The support members shall be designed to be installed at any location along the overhead member. The use of fixed connection plates welded transversely to the longitudinal axis of the overhead member is not permitted. The use of U-bolts and clamps with threaded fasteners is permitted provided the fasteners are not subject to shear forces. No less than 2 U-bolts or 4 threaded rods shall be used at each overhead member connection. The



threaded ends of these fasteners shall have double nuts. The drilling of holes into the overhead member to prevent the panel support members from rotating is not permitted.

The minimum thickness of the sign panel support members and the plate and rolled shape components used in the connection to the sign support shall be  $\frac{1}{4}$ ".

The sign support shall be designed for the load effects due to the actual sign panels, including crown panels, as well as any future sign and crown panels that it will carry, as shown on the plans. The sign supports shall also be designed for the load effects of sign and crown panels during all stages of construction which may exist during the project under which the supports are installed. The load effects on the sign support from the sign and crown panels shall include forces and moments due to the eccentricity of the sign and crown panels and the unbalanced lateral loads on the crown panel. The sign support and its component parts shall also be designed for the load effects resulting from the transportation and erection of the support.

The sign support shall be designed so that the span member extends over and is connected to the top of the poles with a high-strength bolted, ring stiffened, built-up box connection. A minimum of 8 high-strength bolts shall be used to connect the pole connection plate to the built-up box connection plate. All bolts, nuts and washers used in the connection shall be visible. The use of tapped holes in the plates of the connection is not permitted.

The sign support and its component parts shall be designed for the governing load effects assuming the structure is rigidly connected at the span to pole connection **and** assuming the structure is free to rotate at the span to pole connection.

Vent and drain holes shall be provided for galvanizing. The number, size and location of vent and drain holes should be coordinated with the galvanizer prior to the submission of the sign support design. The area of vent and drain holes at each end of a member shall be at least 30% of the inside area of the member for members 3" in diameter and greater and 45% of the inside area of the member for members smaller than 3" in diameter. The vent and drain holes shall be strategically located for reducing stress and for proper galvanizing. The holes shall be made by drilling. Flame cut holes are not permitted. The edges of all holes shall be rounded by grinding. After galvanizing, exposed holes placed in the sign support components for galvanizing shall be sealed with neoprene plugs.

Each pole shall have a handhole located adjacent to base of the pole. One handhole shall be installed adjacent to each span member flange splice. All handholes shall be reinforced with a frame. The pole handholes shall be located with a normal direction that is 90° to the plane formed by the pole and overhead member. Handholes in the span member shall be oriented so that the opening faces down. In poles, 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 2'-6", whichever is greater. In span members, the minimum clear distance from the flange splice plate to the outside face of the handhole frame shall be no less than the diameter of the tubular member or 1'-6", whichever is greater.

The handhole frame shall be fabricated from steel plate and bent to form a closed shape and joined with a complete joint penetration groove weld. All surfaces of the groove weld shall be ground smooth and flush with the adjacent base metal. The handhole frame shall have a minimum 4" wide by minimum 6" high clear opening. The maximum width of the handhole opening, the clear opening plus twice the frame thickness, shall not be greater than 40% of the tubular member diameter at that section. The inside corners of the handhole frame shall be rounded to a radius of 30% to 50% of the width of the clear opening. The minimum thickness of the handhole frame shall be no less than the thickness of the pole or 5/16", whichever is greater. The handhole frame shall be connected to the tubular member with a partial joint penetration groove weld reinforced with a fillet weld. The handhole weld shall start and end at the point that is coincident with the longitudinal axis of symmetry of the tubular member and the longitudinal axis of symmetry of the handhole frame. 100% of the weld shall be non-destructively tested in accordance with the magnetic particle method. The handhole shall be provided with a cover connected to the frame with no less than 4 stainless steel screws. The cover shall be installed with a neoprene gasket matching the dimensions of the cover. The cover shall also be attached to the frame with a 1'-6" long stainless steel chain. The stainless steel chain shall be bolted to the cover inside face of the cover with a stainless steel bolt with a lock nut and bolted to the inside side face of the handhole frame with a stainless steel bolt. On pole hand hole frames, the opposite side face of the handhole shall have a hole with a nut welded to outside face for a galvanized steel grounding bolt.

The ends of each span member shall be sealed with a removable end cap plate attached to the member with no less than 3 threaded fasteners. The joint between the member and plate shall be sealed with a neoprene gasket.

The design of the sign support and the anchorage shall be coordinated with the design of the foundation to ensure that the foundation is adequate for the support reactions and to avoid conflicts between the embedded anchorage and the foundation reinforcement.

Prior to performing a field survey for each sign support, the Contractor shall coordinate with the Engineer to locate and stake each support foundation. The foundations shall be located to avoid conflicts with both subsurface and overhead utilities and subsurface drainage structures. In accordance with Article 1.05.15, the Contractor shall contact "Call Before You Dig" to identify the subsurface utilities that are located in the vicinity of each foundation. Once the location of each foundation has been found acceptable to the Engineer, the Contractor shall perform a field survey to obtain the information necessary to prepare a roadway cross-section with details of each sign support and supporting foundation(s).

The Contractor shall prepare and submit one copy of a cross-section (elevation) drawing based on a field survey for each sign support to the Engineer for review. A cross-section drawing is a working drawing for permanent construction. The cross-section drawing for each support shall be submitted in an individual file in electronic portable document format (.pdf) with commenting enabled. The electronic portable document format (.pdf) cross-section drawings shall be created on ANSI D (22" x 34") full scale (1" electronic file = 1" paper) sheets. (The purpose of creating the drawings on ANSI D sheets is so that the sheets may be printed/plotted at that size or smaller

without loss of legibility.) Each drawing shall have a border and title block. Located in the lower right hand corner of the drawing adjacent to the title block, each drawing shall have a rectangular box, 2 ¼" wide x 1 ¾" high, for the reviewers stamp. On the ANSI D full scale sheets, the minimum text height and width shall be 1/8". All letter characters shall be uppercase. Only one sign support cross-section shall be shown on each drawing.

The cross-sections shall include, but not be limited to the following:

- Project number, town, location (route number, direction, mileage), station, structure number, sign location number, and site number
- Location and dimensions of travel lanes and shoulders
- Location and elevation of the high point of the road
- Top and bottom of slope elevations. Slope of finished grade at foundations
- Locations of utilities (both overhead and subsurface)
- Locations of drainage facilities
- Locations of noise barriers, including elevation of top of wall
- Type of protection (metal beam rail/barrier), and the dimension from the front face of metal beam rail /barrier to the edge of the foundation and centerline of the foundation
- Elevation of the top of the foundation(s). The top of the foundation(s) shall project 6" to 12" above the level ground or 6" to 12" above the finished grade at the high side of a sloping grade.
- Dimension from top foundation to finish grade (existing or proposed as applicable).
- Span, dimension from centerline to centerline of foundations
- Dimensions of sign panel(s)
- Location of sign panel(s) relative to the centerline of the foundations/poles
- Location of sign panel(s) relative to the roadway travel lanes
- Dimension from top of foundation to centerline of overhead member
- Minimum dimensions from high point of the road to the centerline of the overhead member and the bottom of the sign panel(s)

- Elevation of centerline of overhead member

The Contractor shall submit the cross-section drawings to the project's "Engineer of Record" for review. The project's "Engineer of Record" is identified in the signature block on the sign support traffic cross-section contract plans. A copy of the transmittal shall be sent to the District Construction office administering the project.

The reviewed and stamped cross-section drawings shall be sent by the reviewer, along with a recommendation regarding acceptance, to the District Construction office for review, comment and distribution. The acceptance of cross-section drawings does not relieve the Contractor from verifying that all dimensions are correct. If there are any changes to the proposed location of the sign support and foundations prior to the construction of the foundations, the cross-section shall be re-submitted for review.

Prior to fabrication, the Contractor shall submit working drawings and design computations for each sign support, **based on the reviewed cross-section**, to the Engineer for review in accordance with Article 1.05.02. The working drawings and design computations for sign supports shall conform to working drawings for permanent construction. An individual, independently packaged set of working drawings and computations, with all details and documents necessary for fabrication and erection of the structure and its components, including a copy of the certificate of insurance, shall be prepared and submitted for **each** support. **A single set of drawings with tabulated data for multiple sign support locations is not permitted.** The alpha-numeric support identifier shall be included on these documents. The working drawings and computations shall be prepared in Customary U.S. units. Each working drawing shall be sealed, signed and dated. The cover/first sheet for the computations shall be sealed, signed and dated.

The packaged set of working drawings and computations for each support shall be submitted in an individual file in electronic portable document format (.pdf) with appropriate bookmarks and commenting enabled. The packaged set shall include the following:

- title sheet
- table of contents
- contact information for designer, fabricator and galvanizer – contact information should include name and address of each firm and the name of contact person with phone number and email address
- copy of the certificate of insurance
- copy of fabricator's AISC certification
- copy of the **reviewed** cross-section
- sign support working drawings
- sign support design computations
- welding procedures
- sign support installation procedure, including the method to plumb the poles

The electronic portable document format (.pdf) working drawings shall be created on ANSI D (22" x 34") full scale (1" electronic file = 1" paper) sheets. (The purpose of creating the drawings on ANSI D sheets is so that the sheets may be printed/plotted at that size or smaller without loss of legibility.) Each drawing shall have a border and title block. Located in the lower right hand corner of the drawing adjacent to the title block, each drawing shall have a rectangular box, 2 1/4" wide x 1 3/4" high, for the reviewers stamp. On the ANSI D full scale sheets, the minimum text height and width shall be 1/8". All letter characters shall be uppercase. The electronic files for the design computations, procedures and other supporting data shall be created on ANSI A (8 1/2" x 11"; Letter) sheets.

The working drawings shall include complete details of all sign support components. The drawings shall include, but not be limited to the following:

- the project number, town and support identification number
- reference to the design specifications, including interim specifications
- reference to the design specifications design criteria, such as design wind speed, minimum design life, etc.
- material specifications/designations for all components
- non-destructive weld testing requirements
- details of the location of the longitudinal seam weld in the span and pole members
- vent and drain holes for galvanizing
- dead load and permanent camber
- a plan view of the anchor bolt layout relative to the orientation of the span
- anchor bolt dimensions, including embedment and projection
- support installation procedure, including the method to plumb the poles

The design computations shall include, but not be limited to the following:

- the project number, town and support identification number
- references to design specifications, including interim specifications, and the applicable code section and articles

- description/documentation for all computer programs used in the design
- drawings/models of the structure, components and connections, with dimensions, loads and references to the local and global coordinate systems used (as applicable), to facilitate review of the results
- a tabulation of the section properties of the tubular members at each analyzed section. The tabulated values should include the diameter,  $D$  (if round member); effective width,  $b$  (if multisided member, AASHTO 5.5.2); equivalent diameter (if multisided member, AASHTO 5.6), wall thickness,  $t$ ; inside bend radius,  $r_b$  (if multisided member, AASHTO 5.5.2), cross-sectional area,  $A$ ; moment of inertia,  $I$ ; section modulus,  $S$ ; radius of gyration,  $r$ . AASHTO Table B-1 may be used to determine the section properties. If Table B-1 is used, the radius measured to the mid-thickness of the wall shall also be provided.
- coefficients and factors used in the design
- results of all group loads and load combinations all analysis models
- stress ratios and combined stress ratios for all group loads and load combinations
- maximum vertical deflection due to dead loads
- maximum vertical deflection due to ice loads
- vertical deflection of the span member due to the wind load effects of truck-induced gusts
- total camber and permanent camber

The Contractor shall submit the packaged set of working drawings and calculations to the project's "Engineer of Record". The project's "Engineer of Record" is identified in the signature block on the sign support structural contract plans. A copy of the transmittal shall be sent to the District Construction office administering the project.

The reviewed and stamped working drawings and calculations shall be sent by the reviewer, along with a recommendation regarding acceptance, to the District Construction office for review, comment and distribution. After the District Construction office has reviewed the working drawings and calculations, ensured all comments have been addressed and have found the submittal to be acceptable, in addition to distributing copies of the working drawings and calculations to the Contractor and District offices, a copy of each packaged set of working drawings and calculations shall be sent to the following Department offices:

Bridge Safety and Evaluation  
Research and Materials

Traffic Engineering  
Engineer of Record

The Contractor shall make printed copies of the stamped working drawings and calculations, of the size and number determined by the Engineer, and deliver the copies as directed by the Engineer.

If the as-built condition of the foundation(s), such as the location or elevation, will impact the design, final erection or assembly of the sign support for conformance with the requirements herein, the cross-section shall be re-submitted for review. Subsequently, the working drawings and calculations shall be resubmitted to conform to the revised cross-section and the requirements herein.

The support shall be fabricated in accordance with the latest edition of the AASHTO LRFD Bridge Construction Specifications, including the latest interim specifications, amended herein.

The steel fabricator shall be AISC certified for the fabrication to the Standard for Bridge and Highway Metal Component Manufacturers (CPT).

Fabrication of the support may begin only after the working drawings and design computations have been reviewed and the Engineer has authorized fabrication to begin. The Contractor shall submit to the Engineer, no less than 2 weeks prior to the start of fabrication, the name and location of the fabrication shop where the work will be done so that arrangements can be made for an audit of the facility and the assignment of the Department Quality Assurance (QA) inspector. No fabrication will be accepted unless the QA inspector is present during fabrication. No changes may be made during fabrication without prior written approval by the Department.

The Contractor shall furnish facilities for the inspection of material and workmanship in the shop by the Engineer. The Engineer and his representative shall be allowed free access to the necessary parts of the premises.

The Engineer will provide QA inspection at the fabrication shop to assure that all applicable Quality Control plans and inspections are adequately adhered to and maintained by the Contractor during all phases of the fabrication. A thorough inspection of a random selection of elements at the fabrication shop may serve as the basis of this assurance.

Prior to shipment to the project, each individual piece of steel shall be marked in a clear and permanent fashion by a representative of the fabricators' Quality Control (QC) Department to indicate complete final inspection by the fabricator and conformance to the project specifications for that piece. The mark must be dated. A Materials Certificate in accordance with Article 1.06.07 may be used in lieu of individual stamps or markings, for all material in a single shipment. The Materials Certificate must list each piece within the shipment and accompany the shipment to the project site.

Following the final inspection by the fabricator's QC personnel, the Engineer may select pieces of steel for re-inspection by the Department's QA inspector. Should non-conforming pieces be identified, all similar pieces must be re-inspected by the fabricator and repair procedure(s) submitted to the Engineer for approval. Repairs will be made at the Contractor's expense.

The pieces selected for re-inspection and found to be in conformance, or adequately repaired pieces, may be marked by the QA inspector. Such markings indicate the Engineer takes no exception to the pieces being sent to the project site. Such marking does not indicate acceptance or approval of the material by the Engineer.

All welding details, procedures and nondestructive testing shall conform to the requirements of AWS D1.1 Structural Welding Code - Steel.

Personnel performing the nondestructive testing shall be certified as a NDT Level II technician in accordance with the American Society for Non Destructive Testing (ASNT), Recommended Practice SNT-TC-1A and approved by the Engineer.

All nondestructive testing shall be witnessed by Engineer. Certified reports of all tests shall be submitted to the Engineer for examination. Each certified report shall identify the structure, member, and location of weld or welds tested. Each report shall also list the length and location of any defective welds and include information on the corrective action taken and results of all retests of repaired welds.

The Department reserves the right to perform additional testing as determined by the Engineer. Should the Engineer require nondestructive testing on welds not designated in the contract, the cost of such inspection shall be borne by the Contractor if the testing indicates that any weld(s) are defective. If the testing indicates the weld(s) to be satisfactory, the actual cost of such inspection will be paid by the Department.

All members and components shall be hot-dip galvanized in a single dip. Double-dipping of members and components is not permitted. All exterior and interior surfaces of the sign support members and components, including the interior of the ring-stiffened built-up box connection, shall be completely galvanized.

Galvanized members and components shall be free from uncoated areas, blisters, flux deposits, and gross inclusions. Lumps, projections, globules, or heavy deposits of zinc which will interfere with the intended use of the material will not be permitted.

All damaged areas of the hot-dip galvanized surfaces shall be repaired in accordance with the requirements of ASTM A780. If paint containing zinc dust is used for repairs, the dry coating thickness shall be at least 50% greater than the thickness of the adjacent hot-dip galvanized coating, but no greater than 4.0 mils. The paint shall be brush applied. The use of aerosol spray cans shall not be permitted. The color of the finished repair area shall match the color of the adjacent hot-dip galvanized surface at the time of the repair to the satisfaction of the Engineer.



Prior to shipping, all galvanized surfaces of the members and components shall be inspected, in the presence of the Engineer, to determine the acceptability of the galvanized coating. Galvanized coatings may be found acceptable by the Engineer if all surfaces of the members and components meet the galvanizing requirements herein. Only sign support members and components with acceptable galvanized coatings shall be shipped. If the galvanized coating on any member or component is found not acceptable, the Contractor shall submit a repair procedure to the Engineer for review.

Unless provisions for the sign support structure number are otherwise included in the contract, the sign support structure number shall be stenciled in black paint on the right side pole (as determined by the direction of traffic traveling below the structure) centered approximately 5' off the ground and visible from the roadway. The numeric characters shall be 3" to 4" high and placed vertically so that they may be read from top to bottom.

After fabrication, the sign support components shall be assembled in the fabricator's shop, in the presence of the Engineer, to determine the acceptability of the bolted connections and to confirm the permanent camber. The faying surfaces of the connections shall be free of dirt, loose scale, burrs, other foreign material and other defects that would prevent solid seating of the parts. Prior to assembly, the galvanized faying surfaces shall be scored by wire brushing. The faying surfaces of the connection plates shall be checked with a straight edge to ensure that the surfaces are not distorted and the entire faying surface of each plate will be in contact when assembled. The high-strength bolts, including nuts and washers, shall be installed and tensioned in accordance with Subarticle 6.03.03-4(f). A connection may be found acceptable by the Engineer if the faying surfaces of the connection plates are in firm, continuous contact after properly tensioning the bolts. Only sign supports with acceptable connections shall be shipped. If a bolted connection is found not acceptable, the Contractor shall submit a procedure to repair the connection to the Engineer for review. Galvanized surfaces damaged by the repair procedure shall be hot dip galvanized. Repair of the damaged galvanized surfaces in accordance with the requirements of ASTM A780 or with a galvanizing repair stick is not permitted. Bolts, nuts and washers used for the trial shop fit-up shall not be reused in the final field assembly. With the overhead member supported at the ends, the permanent camber shall be measured at mid-span and the structure shall be rejected if the camber does not meet the following:

$$L/1000 \leq \text{Permanent Camber} \leq L/500$$

where L is the span length of the overhead member measured from centerline to centerline of the poles.

The finished members and components shall be protected with sufficient dunnage and padding to protect them from damage and distortion during transportation. Damage to any material during transportation, improper storage, faulty erection, or undocumented fabrication errors may be cause for rejection of said material at the project site. All costs associated with any corrective action will be borne by the Contractor.

Following delivery to the project site, the Engineer will perform a visual inspection of all material to verify shipping documents, fabricator markings, and that there was no damage to the material or coatings during transportation and handling.

The Engineer is not responsible for approving or accepting any fabricated materials prior to final erection and assembly at the project site.

High-strength bolts, nuts and washers shall be stored in accordance with Subarticle 6.03.03-4(f).

The support shall be erected, assembled and installed in accordance with these specifications and the procedures and methods submitted with the working drawings. The Contractor and the support designer are responsible to ensure that the erection and assembly procedures and methods in this specification are acceptable for use with the support. Changes to these methods and procedures shall be submitted with the working drawings and computations.

Prior to installation of the support, the exposed threads of all the embedded anchor bolts shall be cleaned of accumulated dirt and concrete and lubricated. The threads and bearings surfaces of all the anchor bolt nuts shall be cleaned and lubricated. The anchor bolts and nuts are properly lubricated if the nuts can be turned by hand on the anchor bolt threads. The lubricant shall contain a visible dye of any color that contrasts with the color of the galvanizing. Re-lubricate the threads of the anchor bolts and nuts if more than 24 hours has elapsed since earlier lubrication, or if the anchor bolts and nuts have become wet since they were first lubricated.

The space between the bottom of the baseplate and the top of the foundation shall not be sealed with closed cell elastomer or filled with grout, unless otherwise noted.

Install (turn) the leveling nuts onto the anchor bolts and align the nuts to the same elevation or plane. The distance from the bottom of the leveling nuts to the top of the foundation shall not exceed 1". Place a structural hardened washer on top of each leveling nut, 1 washer on each anchor bolt.

The pole shall be erected so that the centerline of the pole will be plumb after the application of all the dead loads.

Install the pole base plate atop the washers resting on the leveling nuts, place a structural hardened washer on each anchor bolt resting it on the top of the base plate, and install (turn) a top nut on each anchor bolt until the nut contacts the washer. The leveling nuts and washers shall be inspected, and if necessary the nuts (turned), so that the washers are in full contact with the bottom surface of the base plate.

Tighten the top nuts to a snug tight condition in a star pattern. Snug tight is defined as the maximum rotation resulting from the full effort of one person using a 12" long wrench or equivalent. A star tightening pattern is one in which the nuts on opposite or near-opposite sides of the bolt circle are successively tightened in a pattern resembling a star (e.g., For an 8-bolt

circle with bolt sequentially numbered 1 to 8, tighten nuts in the following bolt order: 1, 5, 7, 3, 8, 4, 6, 2.).

Tighten leveling nuts to a snug tight condition in a star pattern.

Before final tightening of the top nuts, mark the reference position of each top nut in a snug-tight condition with a suitable marking on 1 flat with a corresponding reference mark on the base plate at each bolt. Then incrementally turn the top nuts using a star pattern one-sixth of a turn beyond snug tight. Turn the nuts in at least two full tightening cycles (passes). After tightening, verify the top nut rotation. The top nuts shall have full thread engagement. The distance from the bottom of the leveling nuts to the top of the foundation shall not exceed 1".

High-strength bolts, including nuts and washes, shall be installed and tensioned in accordance with Subarticle 6.03.03-4(f). The overhead member shall be temporarily and fully supported while all the high-strength bolts are installed and tensioned. The temporary support of the overhead member shall not be removed until the Engineer has confirmed that the faying surfaces of the connection/flange plates are in firm, continuous contact and the high-strength bolts were properly installed and tensioned. All high-strength bolts in the bolted connections shall be inspected (in accordance with Subarticle 6.03.03-4(f)) to confirm the high-strength bolts were properly tensioned. The use or installation of galvanized hardened steel washer between the faying surfaces of the connection is not permitted.

After erecting the support, the support shall be electrically grounded by attaching the bare copper grounding conductor to the inside of the handhole frame with a galvanized steel bolt and to the ground rod with a ground clamp. The rigid metal conduit shall be electrically grounded by attaching the bare copper grounding conductor to the insulated bonding bushing and to the ground rod with a ground clamp.

After erection of the support and before the installation of the sign panels, if the structure exhibits excessive vibration, oscillations or deflections as determined by the Engineer, the Contractor shall immediately stabilize the structure to the satisfaction of the Engineer. Stabilizing the structure may require the removal of a portion of the structure or the entire structure.

The sign panels shall be located and mounted on the span member as shown in the working drawings.

After installation of the sign panels, the anchor bolts nuts (leveling and top anchor nut) and washers shall be in full contact with the top and bottom surfaces of the pole baseplate and the centerline of the pole shall be plumb.

After erection of the support and after the installation of the sign panels, if the structure exhibits excessive vibration, oscillations or deflections as determined by the Engineer, the Contractor shall design and construct devices to mitigate the movements. The Contractor is responsible for immediately stabilizing the structure to the satisfaction of the Engineer. Stabilizing the structure

may require the removal of the sign panels or the entire structure. Prior to installation of any mitigation device, the Contractor shall submit drawings, design computations other documentation to the Engineer for review in accordance with Article 1.05.02.

**Method of Measurement:** This work will be measured for payment by the number of monotube bridge sign structures, completed and accepted in place.

**Basis of Payment:** This work will be paid for at the contract unit price each for "Monotube Bridge Sign Structure", complete in place, which price shall include field survey, equipment, materials, tools and labor incidental to the design, fabrication and installation, including anchorage materials, sign panel support members and mitigation devices, if required, of the supports at the locations specified on the plans.

## **ITEM #1201802A – 4 CHORD TRUSS BRIDGE SIGN STRUCTURE**

**Description:** Work under this item shall consist of designing, fabricating and installing a sign support structure to carry extruded aluminum traffic signs, on a prepared foundation, in accordance with the details shown on the plans, in accordance with these specifications and as ordered by the Engineer. For the purposes of this specification, the sign support structure shall be composed of a 4 chord truss supported on each end by a 2 post tower.

**Materials:** The tower posts, tower bracing, truss chords and truss bracing shall be tubular members fabricated from round steel pipe. The steel pipe shall have a tabulated yield stress no less than 35,000 psi.

Tower and truss members fabricated from multisided tubular members are not permitted.

The structural plate components, such as the baseplates, connection/flange/splice plates, gusset plates, handhole frames and plates in the truss to post connection, shall be made of steel that conforms to the requirements of ASTM A709, Grade 50T2.

Anchorage plates shall conform to the requirements of ASTM A709, Grade 50T2.

The non-structural components, such as hand hole covers and cap plates, shall conform to the requirements of ASTM A709, Grade 50. Sign panel support members shall conform to the requirements of ASTM A709, Grade 50.

The use of steel plate or rolled shapes with a tabulated yield stress less than 50 ksi is not permitted.

The steel for tower posts, truss chord members, structural plate components, such as the baseplates, connection/flange/splice plates, gusset plates, handhole frames and plates in the truss to tower connection, and shall meet the following Charpy V-notch impact testing requirements:

<b>Yield Strength</b>	<b>Thickness in.</b>	<b>Minimum Test Value Energy ft.-lbs.</b>	<b>Minimum Average Energy, ft.-lbs.</b>
$F_y \leq 36$ ksi	$\leq 4$	20	25 at 40°F
$36$ ksi $< F_y \leq 50$ ksi	$\leq 2$	20	25 at 40°F
$36$ ksi $< F_y \leq 50$ ksi	$2 < t \leq 4$	24	30 at 40°F
$50$ ksi $< F_y \leq 70$ ksi	$\leq 4$	28	35 at -10°F
Charpy V-notch sampling and testing shall be in accordance with ASTM A673, "P" piece frequency.			

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.

Compressible-washer-type direct tension indicators shall conform to ASTM F959, Type 325, and shall be galvanized in accordance with ASTM B695, Class 50.

U-bolts and threaded rods shall conform to ASTM A449. The nuts shall conform to ASTM A563, Grade DH. The washers shall conform to ASTM F436. The bolts, nuts and washers shall be galvanized in accordance with ASTM A153 or ASTM B695, Grade 50. The nuts shall be overtapped to the minimum amount required for the fastener assembly and all surfaces of the nuts shall be lubricated with a lubricant containing a visible dye of any color that contrasts with the color of the galvanizing. The threaded ends of all U-bolts and threaded rods shall be supplied with 1 washer and 2 nuts.

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.

Bare copper grounding conductor shall be #8 AWG stranded bare copper wire conforming to M.15.13. The grounding bolt shall be galvanized steel with a hex head.

All materials used in the finished structure shall be new. The use of materials that have been previously used in a structure or salvaged from a structure is not permitted.

The Contractor shall submit Certified Test Reports and Materials Certificates in conformance with Article 1.06.07 for the steel used in the tower and truss members and components, high-strength bolts (including nuts and washers), anchor bolts (including nuts and washers), U-bolts (including nuts and washers) and threaded rods (including nuts and washers). In addition, the following shall be submitted:

- a. Mill test reports that indicate the place where the material was melted and manufactured.
- b. High-strength bolt test results for proof load tests, wedge tests, and rotational-capacity tests that indicate where the tests were performed, date of tests, location of where the components were manufactured and lot numbers.
- c. Galvanized material test results that indicate the thickness of the galvanizing.

Prior to incorporation into the work, the Contractor shall submit samples in conformance with Article 1.06.02 for the steel used in the support members and components, high-strength bolts (including nuts and washers), anchor bolts (including nuts and washers), U-bolts (including nuts and washers) and threaded rods (including nuts and washers).

**Construction Methods:** The design and fabrication of the sign support structure, including its anchorage (into the foundation) and the hardware and structural members required to support the traffic appurtenances, shall conform to the requirements of the latest edition of the AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaries and Traffic Signals, including the latest interim specifications, available prior to the advertising date of the contract, amended as follows:

- The dead load of the sign panels, sign panel support members and hardware shall be no less than the 8 psf.
- The design wind speed shall be 120 mph. The computation of wind pressures in accordance with Appendix C is not permitted.
- The minimum design life for the structures shall be 50 years.
- The wind importance factor,  $I_r$ , for wind pressure shall be 1.00.
- The wind drag coefficient,  $C_d$ , for traffic signs shall be 1.3.

- The height and exposure factor,  $K_z$ , shall be determined based on the highest elevation of the structure or the supported sign panels. The factor shall be considered constant in all pressure calculations required for the design of the structure. The height and exposure factor shall be no less than 1.05.
- The sign structure shall be designed for fatigue category I for noncantilevered structures. The sign structure shall be designed for the wind load effects due to natural wind gusts and truck-induced gusts. The design pressure for the truck-induced gust shall be based on a truck speed of 65 mph. The sign structure shall be designed assuming that vibration mitigation devices will not be installed.
- The vertical deflection of the truss due to the wind load effects of truck-induced gusts shall not exceed 8".
- The fixity of the structure connections shall be as follows:

Welded gusset plate, bracing member to chord connections shall be considered rigid in the plane of the gusset plate and pinned perpendicular to the plane of the gusset plate.

Flange plate chord to chord connections shall be considered rigid with respect to both axes.

Baseplate to anchor bolt connection shall be considered rigid with respect to both axes.

- The minimum effective length factor,  $K$ , shall be as follows:

For the tower posts,  $k = 2.1$

For truss chord and bracing, and tower bracing,  $k \geq 1.0$

- The maximum stress ratio (the ratio of the computed stress to the allowable stress) or combined stress ratio in any sign structure component due to each group load shall not exceed 0.85. The purpose for limiting the CSR is to allow for future additional sign panel configurations.
- The maximum vertical deflection of the overhead truss due to dead load and ice load effects shall be no greater than  $L/150$ , where  $L$  is the span length of the truss measured from centerline to centerline of the tower posts.
- The truss shall be cambered to compensate for the dead load deflections. The truss shall have a permanent camber no less than  $L/1000$  and no greater than  $L/500$ .  $L$  is the span length of the truss measured from centerline to centerline of the tower posts. The permanent camber is in addition to the dead load camber.



- The maximum span length of the truss shall be 200'-0", measured from the centerline to centerline of the towers.
- The truss chords shall be fabricated in sections and connected with chord flange splices. The chords within the sections shall be fabricated from a single piece of pipe. Chord sections fabricated from multiple pieces of pipe are not permitted. All truss chords shall have the same cross-sectional properties and material designations. The minimum wall thickness of the truss chord members shall be  $\frac{5}{16}$ ".
- Tower posts shall be fabricated from a single piece of pipe. Posts fabricated from multiple pieces of pipe are not permitted. All tower posts shall have the same cross-sectional properties and material designations. The minimum wall thickness of the tower posts shall be  $\frac{5}{16}$ ".
- Tower and truss bracing shall be fabricated from steel pipe. All tower bracing shall have the same cross-sectional properties. All truss bracing shall have the same cross-sectional properties. The cross-sectional properties of the tower and truss bracing may differ. All bracing shall have the same material designations. The bracing shall have a minimum nominal diameter of 2½". The bracing shall have a minimum thickness of 0.203". The bracing shall be connected to tower post and truss chord gusset plates with slotted tube connections. The bracing slot shall have a coped hole at the end of the slot. In a minimum of 25% of the bracing gusset plate to tower post connections, 100% of the fillet welds on each side of the connection, shall be non-destructively tested in accordance with the magnetic particle method. In a minimum of 25% of the bracing gusset plate to truss chord connections, 100% of the fillet welds on each side of the connection, shall be non-destructively tested in accordance with the magnetic particle method.
- At a minimum, internal diagonal bracing shall be provided at each end of each truss section to maintain the shape and stability the truss sections during shipping and handling of the sections and the erection of the completed truss. At a minimum, additional internal diagonal bracing shall be placed at a panel point at the midspan of the truss sections greater than 25'-0" in length. The internal diagonal bracing may be provided using either a single or multiple members.
- All tubular member to transverse plate connections shall be made with a complete joint penetration groove weld with a backing ring attached to the plate with a continuous fillet weld. 100% of the complete joint penetration groove welds shall be non-destructively tested by the ultrasonic method after fabrication and prior to galvanizing. 100% of the complete joint penetration groove welds shall also be non-destructively tested by the ultrasonic method for toe cracks after galvanizing. 100% of backing ring fillet welds shall be non-destructively tested by the

magnetic particle method after fabrication prior to galvanizing. After galvanizing, the joint between the backing ring and tubular member shall be sealed with silicone sealant to prevent the ingress of moisture.

- The use of stiffeners at tubular member to transverse plate connections is not permitted.
- The strength of a connection made with a complete joint penetration groove weld shall be no greater than the strength of the base metal. In connections joining base metal with different yield strengths, the base metal with the lower yield strength shall govern the design.
- The minimum flange splice plate thickness shall be 2". The determination of the plate thickness in the tubular member to transverse plate connections shall consider the potential for the plate to warp due to the heat from welding. Consideration should be given to the use of thicker plates to allow for subsequent machining of warped plates to a flat surface so that removal of material will not compromise the required strength of the plate.
- All high-strength bolted connections shall be designed as slip critical connections with standard holes, unless otherwise noted. The high-strength bolts shall conform to the maximum spacing requirements for sealing and stitch fasteners. The high-strength bolts shall conform to the edge distance requirement for fasteners. Consideration should be given to the use of smaller diameter bolts since they require lower specified minimum bolt tensions.
- The minimum number of high-strength bolts in flange splices in the truss chords shall be 6.
- The minimum thickness of the tower and truss bracing gusset plates shall be 1/2".
- The minimum size fillet weld shall be 1/4", unless noted otherwise. The use of seal and tack welds is not permitted. No welding shall be performed after galvanizing.
- The minimum base plate thickness shall no less than 2" or at least as thick as the anchor bolt diameter, whichever is greater. The determination of the plate thickness in the tubular member to transverse plate connections shall consider the potential for the plate to warp due to the heat from welding. Consideration should be given to the use of thicker plates to allow for subsequent machining of warped plates to a flat surface so that removal of material will not compromise the required strength of the plate.
- The opening in the base plate shall be sized to allow for proper galvanizing and allow conduits projecting from the foundation to pass through it. The size of the opening shall be kept to a minimum to reduce the flexibility of the baseplate.

- The 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,  $\frac{3}{4}$ " minimum thickness, to transmit loads from the post base to the concrete foundation. The use of hooked anchor bolts is not permitted. The minimum number of anchor bolts shall be 4. The minimum anchor bolt diameter shall be  $1\frac{1}{2}$ ". The minimum anchor bolt embedment, the distance from the top of the foundation to the top of the embedded anchorage plate, shall be 3'-6" or the tension development length of the vertical foundation reinforcement plus the end concrete cover, whichever is greater. Each anchor bolt shall be supplied with 5 nuts and 4 washers. Washers shall be placed on the top and bottom surfaces of the post 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 approximate dimensions of the truss and the tower post heights are shown in plan and elevation on the traffic sheets. The actual sign support dimensions shall be determined by the Contractor based on a the horizontal and vertical clearances shown on the plans, a field survey of the finished grade at the site, the elevation of the top of the finished foundation, the locations of overhead and subsurface utilities, the location of the drainage facilities and noise barrier wall locations.

The minimum vertical clearance from the top of the finished road to the bottom of the sign panels and the centerline of the truss shall be as shown on the sign support drawings as amended by the sign support elevation on the traffic sheets.

Sign panels shall be installed symmetrically about the centerline of the truss. The bottom of all signs shall be level. Sign panels shall be installed at an angle of  $5^\circ$  from the vertical, with the top edge tilting toward oncoming traffic.

The sign panels and crown panels, if applicable, shall be connected to sign panel support members. The support members shall extend full height of the sign and crown panels. The number and spacing of support members shall be determined by the Contractor based on the width of the sign and crown panels and the support member spacing parameters shown on the plans. Sign panels shall be supported by no less than 3 support members. Crown panels shall be supported by no less than 2 support members. The faying surface between the sign panel support member and the rear face of the sign panel shall be a flange so that panel clips may be placed on both sides of the flange to connect the panel. The outside support members for each sign panel shall include a sign stop at the bottom of the member and a sign hook at the top of the member to support and carry the sign panels.

The sign panel support members shall be designed to be vertically adjustable to compensate for the truss camber. The supports members shall be designed to be installed at any location along

the truss. The use of U-bolts and threaded rods is permitted. No less than 2 U-bolts or 4 threaded rods shall be used at each chord connection. The threaded ends of these fasteners shall have double nuts.

The minimum thickness of the sign panel support members and the plate and rolled shape components used in the connection to the sign support shall be  $\frac{1}{4}$ ".

The sign support shall be designed for the load effects due to the actual sign panels, including crown panels, as well as any future sign and crown panels that it will carry, as shown on the plans. The sign supports shall also be designed for the load effects of sign and crown panels during all stages of construction which may exist during the project under which the supports are installed. The load effects on the sign support from the sign and crown panels shall include forces and moments due to the eccentricity of the sign and crown panels and the unbalanced lateral loads on the crown panel. The sign support and its component parts shall also be designed for the load effects resulting from the transportation and erection of the support.

The sign support shall be designed so that the 4 chords of the truss fit within the tower posts. Each truss chord shall be connected to a tower post. 100% of the fillet welds used in the truss to post connection shall be non-destructively tested in accordance with the magnetic particle method. All bolts, nuts and washers used in the connection shall be visible. The use of tapped holes in the plates of the connection is not permitted.

Vent and drain holes shall be provided for galvanizing. The number, size and location of vent and drain holes should be coordinated with the galvanizer prior to the submission of the sign support design. The area of vent and drain holes at each end of a member shall be at least 30% of the inside area of the member for members 3" in diameter and greater and 45% of the inside area of the member for members smaller than 3" in diameter. The vent and drain holes shall be strategically located for reducing stress and for proper galvanizing. The holes shall be made by drilling. Flame cut holes are not permitted. The edges of all holes shall be rounded by grinding. After galvanizing, exposed holes placed in the sign support components for galvanizing shall be sealed with neoprene plugs.

One post in each tower shall have a handhole located adjacent to base of the post. The handhole shall be reinforced with a frame. The handhole shall be located with a normal direction that is 90° to the plane formed by the post and overhead truss. 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 post member or 2'-6", whichever is greater.

The handhole frame shall be fabricated from steel plate and bent to form a closed shape and joined with a complete joint penetration groove weld. All surfaces of the groove weld shall be ground smooth and flush with the adjacent base metal. The handhole frame shall have a minimum 4" wide by minimum 6" high clear opening. The maximum width of the handhole opening, the clear opening plus twice the frame thickness, shall not be greater than 40% of the post 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 post or 5/16", whichever is greater. The handhole frame shall be connected to the post 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 post and the longitudinal axis of symmetry of the handhole frame. 100% of the weld shall be non-destructively tested in accordance with the magnetic particle method. The handhole shall be provided with a cover connected to the frame with no less than 4 stainless steel screws. The cover shall be installed with a neoprene gasket matching the dimensions of the cover. The cover shall also be attached to the frame with a 1'-6" long stainless steel chain. The stainless steel chain shall be bolted to the cover inside face of the cover with a stainless steel bolt with a lock nut and bolted to the inside side face of the handhole frame with a stainless steel bolt. On post hand hole frames, the opposite side face of the handhole shall have a hole with a nut welded to outside face for a galvanized steel grounding bolt.

The ends of each chord member shall be sealed with a removable end cap plate attached to the member with a threaded fastener. The joint between the member and plate shall be sealed with a neoprene gasket.

The design of the sign support and the anchorage shall be coordinated with the design of the foundation to ensure that the foundation is adequate for the support reactions and to avoid conflicts between the embedded anchorage and the foundation reinforcement.

Prior to performing a field survey for each sign support, the Contractor shall coordinate with the Engineer to locate and stake each support foundation. The foundations shall be located to avoid conflicts with both subsurface and overhead utilities and subsurface drainage structures. In accordance with Article 1.05.15, the Contractor shall contact "Call Before You Dig" to identify the subsurface utilities that are located in the vicinity of each foundation. Once the location of each foundation has been found acceptable to the Engineer, the Contractor shall perform a field survey to obtain the information necessary to prepare a roadway cross-section with details of each sign support and supporting foundation(s).

The Contractor shall prepare and submit one copy of a cross-section (elevation) drawing based on a field survey for each sign support to the Engineer for review and approval. The cross-section drawing for each support shall be submitted in an individual file in electronic portable document format (.pdf) with commenting enabled. The electronic portable document format (.pdf) cross-section drawings shall be created on ANSI D (22" x 34") full scale (1" electronic file = 1" paper) sheets. (The purpose of creating the drawings on ANSI D sheets is so that the sheets may be printed/plotted at that size or smaller without loss of legibility.) Each drawing shall have a border and title block. Located in the lower right hand corner of the drawing adjacent to the title block, each drawing shall have a rectangular box, 2 1/4" wide x 1 3/4" high, for the reviewers stamp. On the ANSI D full scale sheets, the minimum text height and width shall be 1/8". All letter characters shall be uppercase. Only one sign support cross-section shall be shown on each drawing.

The cross-sections shall include, but not be limited to the following:

- Project number, town, location (route number, direction, mileage), station, structure number, sign location number, and site number
- Location and dimensions of travel lanes and shoulders
- Location and elevation of the high point of the road
- Top and bottom of slope elevations. Slope of finished grade at foundations
- Locations of utilities (both overhead and subsurface)
- Locations of drainage facilities
- Locations of noise barriers, including elevation of top of wall
- Type of protection (metal beam rail/barrier), and the dimension from the front face of metal beam rail /barrier to the edge of the foundation and centerline of the foundation
- Elevation of the top of the foundation(s). The top of the foundation(s) shall project 6" to 12" above the level ground or 6" to 12" above the finished grade at the high side of a sloping grade.
- Dimension from top foundation to finish grade (existing or proposed as applicable).
- Span, dimension from centerline to centerline of foundations
- Dimensions of sign panel(s)
- Location of sign panel(s) relative to the centerline of the foundations/posts
- Location of sign panel(s) relative to the roadway travel lanes
- Dimension from top of foundation to centerline of truss
- Minimum dimensions from high point of the road to the centerline of the truss and the bottom of the sign panel(s)
- Elevation of centerline of truss

The Contractor shall submit the cross-section drawings to the project's "Engineer of Record" for review. The project's "Engineer of Record" is identified in the signature block on the sign

support traffic cross-section contract plans. A copy of the transmittal shall be sent to the District Construction office administering the project.

The reviewed and stamped cross-section drawings shall be sent by the reviewer, along with a recommendation regarding acceptance, to the District Construction office for review, comment and distribution. The acceptance of cross-section drawings does not relieve the Contractor from verifying that all dimensions are correct. If there are any changes to the proposed location of the sign support and foundations prior to the construction of the foundations, the cross-section shall be re-submitted for review.

Prior to fabrication, the Contractor shall submit working drawings and design computations for each sign support, **based on the reviewed cross-section**, to the Engineer for review in accordance with Article 1.05.02. The working drawings and design computations for sign supports shall conform to working drawings for permanent construction. An individual, independently packaged set of working drawings and computations, with all details and documents necessary for fabrication and erection of the structure and its components, including a copy of the certificate of insurance, shall be prepared and submitted for **each** support. **A single set of drawings with tabulated data for multiple sign support locations is not permitted.** The alpha-numeric support identifier shall be included on these documents. The working drawings and computations shall be prepared in Customary U.S. units. Each working drawing shall be sealed, signed and dated. The cover/first sheet for the computations shall be sealed, signed and dated.

The packaged set of working drawings and computations for each support shall be submitted in an individual file in electronic portable document format (.pdf) with appropriate bookmarks and commenting enabled. The packaged set shall include the following:

- title sheet
- table of contents
- contact information for designer, fabricator and galvanizer – contact information should include name and address of each firm and the name of contact person with phone number and email address
- copy of the certificate of insurance
- copy of fabricator's AISC certification
- copy of the **reviewed** cross-section
- sign support working drawings
- sign support design computations
- welding procedures
- sign support installation procedure, including the method to plumb the tower posts

The electronic portable document format (.pdf) working drawings shall be created on ANSI D (22" x 34") full scale (1" electronic file = 1" paper) sheets. (The purpose of creating the drawings on ANSI D sheets is so that the sheets may be printed/plotted at that size or smaller without loss of legibility.) Each drawing shall have a border and title block. Located in the lower right hand corner of the drawing adjacent to the title block, each drawing shall have a

rectangular box, 2 ¼" wide x 1 ¾" high, for the reviewers stamp. On the ANSI D full scale sheets, the minimum text height and width shall be 1/8". All letter characters shall be uppercase. The electronic files for the design computations, procedures and other supporting data shall be created on ANSI A (8 ½" x 11"; Letter) sheets.

The working drawings shall include complete details of all sign support components. The drawings shall include, but not be limited to the following:

- the project number, town and support identification number
- reference to the design specifications, including interim specifications
- reference to the design specifications design criteria, such as design wind speed, minimum design life, etc.
- material specifications/designations for all components
- non-destructive weld testing requirements
- vent and drain holes for galvanizing
- dead load and permanent camber
- a plan view of the anchor bolt layout relative to the orientation of the span
- anchor bolt dimensions, including embedment and projection
- support installation procedure, including the method to plumb the tower posts

The design computations shall include, but not be limited to the following:

- the project number, town and support identification number
- references to design specifications, including interim specifications, and the applicable code section and articles
- description/documentation for all computer programs used in the design
- drawings/models of the structure, components and connections, with dimensions, loads and references to the local and global coordinate systems used (as applicable), to facilitate review of the results
- Tabulation of the section properties of the tubular members at each analyzed section. The tabulated values should include the diameter, D; wall thickness,



t; cross-sectional area, A; moment of inertia, I; section modulus, S; radius of gyration, r. AASHTO Table B-1 may be used to determine the section properties. If Table B-1 is used, the radius measured to the mid-thickness of the wall shall also be provided.

- coefficients and factors used in the design
- results of all group loads and load combinations
- stress ratios and combined stress ratios for all group loads and load combinations
- maximum vertical deflection due to dead loads
- maximum vertical deflection due to ice loads
- vertical deflection of the truss due to the wind load effects of truck-induced gusts
- total camber and permanent camber

The Contractor shall submit the packaged set of working drawings and calculations to the project's "Engineer of Record". The project's "Engineer of Record" is identified in the signature block on the sign support structural contract plans. A copy of the transmittal shall be sent to the District Construction office administering the project.

The reviewed and stamped working drawings and calculations shall be sent by the reviewer, along with a recommendation regarding acceptance, to the District Construction office for review, comment and distribution. After the District Construction office has reviewed the working drawings and calculations, ensured all comments have been addressed and have found the submittal to be acceptable, in addition to distributing copies of the working drawings and calculations to the Contractor and District offices, a copy of each packaged set of working drawings and calculations shall be sent to the following Department offices:

Bridge Safety and Evaluation  
 Research and Materials  
 Traffic Engineering  
 Engineer of Record

The Contractor shall make printed copies of the stamped working drawings and calculations, of the size and number determined by the Engineer, and deliver the copies as directed by the Engineer.

If the as-built condition of the foundation(s), such as the location or elevation, will impact the design, final erection or assembly of the sign support for conformance with the requirements

herein, the cross-section shall be re-submitted for review. Subsequently, the working drawings and calculations shall be resubmitted to conform to the revised cross-section and the requirements herein.

The support shall be fabricated in accordance with the latest edition of the AASHTO LRFD Bridge Construction Specifications, including the latest interim specifications, amended herein.

The steel fabricator shall be AISC certified for the fabrication to the Standard for Bridge and Highway Metal Component Manufacturers (CPT).

Fabrication of the support may begin only after the working drawings and design computations have been reviewed and the Engineer has authorized fabrication to begin. The Contractor shall submit to the Engineer, no less than 2 weeks prior to the start of fabrication, the name and location of the fabrication shop where the work will be done so that arrangements can be made for an audit of the facility and the assignment of the Department Quality Assurance (QA) inspector. No fabrication will be accepted unless the QA inspector is present during fabrication. No changes may be made during fabrication without prior written approval by the Department.

The Contractor shall furnish facilities for the inspection of material and workmanship in the shop by the Engineer. The Engineer and his representative shall be allowed free access to the necessary parts of the premises.

The Engineer will provide QA inspection at the fabrication shop to assure that all applicable Quality Control plans and inspections are adequately adhered to and maintained by the Contractor during all phases of the fabrication. A thorough inspection of a random selection of elements at the fabrication shop may serve as the basis of this assurance.

Prior to shipment to the project, each individual piece of steel shall be marked in a clear and permanent fashion by a representative of the fabricators' Quality Control (QC) Department to indicate complete final inspection by the fabricator and conformance to the project specifications for that piece. The mark must be dated. A Materials Certificate in accordance with Article 1.06.07 may be used in lieu of individual stamps or markings, for all material in a single shipment. The Materials Certificate must list each piece within the shipment and accompany the shipment to the project site.

Following the final inspection by the fabricator's QC personnel, the Engineer may select pieces of steel for re-inspection by the Department's QA inspector. Should non-conforming pieces be identified, all similar pieces must be re-inspected by the fabricator and repair procedure(s) submitted to the Engineer for approval. Repairs will be made at the Contractor's expense.

The pieces selected for re-inspection and found to be in conformance, or adequately repaired pieces, may be marked by the QA inspector. Such markings indicate the Engineer takes no exception to the pieces being sent to the project site. Such marking does not indicate acceptance or approval of the material by the Engineer.

All welding details, procedures and nondestructive testing shall conform to the requirements of AWS D1.1 Structural Welding Code - Steel.

Personnel performing the nondestructive testing shall be certified as a NDT Level II technician in accordance with the American Society for Non Destructive Testing (ASNT), Recommended Practice SNT-TC-1A and approved by the Engineer.

All nondestructive testing shall be witnessed by Engineer. Certified reports of all tests shall be submitted to the Engineer for examination. Each certified report shall identify the structure, member, and location of weld or welds tested. Each report shall also list the length and location of any defective welds and include information on the corrective action taken and results of all retests of repaired welds.

The Department reserves the right to perform additional testing as determined by the Engineer. Should the Engineer require nondestructive testing on welds not designated in the contract, the cost of such inspection shall be borne by the Contractor if the testing indicates that any weld(s) are defective. If the testing indicates the weld(s) to be satisfactory, the actual cost of such inspection will be paid by the Department.

All members and components shall be hot-dip galvanized in a single dip. Double-dipping of members and components is not permitted. All exterior and interior surfaces of the sign support members and components shall be completely galvanized.

Galvanized members and components shall be free from uncoated areas, blisters, flux deposits, and gross inclusions. Lumps, projections, globules, or heavy deposits of zinc which will interfere with the intended use of the material will not be permitted.

All damaged areas of the hot-dip galvanized surfaces shall be repaired in accordance with the requirements of ASTM A780. If paint containing zinc dust is used for repairs, the dry coating thickness shall be at least 50% greater than the thickness of the adjacent hot-dip galvanized coating, but no greater than 4.0 mils. The paint shall be brush applied. The use of aerosol spray cans shall not be permitted. The color of the finished repair area shall match the color of the adjacent hot-dip galvanized surface at the time of the repair to the satisfaction of the Engineer.

Prior to shipping, all galvanized surfaces of the members and components shall be inspected, in the presence of the Engineer, to determine the acceptability of the galvanized coating. Galvanized coatings may be found acceptable by the Engineer if all surfaces of the members and components meet the galvanizing requirements herein. Only sign support members and components with acceptable galvanized coatings shall be shipped. If the galvanized coating on any member or component is found not acceptable, the Contractor shall submit a repair procedure to the Engineer for review.

Unless provisions for the sign support structure number are otherwise included in the contract, the sign support structure number shall be stenciled in black paint on the right side pole (as determined by the direction of traffic traveling below the structure) centered approximately 5'

off the ground and visible from the roadway. The numeric characters shall be 3" to 4" high and placed vertically so that they may be read from top to bottom.

After fabrication, the sign support components shall be assembled in the fabricator's shop, in the presence of the Engineer, to determine the acceptability of the bolted connections and to confirm the permanent camber. The faying surfaces of the connections shall be free of dirt, loose scale, burrs, other foreign material and other defects that would prevent solid seating of the parts. Prior to assembly, the galvanized faying surfaces shall be scored by wire brushing. The faying surfaces of the connection plates shall be checked with a straight edge to ensure that the surfaces are not distorted and the entire faying surface of each plate will be in contact when assembled. The high-strength bolts, including nuts and washes, shall be installed and tensioned in accordance with Subarticle 6.03.03-4(f). A connection may be found acceptable by the Engineer if the faying surfaces of the connection plates are in firm, continuous contact after properly tensioning the bolts. Only sign supports with acceptable connections shall be shipped. If a bolted connection is found not acceptable, the Contractor shall submit a procedure to repair the connection to the Engineer for review. Galvanized surfaces damaged by the repair procedure shall be hot dip galvanized. Repair of the damaged galvanized surfaces in accordance with the requirements of ASTM A780 or with a galvanizing repair stick is not permitted. Bolts, nuts and washers used for the trial shop fit-up shall not be reused in the final field assembly. The permanent camber shall be measured at mid-span and the member shall be rejected if the camber does not meet the following:

$$L/1000 \leq \text{Permanent Camber} \leq L/500$$

where L is the span length of the overhead member measured from centerline to centerline of the tower posts.

The finished members and components shall be protected with sufficient dunnage and padding to protect them from damage and distortion during transportation. Damage to any material during transportation, improper storage, faulty erection, or undocumented fabrication errors may be cause for rejection of said material at the project site. All costs associated with any corrective action will be borne by the Contractor.

Following delivery to the project site, the Engineer will perform a visual inspection of all material to verify shipping documents, fabricator markings, and that there was no damage to the material or coatings during transportation and handling.

The Engineer is not responsible for approving or accepting any fabricated materials prior to final erection and assembly at the project site.

High-strength bolts, nuts and washers shall be stored in accordance with Subarticle 6.03.03-4(f).

The support shall be erected, assembled and installed in accordance with these specifications and the procedures and methods submitted with the working drawings. The Contractor and the support designer are responsible to ensure that the erection and assembly procedures and

methods in this specification are acceptable for use with the support. Changes to these methods and procedures shall be submitted with the working drawings and computations.

Prior to installation of the support, the exposed threads of all the embedded anchor bolts shall be cleaned of accumulated dirt and concrete and lubricated. The threads and bearings surfaces of all the anchor bolt nuts shall be cleaned and lubricated. The anchor bolts and nuts are properly lubricated if the nuts can be turned by hand on the anchor bolt threads. The lubricant shall contain a visible dye of any color that contrasts with the color of the galvanizing. Re-lubricate the threads of the anchor bolts and nuts if more than 24 hours has elapsed since earlier lubrication, or if the anchor bolts and nuts have become wet since they were first lubricated.

The space between the bottom of the baseplate and the top of the foundation shall not be sealed with closed cell elastomer or filled with grout, unless otherwise noted.

Install (turn) the leveling nuts onto the anchor bolts and align the nuts to the same elevation or plane. The distance from the bottom of the leveling nuts to the top of the foundation shall not exceed 1". Place a structural hardened washer on top of each leveling nut, 1 washer on each anchor bolt.

The tower shall be erected so that the centerline of the tower will be plumb after the application of all the dead loads.

Install the post base plate atop the washers resting on the leveling nuts, place a structural hardened washer on each anchor bolt resting it on the top of the base plate, and install (turn) a top nut on each anchor bolt until the nut contacts the washer. The leveling nuts and washers shall be inspected, and if necessary the nuts (turned), so that the washers are in full contact with the bottom surface of the base plate.

Tighten the top nuts to a snug tight condition in a star pattern. Snug tight is defined as the maximum rotation resulting from the full effort of one person using a 12" long wrench or equivalent. A star tightening pattern is one in which the nuts on opposite or near-opposite sides of the bolt circle are successively tightened in a pattern resembling a star (e.g., For an 8-bolt circle with bolt sequentially numbered 1 to 8, tighten nuts in the following bolt order: 1, 5, 7, 3, 8, 4, 6, 2.).

Tighten leveling nuts to a snug tight condition in a star pattern.

Before final tightening of the top nuts, mark the reference position of each top nut in a snug-tight condition with a suitable marking on 1 flat with a corresponding reference mark on the base plate at each bolt. Then incrementally turn the top nuts using a star pattern one-sixth of a turn beyond snug tight. Turn the nuts in at least two full tightening cycles (passes). After tightening, verify the top nut rotation. The top nuts shall have full thread engagement. The distance from the bottom of the leveling nuts to the top of the foundation shall not exceed 1".

High-strength bolts, including nuts and washes, shall be installed and tensioned in accordance with Subarticle 6.03.03-4(f). The truss shall be temporarily and fully supported while all the high-strength bolts are installed and tensioned. The temporary support of the truss shall not be removed until the Engineer has confirmed that the faying surfaces of the connection/flange plates are in firm, continuous contact and the high-strength bolts were properly installed and tensioned. All high-strength bolts in the bolted connections shall be inspected (in accordance with Subarticle 6.03.03-4(f)) to confirm the high-strength bolts were properly tensioned.

After erecting the support, the support shall be electrically grounded by attaching the bare copper grounding conductor to the inside of the handhole frame with a galvanized steel bolt and to the ground rod with a ground clamp. The rigid metal conduit shall be electrically grounded by attaching the bare copper grounding conductor to the insulated bonding bushing and to the ground rod with a ground clamp.

After erection of the support and before the installation of the sign panels, if the structure exhibits excessive vibration, oscillations or deflections as determined by the Engineer, the Contractor shall immediately stabilize the structure to the satisfaction of the Engineer. Stabilizing the structure may require the removal of a portion of the structure or the entire structure.

The sign panels shall be located and mounted on the truss as shown in the working drawings.

After installation of the sign panels, the anchor bolts nuts (leveling and top anchor nut) and washers shall be in full contact with the top and bottom surfaces of the post baseplate and the centerline of the post shall be plumb.

After erection of the support and after the installation of the sign panels, if the structure exhibits excessive vibration, oscillations or deflections as determined by the Engineer, the Contractor shall design and construct devices to mitigate the movements. The Contractor is responsible for immediately stabilizing the structure to the satisfaction of the Engineer. Stabilizing the structure may require the removal of the sign panels or the entire structure. Prior to installation of any mitigation device, the Contractor shall submit drawings, design computations other documentation to the Engineer for review in accordance with Article 1.05.02.

**Method of Measurement:** This work will be measured for payment by the number of bridge sign structures, completed and accepted in place.

**Basis of Payment:** This work will be paid for at the contract unit price each for "4 Chord Truss Bridge Sign Structure", complete in place, which price shall include the field survey, equipment, materials, tools and labor incidental to the design, fabrication and installation, including anchorage materials, sign panel support members and mitigation devices, if required, of the supports at the locations specified on the plans.

## **ITEM #1201804A – 4 CHORD TRUSS CANTILEVER SIGN STRUCTURE**

**Description:** Work under this item shall consist of designing, fabricating and installing a sign support structure to carry extruded aluminum traffic signs, on a prepared foundation, in accordance with the details shown on the plans, in accordance with these specifications and as ordered by the Engineer. For the purposes of this specification, the sign support structure shall be composed of a cantilevered 4 chord truss supported by a single linear tubular pole member.

**Materials:** The poles shall be tubular members with either a round or multisided cross-section. The round tubular members shall be fabricated from steel pipe with a tabulated yield stress no less than 35,000 psi. The multisided tubular members shall be fabricated from steel plate conforming to the requirements of ASTM A709, Grade 50T2.

The truss chord members shall be tubular members with a round cross-section fabricated from steel pipe with a tabulated yield stress no less than 35,000 psi. Truss chord members fabricated from tubular members with a multisided cross-section are not permitted.

The truss bracing members shall be tubular members with a round cross-section fabricated from steel pipe with a tabulated yield stress no less than 35,000 psi.

The structural plate components, such as the baseplates, connection/flange/splice plates, gusset plates, handhole frames and plates in the truss to pole connection, shall be made of steel that conforms to the requirements of ASTM A709, Grade 50T2.

Anchorage plates shall conform to the requirements of ASTM A709, Grade 50T2.

The non-structural components, such as hand hole covers and cap plates, shall conform to the requirements of ASTM A709, Grade 50. Sign panel support members shall conform to the requirements of ASTM A709, Grade 50.

The use of steel plate or rolled shapes with a tabulated yield stress less than 50 ksi is not permitted.

The steel for pole, truss chord members, structural plate components, such as the baseplates, connection/flange/splice plates, gusset plates, handhole frames and plates in the truss to pole connection, shall meet the following Charpy V-notch impact testing requirements:

<b>Yield Strength</b>	<b>Thickness in.</b>	<b>Minimum Test Value Energy ft.-lbs.</b>	<b>Minimum Average Energy, ft.-lbs.</b>
$F_y \leq 36 \text{ ksi}$	$\leq 4$	20	25 at 40°F
$36 \text{ ksi} < F_y \leq 50 \text{ ksi}$	$\leq 2$	20	25 at 40°F
$36 \text{ ksi} < F_y \leq 50 \text{ ksi}$	$2 < t \leq 4$	24	30 at 40°F
$50 \text{ ksi} < F_y \leq 70 \text{ ksi}$	$\leq 4$	28	35 at -10°F

Charpy V-notch sampling and testing shall be in accordance with ASTM A673, "P" piece frequency.

The weld filler metal shall have a matching strength relationship with the base metal.

All high strength bolts shall conform to ASTM A325, Type 1. Nuts shall conform to ASTM A563, Grade DH. Circular, flat, hardened steel washers shall conform to ASTM F436. The bolts, nuts and washers shall be galvanized in accordance with ASTM A153 or ASTM B695, Class 50. The nuts shall be overtapped to the minimum amount required for the bolt assembly and all surfaces of the nuts shall be lubricated with a lubricant containing a visible dye of any color that contrasts with the color of the galvanizing. The high strength bolts shall conform to the requirements of Subarticle M.06.02-3.

Compressible-washer-type direct tension indicators shall conform to ASTM F959, Type 325, and shall be galvanized in accordance with ASTM B695, Class 50.

U-bolts and threaded rods shall conform to ASTM A449. The nuts shall conform to ASTM A563, Grade DH. The washers shall conform to ASTM F436. The bolts, nuts and washers shall be galvanized in accordance with ASTM A153 or ASTM B695, Class 50. The nuts shall be overtapped to the minimum amount required for the fastener assembly and all surfaces of the nuts shall be lubricated with a lubricant containing a visible dye of any color that contrasts with the color of the galvanizing. The threaded ends of all U-bolts and threaded rods shall be supplied with 1 washer and 2 nuts.

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.

Bare copper grounding conductor shall be #8 AWG stranded bare copper wire conforming to M.15.13. The grounding bolt shall be galvanized steel with a hex head.

All materials used in the finished structure shall be new. The use of materials that have been previously used in a structure or salvaged from a structure is not permitted.

The Contractor shall submit Certified Test Reports and Materials Certificates in conformance with Article 1.06.07 for the steel used in the support members and components, high-strength bolts (including nuts and washers), anchor bolts (including nuts and washers), U-bolts (including nuts and washers) and threaded rods (including nuts and washers). In addition, the following shall be submitted:

- a. Mill test reports that indicate the place where the material was melted and manufactured.
- b. High-strength bolt test results for proof load tests, wedge tests, and rotational-capacity tests that indicate where the tests were performed, date of tests, location of where the components were manufactured and lot numbers.
- c. Galvanized material test results that indicate the thickness of the galvanizing.

Prior to incorporation into the work, the Contractor shall submit samples in conformance with Article 1.06.02 for the steel used in the support members and components, high-strength bolts (including nuts and washers), anchor bolts (including nuts and washers), U-bolts (including nuts and washers) and threaded rods (including nuts and washers).

**Construction Methods:** The design and fabrication of the sign support structure, including its anchorage (into the foundation) and the hardware and structural members required to support the traffic appurtenances, shall conform to the requirements of the latest edition of the AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaries and Traffic Signals, including the latest interim specifications, available prior to the advertising date of the contract, amended as follows:

- The dead load of the sign panels, sign panel support members and hardware shall be no less than the 8 psf.
- The design wind speed shall be 120 mph. The computation of wind pressures in accordance with Appendix C is not permitted.

- The minimum design life for the structures shall be 50 years.
- The wind importance factor,  $I_r$ , for wind pressure shall be 1.00.
- The wind drag coefficient,  $C_d$ , for traffic signs shall be 1.3.
- The height and exposure factor,  $K_z$ , shall be determined based on the highest elevation of the structure or the supported sign panels. The factor shall be considered constant in all pressure calculations required for the design of the structure. The height and exposure factor shall be no less than 1.05.
- The sign structure shall be designed for fatigue category I for cantilevered structures. The sign structure shall be designed for the wind load effects due to natural wind gusts and truck-induced gusts. The design pressure for the truck-induced gust shall be based on a truck speed of 65 mph. The sign structure shall be designed assuming that vibration mitigation devices will not be installed.
- The vertical deflection of the free end of the truss due to the wind load effects of truck-induced gusts shall not exceed 8".
- The fixity of the structure connections shall be as follows:
  - Welded gusset plate, bracing member to chord connections shall be considered rigid in the plane of the gusset plate and pinned perpendicular to the plane of the gusset plate.
  - Flange plate chord to chord connections shall be considered rigid with respect to both axes.
  - Baseplate to anchor bolt connection shall be considered rigid with respect to both axes.
- The minimum effective length factor,  $K$ , shall be as follows:
  - For the pole,  $k = 2.1$
  - For truss chord and bracing,  $k \geq 1.0$
- The maximum stress ratio (the ratio of the computed stress to the allowable stress) or combined stress ratio in any sign structure component due to each group load shall not exceed 0.85. The purpose for limiting the CSR is to allow for future additional sign panel configurations.
- The truss shall be cambered to compensate for the dead load deflections. The truss shall have a permanent camber no less than  $L/1000$  and no greater than  $L/500$ .  $L$

is the span length of the cantilever truss measured from centerline of the pole to the end of the truss. The permanent camber is in addition to the dead load camber. The total camber shall be obtained with the use of through chord connection plates installed at an angle.

- The maximum span length of the truss shall be 45'-0", measured from the centerline of the pole to the end of the truss.
- The truss chords shall be fabricated in 1 or more sections and connected with chord flange splices. The chords within the sections shall be fabricated from single pieces of pipe. Chord sections fabricated from multiple pieces of pipe are not permitted. All truss chords shall have the same cross-sectional properties and material designations. The minimum wall thickness of the truss chord members shall be  $\frac{5}{16}$ ".
- The truss bracing shall be fabricated from steel pipe. All truss bracing shall have the same cross-sectional properties and material designations. The bracing shall have a minimum nominal diameter of 2½". The bracing shall have a minimum thickness of 0.203". The bracing shall be connected to truss chord gusset plates with slotted tube connections. The bracing slot shall have a coped hole at the end of the slot. In a minimum of 25% of the bracing gusset plate to truss chord connections, 100% of the fillet welds on each side of the connection, shall be non-destructively tested in accordance with the magnetic particle method.
- At a minimum, internal diagonal bracing shall be provided at each end of each truss section to maintain the shape and stability the truss sections during shipping and handling of the sections and the erection of the completed truss. At a minimum, additional internal diagonal bracing shall be placed at a panel point at the midspan of the truss sections greater than 25'-0" in length. The internal diagonal bracing may be provided using either a single or multiple members.
- The minimum diameter of the pole shall be 2'-0". The maximum diameter of the pole shall be 2'-6".
- The pole shall be a tubular member with either a round or multisided cross-section. Multisided tubular members with other than 16 sides are not permitted. Multisided tubular member with fluted sides are not permitted.
- The minimum wall thickness of the pole shall be  $\frac{5}{16}$ ". The wall thickness of the pole shall be uniform throughout its length. The use of multiple plies (laminations) to obtain the required member thickness is not permitted. The use of shop-fabricated stepped members is not permitted.

- Joining 2 tubular members together with a circumferential weld to fabricate a pole is not permitted.
- Slip-type field splices are not permitted in any member.
- The poles may be fabricated with no more than 2 longitudinal seam welds. The seam welds shall be ground smooth and flush with the adjacent base metal. The use of external longitudinal reinforcement bars at longitudinal seam welds is not permitted. The use of spiral seam welds is not permitted.
- The longitudinal seam welds within 6" of the member ends shall be complete joint penetration groove welds.
- 100% of partial joint penetration longitudinal seam welds shall be non-destructively tested in accordance with the magnetic particle method. 100 % of complete joint penetration seam welds shall be non-destructively tested in accordance with the ultrasonic method.
- All tubular member to transverse plate connections shall be made with a complete joint penetration groove weld with a backing ring attached to the plate with a continuous fillet weld. 100% of the complete joint penetration groove welds shall be non-destructively tested by the ultrasonic method after fabrication and prior to galvanizing. 100% of the complete joint penetration groove welds shall also be non-destructively tested by the ultrasonic method for toe cracks after galvanizing. 100% of backing ring fillet welds shall be non-destructively tested by the magnetic particle method after fabrication prior to galvanizing. After galvanizing, the joint between the backing ring and tubular member shall be sealed with silicone sealant to prevent the ingress of moisture.
- The use of stiffeners at tubular member to base plate connection is not permitted.
- The strength of a connection made with a complete joint penetration groove weld shall be no greater than the strength of the base metal. In connections joining base metal with different yield strengths, the base metal with the lower yield strength shall govern the design.
- The minimum flange splice plate thickness shall be 2". The determination of the plate thickness in the tubular member to transverse plate connections shall consider the potential for the plate to warp due to the heat from welding. Consideration should be given to the use of thicker plates to allow for subsequent machining of warped plates to a flat surface so that removal of material will not compromise the required strength of the plate.
- All high-strength bolted connections shall be designed as slip critical connections with standard holes, unless otherwise noted. The high-strength bolts shall

conform to the maximum spacing requirements for sealing and stitch fasteners. The high-strength bolts shall conform to the edge distance requirement for fasteners. Consideration should be given to the use of smaller diameter bolts since they require lower specified minimum bolt tensions.

- The minimum number of high-strength bolts in flange splices in the truss chords shall be 6.
- The minimum thickness of the truss to pole connection plates shall be  $\frac{3}{4}$ ". The minimum thickness of the truss bracing gusset plates and the stiffener plates shall be  $\frac{1}{2}$ ".
- The minimum size fillet weld shall be  $\frac{1}{4}$ ", unless noted otherwise. The use of seal and tack welds is not permitted. No welding shall be performed after galvanizing.
- The minimum base plate thickness shall no less than  $2\frac{1}{2}$ " or at least as thick as the anchor bolt diameter, whichever is greater. The determination of the plate thickness in the tubular member to transverse plate connections shall consider the potential for the plate to warp due to the heat from welding. Consideration should be given to the use of thicker plates to allow for subsequent machining of warped plates to a flat surface so that removal of material will not compromise the required strength of the plate.
- The opening in the base plate shall be sized to allow for proper galvanizing and allow conduits projecting from the foundation to pass through it. The size of the opening shall be kept to a minimum to reduce the flexibility of the baseplate.
- The 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,  $\frac{3}{4}$ " minimum thickness, to transmit loads from the pole base to the concrete foundation. The use of hooked anchor bolts is not permitted. The minimum number of anchor bolts shall be 12. The minimum anchor bolt diameter shall be 2". The minimum anchor bolt embedment, the distance from the top of the foundation to the top of the embedded anchorage plate, shall be 3'-6" or the tension development length of the vertical foundation reinforcement plus the end concrete cover, which ever is greater. Each anchor bolt shall be supplied with 5 nuts and 4 washers. Washers shall be placed on the top and bottom surfaces of the pole base plate and anchorage plate. Welding to the anchor bolts is not permitted. The use of lock washers with the anchor bolt assembly is not permitted.

The approximate dimensions of the truss and the pole heights are shown in plan and elevation on the traffic sheets. The actual sign support dimensions shall be determined by the Contractor

based on a the horizontal and vertical clearances shown on the plans, a field survey of the finished grade at the site, the elevation of the top of the finished foundation, the locations of overhead and subsurface utilities, the location of the drainage facilities and noise barrier wall locations.

The minimum vertical clearance from the top of the finished road to the bottom of the sign panels and the centerline of the truss shall be as shown on the sign support drawings as amended by the sign support elevation on the traffic sheets.

Sign panels shall be installed symmetrically about the centerline of the truss. The bottom of all signs shall be level. Sign panels shall be installed at an angle of 5° from the vertical, with the top edge tilting toward oncoming traffic.

The sign panels and crown panels, if applicable, shall be connected to sign panel support members. The support members shall extend full height of the sign and crown panels. The number and spacing of support members shall be determined by the Contractor based on the width of the sign and crown panels and the support member spacing parameters shown on the plans. Sign panels shall be supported by no less than 3 support members. Crown panels shall be supported by no less than 2 support members. The faying surface between the sign panel support member and the rear face of the sign panel shall be a flange so that panel clips may be placed on both sides of the flange to connect the panel. The outside support members for each sign panel shall include a sign stop at the bottom of the member and a sign hook at the top of the member to support and carry the sign panels.

The sign panel support members shall be designed to be vertically adjustable to compensate for the truss camber. The supports members shall be designed to be installed at any location along the truss. The use of U-bolts and threaded rods is permitted. No less than 2 U-bolts or 4 threaded rods shall be used at each chord connection. The threaded ends of these fasteners shall have double nuts.

The minimum thickness of the sign panel support members and the plate and rolled shape components used in the connection to the sign support shall be ¼”.

The sign support shall be designed for the load effects due to the actual sign panels, including crown panels, as well as any future sign and crown panels that it will carry, as shown on the plans. The sign supports shall also be designed for the load effects of sign and crown panels during all stages of construction which may exist during the project under which the supports are installed. The load effects on the sign support from the sign and crown panels shall include forces and moments due to the eccentricity of the sign and crown panels and the unbalanced lateral loads on the crown panel. The sign support and its component parts shall also be designed for the load effects resulting from the transportation and erection of the support.

The sign support shall be designed so that the pole extends into the truss and is connected at each chord. Connection plates, through each chord, shall be fastened with high-strength bolts to stiffened connection plates fillet welded to the pole. 100% of the fillet welds used in the truss to

pole connection shall be non-destructively tested in accordance with the magnetic particle method. All bolts, nuts and washers used in the connection shall be visible. The use of tapped holes in the plates of the connection is not permitted.

Vent and drain holes shall be provided for galvanizing. The number, size and location of vent and drain holes should be coordinated with the galvanizer prior to the submission of the sign support design. The area of vent and drain holes at each end of a member shall be at least 30% of the inside area of the member for members 3" in diameter and greater and 45% of the inside area of the member for members smaller than 3" in diameter. The vent and drain holes shall be strategically located for reducing stress and for proper galvanizing. The holes shall be made by drilling. Flame cut holes are not permitted. The edges of all holes shall be rounded by grinding. After galvanizing, exposed holes placed in the sign support components for galvanizing shall be sealed with neoprene plugs.

The pole shall have a handhole located adjacent to base of the pole. The handhole shall be reinforced with a frame. The handhole shall be located with a normal direction that is 90° to the plane formed by the pole and overhead truss. 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 pole member or 2'-6", whichever is greater.

The handhole frame shall be fabricated from steel plate and bent to form a closed shape and joined with a complete joint penetration groove weld. All surfaces of the groove weld shall be ground smooth and flush with the adjacent base metal. The handhole frame shall have a minimum 4" wide by minimum 6" high clear opening. The maximum width of the handhole opening, the clear opening plus twice the frame thickness, shall not be greater than 40% of the pole diameter at that section. The inside corners of the handhole frame shall be rounded to a radius of 30% to 50% of the width of the clear opening. The minimum thickness of the handhole frame shall be no less than the thickness of the pole or 5/16", whichever is greater. The handhole frame shall be connected to the pole with a partial joint penetration groove weld reinforced with a fillet weld. The handhole weld shall start and end at the point that is coincident with the longitudinal axis of symmetry of the pole and the longitudinal axis of symmetry of the handhole frame. 100% of the weld shall be non-destructively tested in accordance with the magnetic particle method. The handhole shall be provided with a cover connected to the frame with no less than 4 stainless steel screws. The cover shall be installed with a neoprene gasket matching the dimensions of the cover. The cover shall also be attached to the frame with a 1'-6" long stainless steel chain. The stainless steel chain shall be bolted to the cover inside face of the cover with a stainless steel bolt with a lock nut and bolted to the inside side face of the handhole frame with a stainless steel bolt. On pole hand hole frames, the opposite side face of the handhole shall have a hole with a nut welded to outside face for a galvanized steel grounding bolt.

The ends of each chord member shall be sealed with a removable end cap plate attached to the member with a threaded fastener. The joint between the member and plate shall be sealed with a neoprene gasket.

The design of the sign support and the anchorage shall be coordinated with the design of the foundation to ensure that the foundation is adequate for the support reactions and to avoid conflicts between the embedded anchorage and the foundation reinforcement.

Prior to performing a field survey for each sign support, the Contractor shall coordinate with the Engineer to locate and stake each support foundation. The foundations shall be located to avoid conflicts with both subsurface and overhead utilities and subsurface drainage structures. In accordance with Article 1.05.15, the Contractor shall contact "Call Before You Dig" to identify the subsurface utilities that are located in the vicinity of each foundation. Once the location of each foundation has been found acceptable to the Engineer, the Contractor shall perform a field survey to obtain the information necessary to prepare a roadway cross-section with details of each sign support and supporting foundation(s).

The Contractor shall prepare and submit one copy of a cross-section (elevation) drawing based on a field survey for each sign support to the Engineer for review. A cross-section drawing is a working drawing for permanent construction. The cross-section drawing for each support shall be submitted in an individual file in electronic portable document format (.pdf) with commenting enabled. The electronic portable document format (.pdf) cross-section drawings shall be created on ANSI D (22" x 34") full scale (1" electronic file = 1" paper) sheets. (The purpose of creating the drawings on ANSI D sheets is so that the sheets may be printed/plotted at that size or smaller without loss of legibility.) Each drawing shall have a border and title block. Located in the lower right hand corner of the drawing adjacent to the title block, each drawing shall have a rectangular box, 2 1/4" wide x 1 3/4" high, for the reviewers stamp. On the ANSI D full scale sheets, the minimum text height and width shall be 1/8". All letter characters shall be uppercase. Only one sign support cross-section shall be shown on each drawing.

The cross-sections shall include, but not be limited to the following:

- Project number, town, location (route number, direction, mileage), station, structure number, sign location number, and site number
- Location and dimensions of travel lanes and shoulders
- Location and elevation of the high point of the road
- Top and bottom of slope elevations. Slope of finished grade at foundations
- Locations of utilities (both overhead and subsurface)
- Locations of drainage facilities
- Locations of noise barriers, including elevation of top of wall



- Type of protection (metal beam rail/barrier), and the dimension from the front face of metal beam rail /barrier to the edge of the foundation and centerline of the foundation
- Elevation of the top of the foundation(s). The top of the foundation(s) shall project 6” to 12” above the level ground or 6” to 12” above the finished grade at the high side of a sloping grade.
- Dimension from top foundation to finish grade (existing or proposed as applicable).
- Span, dimension from centerline to centerline of foundations
- Dimensions of sign panel(s)
- Location of sign panel(s) relative to the centerline of the foundations/poles
- Location of sign panel(s) relative to the roadway travel lanes
- Dimension from top of foundation to centerline of truss
- Minimum dimensions from high point of the road to the centerline of the truss and the bottom of the sign panel(s)
- Elevation of centerline of truss

The Contractor shall submit the cross-section drawings to the project’s “Engineer of Record” for review. The project’s “Engineer of Record” is identified in the signature block on the sign support traffic cross-section contract plans. A copy of the transmittal shall be sent to the District Construction office administering the project.

The reviewed and stamped cross-section drawings shall be sent by the reviewer, along with a recommendation regarding acceptance, to the District Construction office for review, comment and distribution. The acceptance of cross-section drawings does not relieve the Contractor from verifying that all dimensions are correct. If there are any changes to the proposed location of the sign support and foundations prior to the construction of the foundations, the cross-section shall be re-submitted for review.

Prior to fabrication, the Contractor shall submit working drawings and design computations for each sign support, **based on the reviewed cross-section**, to the engineer for review in accordance with Article 1.05.02. The working drawings and design computations for sign supports shall conform to working drawings for permanent construction. An individual, independently packaged set of working drawings and computations, with all details and documents necessary for fabrication and erection of the structure and its components, including a copy of the certificate of insurance, shall be prepared and submitted for **each** support. **A single**

**set of drawings with tabulated data for multiple sign support locations is not permitted.**

The alpha-numeric support identifier shall be included on these documents. The working drawings and computations shall be prepared in Customary U.S. units. Each working drawing shall be sealed, signed and dated. The cover/first sheet for the computations shall be sealed, signed and dated.

The packaged set of working drawings and computations for each support shall be submitted in an individual file in electronic portable document format (.pdf) with appropriate bookmarks and commenting enabled. The packaged set shall include the following:

- title sheet
- table of contents
- contact information for designer, fabricator and galvanizer – contact information should include name and address of each firm and the name of contact person with phone number and email address
- copy of the certificate of insurance
- copy of fabricator's AISC certification
- copy of the **reviewed** cross-section
- sign support working drawings
- sign support design computations
- welding procedures
- sign support installation procedure, including the method to plumb the poles

The electronic portable document format (.pdf) working drawings shall be created on ANSI D (22" x 34") full scale (1" electronic file = 1" paper) sheets. (The purpose of creating the drawings on ANSI D sheets is so that the sheets may be printed/plotted at that size or smaller without loss of legibility.) Each drawing shall have a border and title block. Located in the lower right hand corner of the drawing adjacent to the title block, each drawing shall have a rectangular box, 2 1/4" wide x 1 3/4" high, for the reviewers stamp. On the ANSI D full scale sheets, the minimum text height and width shall be 1/8". All letter characters shall be uppercase. The electronic files for the design computations, procedures and other supporting data shall be created on ANSI A (8 1/2" x 11"; Letter) sheets.

The working drawings shall include complete details of all sign support components. The drawings shall include, but not be limited to the following:

- the project number, town and support identification number
- reference to the design specifications, including interim specifications
- reference to the design specifications design criteria, such as design wind speed, minimum design life, etc.
- material specifications/designations for all components

- non-destructive weld testing requirements
- details of the location of the longitudinal seam weld in the pole
- vent and drain holes for galvanizing
- dead load and permanent camber
- a plan view of the anchor bolt layout relative to the orientation of the span
- anchor bolt dimensions, including embedment and projection
- support installation procedure, including the method to plumb the pole

The design computations shall include, but not be limited to the following:

- the project number, town and support identification number
- references to design specifications, including interim specifications, and the applicable code section and articles
- description/documentation for all computer programs used in the design
- drawings/models of the structure, components and connections, with dimensions, loads and references to the local and global coordinate systems used (as applicable), to facilitate review of the results
- Tabulation of the section properties of the tubular members at each analyzed section. The tabulated values should include the diameter,  $D$  (if round member); effective width,  $b$  (if multisided member, AASHTO 5.5.2); equivalent diameter (if multisided member, AASHTO 5.6), wall thickness,  $t$ ; inside bend radius,  $r_b$  (if multisided member, AASHTO 5.5.2), cross-sectional area,  $A$ ; moment of inertia,  $I$ ; section modulus,  $S$ ; radius of gyration,  $r$ . AASHTO Table B-1 may be used to determine the section properties. If Table B-1 is used, the radius measured to the mid-thickness of the wall shall also be provided.
- coefficients and factors used in the design
- results of all group loads and load combinations
- stress ratios and combined stress ratios for all group loads and load combinations

- maximum vertical deflection due to dead loads
- maximum vertical deflection due to ice loads
- vertical deflection of the free end of the truss due to the wind load effects of truck-induced gusts
- total camber and permanent camber

The Contractor shall submit the packaged set of working drawings and calculations to the project's "Engineer of Record". The project's "Engineer of Record" is identified in the signature block on the sign support structural contract plans. A copy of the transmittal shall be sent to the District Construction office administering the project.

The reviewed and stamped working drawings and calculations shall be sent by the reviewer, along with a recommendation regarding acceptance, to the District Construction office for review, comment and distribution. After the District Construction office has reviewed the working drawings and calculations, ensured all comments have been addressed and have found the submittal to be acceptable, in addition to distributing copies of the working drawings and calculations to the Contractor and District offices, a copy of each packaged set of working drawings and calculations shall be sent to the following Department offices:

Bridge Safety and Evaluation  
Research and Materials  
Traffic Engineering  
Engineer of Record

The Contractor shall make printed copies of the stamped working drawings and calculations, of the size and number determined by the Engineer, and deliver the copies as directed by the Engineer.

If the as-built condition of the foundation(s), such as the location or elevation, will impact the design, final erection or assembly of the sign support for conformance with the requirements herein, the cross-section shall be re-submitted for review. Subsequently, the working drawings and calculations shall be resubmitted to conform to the revised cross-section and the requirements herein.

The support shall be fabricated in accordance with the latest edition of the AASHTO LRFD Bridge Construction Specifications, including the latest interim specifications, amended herein.

The steel fabricator shall be AISC certified for the fabrication to the Standard for Bridge and Highway Metal Component Manufacturers (CPT).

Fabrication of the support may begin only after the working drawings and design computations have been reviewed and the Engineer has authorized fabrication to begin. The Contractor shall submit to the Engineer, no less than 2 weeks prior to the start of fabrication, the name and location of the fabrication shop where the work will be done so that arrangements can be made for an audit of the facility and the assignment of the Department Quality Assurance (QA) inspector. No fabrication will be accepted unless the QA inspector is present during fabrication. No changes may be made during fabrication without prior written approval by the Department.

The Contractor shall furnish facilities for the inspection of material and workmanship in the shop by the Engineer. The Engineer and his representative shall be allowed free access to the necessary parts of the premises.

The Engineer will provide QA inspection at the fabrication shop to assure that all applicable Quality Control plans and inspections are adequately adhered to and maintained by the Contractor during all phases of the fabrication. A thorough inspection of a random selection of elements at the fabrication shop may serve as the basis of this assurance.

Prior to shipment to the project, each individual piece of steel shall be marked in a clear and permanent fashion by a representative of the fabricators' Quality Control (QC) Department to indicate complete final inspection by the fabricator and conformance to the project specifications for that piece. The mark must be dated. A Materials Certificate in accordance with Article 1.06.07 may be used in lieu of individual stamps or markings, for all material in a single shipment. The Materials Certificate must list each piece within the shipment and accompany the shipment to the project site.

Following the final inspection by the fabricator's QC personnel, the Engineer may select pieces of steel for re-inspection by the Department's QA inspector. Should non-conforming pieces be identified, all similar pieces must be re-inspected by the fabricator and repair procedure(s) submitted to the Engineer for approval. Repairs will be made at the Contractor's expense.

The pieces selected for re-inspection and found to be in conformance, or adequately repaired pieces, may be marked by the QA inspector. Such markings indicate the Engineer takes no exception to the pieces being sent to the project site. Such marking does not indicate acceptance or approval of the material by the Engineer.

All welding details, procedures and nondestructive testing shall conform to the requirements of AWS D1.1 Structural Welding Code - Steel.

Personnel performing the nondestructive testing shall be certified as a NDT Level II technician in accordance with the American Society for Non Destructive Testing (ASNT), Recommended Practice SNT-TC-1A and approved by the Engineer.

All nondestructive testing shall be witnessed by Engineer. Certified reports of all tests shall be submitted to the Engineer for examination. Each certified report shall identify the structure, member, and location of weld or welds tested. Each report shall also list the length and location

of any defective welds and include information on the corrective action taken and results of all retests of repaired welds.

The Department reserves the right to perform additional testing as determined by the Engineer. Should the Engineer require nondestructive testing on welds not designated in the contract, the cost of such inspection shall be borne by the Contractor if the testing indicates that any weld(s) are defective. If the testing indicates the weld(s) to be satisfactory, the actual cost of such inspection will be paid by the Department.

All members and components shall be hot-dip galvanized in a single dip. Double-dipping of members and components is not permitted. All exterior and interior surfaces of the sign support members and components shall be completely galvanized.

Galvanized members and components shall be free from uncoated areas, blisters, flux deposits, and gross inclusions. Lumps, projections, globules, or heavy deposits of zinc which will interfere with the intended use of the material will not be permitted.

All damaged areas of the hot-dip galvanized surfaces shall be repaired in accordance with the requirements of ASTM A780. If paint containing zinc dust is used for repairs, the dry coating thickness shall be at least 50% greater than the thickness of the adjacent hot-dip galvanized coating, but no greater than 4.0 mils. The paint shall be brush applied. The use of aerosol spray cans shall not be permitted. The color of the finished repair area shall match the color of the adjacent hot-dip galvanized surface at the time of the repair to the satisfaction of the Engineer.

Prior to shipping, all galvanized surfaces of the members and components shall be inspected, in the presence of the Engineer, to determine the acceptability of the galvanized coating. Galvanized coatings may be found acceptable by the Engineer if all surfaces of the members and components meet the galvanizing requirements herein. Only sign support members and components with acceptable galvanized coatings shall be shipped. If the galvanized coating on any member or component is found not acceptable, the Contractor shall submit a repair procedure to the Engineer for review.

Unless provisions for the sign support structure number are otherwise included in the contract, the sign support structure number shall be stenciled in black paint on the right side pole (as determined by the direction of traffic traveling below the structure) centered approximately 5' off the ground and visible from the roadway. The numeric characters shall be 3" to 4" high and placed vertically so that they may be read from top to bottom.

After fabrication, the sign support components shall be assembled in the fabricator's shop, in the presence of the Engineer, to determine the acceptability of the bolted connections and to confirm the permanent camber. The faying surfaces of the connections shall be free of dirt, loose scale, burrs, other foreign material and other defects that would prevent solid seating of the parts. Prior to assembly, the galvanized faying surfaces shall be scored by wire brushing. The faying surfaces of the connection plates shall be checked with a straight edge to ensure that the surfaces are not distorted and the entire faying surface of each plate will be in contact when assembled.

The high-strength bolts, including nuts and washes, shall be installed and tensioned in accordance with Subarticle 6.03.03-4(f). A connection may be found acceptable by the Engineer if the faying surfaces of the connection plates are in firm, continuous contact after properly tensioning the bolts. Only sign supports with acceptable connections shall be shipped. If a bolted connection is found not acceptable, the Contractor shall submit a procedure to repair the connection to the Engineer for review. Galvanized surfaces damaged by the repair procedure shall be hot dip galvanized. Repair of the damaged galvanized surfaces in accordance with the requirements of ASTM A780 or with a galvanizing repair stick is not permitted. Bolts, nuts and washers used for the trial shop fit-up shall not be reused in the final field assembly. The permanent camber shall be measured at the end of the truss and the structure shall be rejected if the camber does not meet the following:

$$L/1000 \leq \text{Permanent Camber} \leq L/500$$

where L is the span length of the overhead member measured from centerline to the end of the truss.

The finished members and components shall be protected with sufficient dunnage and padding to protect them from damage and distortion during transportation. Damage to any material during transportation, improper storage, faulty erection, or undocumented fabrication errors may be cause for rejection of said material at the project site. All costs associated with any corrective action will be borne by the Contractor.

Following delivery to the project site, the Engineer will perform a visual inspection of all material to verify shipping documents, fabricator markings, and that there was no damage to the material or coatings during transportation and handling.

The Engineer is not responsible for approving or accepting any fabricated materials prior to final erection and assembly at the project site.

High-strength bolts, nuts and washers shall be stored in accordance with Subarticle 6.03.03-4(f).

The support shall be erected, assembled and installed in accordance with these specifications and the procedures and methods submitted with the working drawings. The Contractor and the support designer are responsible to ensure that the erection and assembly procedures and methods in this specification are acceptable for use with the support. Changes to these methods and procedures shall be submitted with the working drawings and computations.

Prior to installation of the support, the exposed threads of all the embedded anchor bolts shall be cleaned of accumulated dirt and concrete and lubricated. The threads and bearings surfaces of all the anchor bolt nuts shall be cleaned and lubricated. The anchor bolts and nuts are properly lubricated if the nuts can be turned by hand on the anchor bolt threads. The lubricant shall contain a visible dye of any color that contrasts with the color of the galvanizing. Re-lubricate the threads of the anchor bolts and nuts if more than 24 hours has elapsed since earlier lubrication, or if the anchor bolts and nuts have become wet since they were first lubricated.

The space between the bottom of the baseplate and the top of the foundation shall not be sealed with closed cell elastomer or filled with grout, unless otherwise noted.

Install (turn) the leveling nuts onto the anchor bolts and align the nuts to the same elevation or plane. The distance from the bottom of the leveling nuts to the top of the foundation shall not exceed 1". Place a structural hardened washer on top of each leveling nut, 1 washer on each anchor bolt.

The pole shall be erected so that the centerline of the pole will be plumb after the application of all the dead loads. The pole may be initially installed raked in the opposite direction of the overhead member to obtain the plumb condition. Raking the pole may be accomplished by installing the leveling nuts in a plane other than level.

Install the pole base plate atop the washers resting on the leveling nuts, place a structural hardened washer on each anchor bolt resting it on the top of the base plate, and install (turn) a top nut on each anchor bolt until the nut contacts the washer. The leveling nuts and washers shall be inspected, and if necessary the nuts (turned), so that the washers are in full contact with the bottom surface of the base plate.

Tighten the top nuts to a snug tight condition in a star pattern. Snug tight is defined as the maximum rotation resulting from the full effort of one person using a 12" long wrench or equivalent. A star tightening pattern is one in which the nuts on opposite or near-opposite sides of the bolt circle are successively tightened in a pattern resembling a star (e.g., For an 8-bolt circle with bolt sequentially numbered 1 to 8, tighten nuts in the following bolt order: 1, 5, 7, 3, 8, 4, 6, 2.).

Tighten leveling nuts to a snug tight condition in a star pattern.

Before final tightening of the top nuts, mark the reference position of each top nut in a snug-tight condition with a suitable marking on 1 flat with a corresponding reference mark on the base plate at each bolt. Then incrementally turn the top nuts using a star pattern one-sixth of a turn beyond snug tight. Turn the nuts in at least two full tightening cycles (passes). After tightening, verify the top nut rotation. The top nuts shall have full thread engagement. The distance from the bottom of the leveling nuts to the top of the foundation shall not exceed 1".

High-strength bolts, including nuts and washes, shall be installed and tensioned in accordance with Subarticle 6.03.03-4(f). The truss shall be temporarily and fully supported while all the high-strength bolts are installed and tensioned. The temporary support of the truss shall not be removed until the Engineer has confirmed that the faying surfaces of the connection/flange plates are in firm, continuous contact and the high-strength bolts were properly installed and tensioned. All high-strength bolts in the bolted connections shall be inspected (in accordance with Subarticle 6.03.03-4(f)) to confirm the high-strength bolts were properly tensioned.



After erecting the support, the support shall be electrically grounded by attaching the bare copper grounding conductor to the inside of the handhole frame with a galvanized steel bolt and to the ground rod with a ground clamp. The rigid metal conduit shall be electrically grounded by attaching the bare copper grounding conductor to the insulated bonding bushing and to the ground rod with a ground clamp.

After erection of the support and before the installation of the sign panels, if the structure exhibits excessive vibration, oscillations or deflections as determined by the Engineer, the Contractor shall immediately stabilize the structure to the satisfaction of the Engineer. Stabilizing the structure may require the removal of a portion of the structure or the entire structure.

The sign panels shall be located and mounted on the truss as shown in the working drawings.

After installation of the sign panels, the anchor bolts nuts (leveling and top anchor nut) and washers shall be in full contact with the top and bottom surfaces of the pole baseplate and the centerline of the pole shall be plumb.

After erection of the support and after the installation of the sign panels, if the structure exhibits excessive vibration, oscillations or deflections as determined by the Engineer, the Contractor shall design and construct devices to mitigate the movements. The Contractor is responsible for immediately stabilizing the structure to the satisfaction of the Engineer. Stabilizing the structure may require the removal of the sign panels or the entire structure. Prior to installation of any mitigation device, the Contractor shall submit drawings, design computations other documentation to the Engineer for review in accordance with Article 1.05.02.

**Method of Measurement:** This work will be measured for payment by the number of cantilever sign structures, completed and accepted in place.

**Basis of Payment:** This work will be paid for at the contract unit price each for "4 Chord Truss Cantilever Sign Structure", complete in place, which price shall include field survey, equipment, materials, tools and labor incidental to the design, fabrication and installation, including anchorage materials, sign panel support members and mitigation devices, if required, of the supports at the locations specified on the plans.

**ITEM #1202239A – OVERHEAD TRUSS SIGN SUPPORT FOUNDATION**

**Description:** Work under this item shall consist of the subsurface investigation, design and construction of foundations to support a 4 chord truss bridge sign structure, in accordance with the details shown on the plans, in accordance with these specifications and as ordered by the Engineer. The foundation may be either a spread footing foundation or a drilled shaft foundation as selected by the Contractor.

For the purpose of bidding this item, the Contractor shall assume that the subsurface conditions for each foundation location consists of cohesionless medium dense granular soil (AASHTO A-1 or A-2) with cobbles present and a high groundwater table which requires the use of wet construction/concreting methods.

**Materials:** The reinforcing steel shall be uncoated, ASTM A615, Grade 60 reinforcement conforming to the requirements of Article M.06.01.

Granular fill shall conform to M.02.01.

Temporary Earth Retaining System: Materials of steel sheet piling shall conform to the requirements of ASTM A328. Timber sheet piling shall conform to the requirements of Subarticle M.09.01-1. Materials other than steel or timber, or a combination of these may be used provided they are properly designed for the purpose intended. Systems utilizing other material(s) shall conform to the manufacturer's specifications and project specifications. The parts list shall be furnished for the proprietary system and the Contractor shall provide the material certificates for the parts.

Concrete for the spread footing foundation, both footing and pedestal, and for the formed pedestals of the drilled shaft foundation shall conform to Article M.03 for Class 'F' Concrete. The 28 day minimum compressive strength of the concrete in the constructed pedestal shall be 4,400 psi. The concrete mix design, including admixtures, shall be submitted to the Engineer for approval.

The concrete for the drilled shaft shall be dense, homogeneous, fluid, resistant to segregation and consolidate under self-weight. The concrete for the drilled shaft shall be a Contractor designed Portland cement concrete with a 3/8" (No. 8) maximum coarse aggregate size and a minimum of 705 lbs/cubic yard of cementitious materials. The initial concrete slump shall be 7"  $\pm$  1". The concrete shall maintain a minimum 4" slump for the duration of the concrete placement. The concrete shall contain 1% - 7% air entrainment. The 28 day minimum compressive strength of the concrete in the constructed foundation shall be 4,000 psi. The concrete mix design, including admixtures, shall be submitted to the Engineer for approval.

The slurry shall be Contractor designed mineral slurry that meets the range of values listed herein. The slurry mix design, including admixtures, shall be submitted to the Engineer for approval.

Rigid metal conduit, ground rod sleeves and related hardware, and end caps shall be galvanized steel conduit, conforming to the Plans and Article M.15.09.

Ground rods shall be 5/8" in diameter by 12'-0" long copper clad steel. The copper cladding shall be a minimum thickness of 0.128". The ground clamp shall be a square-head bolt type, approved for direct burial.

Bare copper wire shall conform to Article M.15.13.

Topsoil shall conform to Article M.13.01.

Fertilizer shall conform to Article M.13.03.

Seed mixture shall conform to Article M.13.04.

Mulch shall conform to Article M.13.05.

Erosion control matting shall conform to Article M.13.09.

### **Construction Methods:**

**Subsurface Conditions for Foundation Design:** As early as possible and prior to preparation of the foundation design, the Contractor **shall** perform a subsurface investigation for **each** sign foundation location. The subsurface data obtained in the exploration program at each site shall be used in the design of the foundation at that site. Use of the assumed subsurface condition (that was provided for the purpose of bidding), an assumed conservative subsurface condition or any other assumed subsurface condition shall not be allowed for use in the foundation design nor shall any assumed subsurface condition relieve the Contractor from their responsibility of obtaining a test boring at each foundation site. The subsurface investigation program should be prepared and executed in accordance with the most recent editions of the AASHTO Manual on Subsurface Investigations and ConnDOT Geotechnical Engineering Manual. The Contractor shall provide a full-time inspector to oversee the subsurface exploration program. The subsurface investigations and all related cost will not be measured for payment and shall be included in the cost of the foundation.

The Contractor shall review results of their subsurface investigation to determine if subsurface conditions for sign foundation locations differ materially from those assumed at the time of bid. Should the subsurface investigation(s) encounter conditions that differ materially, the Contractor shall notify the Engineer in writing prior to the submission of the working drawings and calculations. All matters regarding increased cost relating to agreed upon change in subsurface conditions will be handled per Section 1.04.04 – Differing Site Conditions.

**Design Requirements for Spread Footing Foundations:** The design of spread footing traffic structure foundations shall conform to the requirements of AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaries and Traffic Signals – latest edition, including the latest interim specifications, available prior to the advertising date of the contract, amended as follows:

- The footing and pedestal shall be designed for the traffic structure support reactions of all group loads and load combinations. No reduction of the reactions or increase in the allowable stresses of the materials is permitted.
- The minimum concrete cover for the reinforcement in the footing and pedestal shall be 3”.
- The footing shall have a top and bottom mat of reinforcement. The reinforcement in each mat shall extend full length and width of the footing. Splicing of the footing reinforcement is not permitted. The minimum size and spacing of reinforcement in each direction of each mat shall be #5 @ 12”.
- The foundation shall have a single rectangular pedestal connected to the footing with dowels cast into the footing. The minimum size and spacing of reinforcement in each face of the pedestal shall be #5 @ 12”.
- The minimum factor of safety against overturning shall be 2.0. Resistance to overturning shall be based solely on applicable dead loads.
- The minimum factor of safety against sliding and torsion shall be 1.5. The maximum value for the coefficient of friction to be used in determining the sliding resistance shall be 0.6. Resistance to sliding and torsion shall be based solely on applicable dead loads.
- The use of soil or rock anchors to increase overturning or sliding resistance is not permitted.
- If ground water is present, the design of the foundation shall include the effects of buoyancy.
- The footing shall be founded on entirely on either level soil or level rock. Constructing a footing on a sloping substrate is not permitted. Footings founded on a combination of soil and rock and soil are not permitted.
- Footings on soil shall be placed on a minimum of 12” of granular fill.
- The minimum embedment for a foundation, founded entirely on soil, shall be no less than 4’ below the finished grade at the low side of a sloping grade. The

minimum embedment for a foundation, founded entirely on rock, shall be no less than 6" below the finished grade at the low side of a sloping grade.

- The design of the foundation shall account for the slope of the finished grade.
- The top of the pedestal shall project 6" to 12" above the level ground or 6" to 12" above the finished grade at the high side of a sloping grade.
- The design of the foundation shall be coordinated with the traffic structure support to avoid conflicts between the embedded support anchorage and the reinforcement.

**Design Requirements for Drilled Shaft Foundations:** The design of drilled shaft traffic structure foundations shall conform to the requirements of AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaries and Traffic Signals – latest edition, including the latest interim specifications, available prior to the advertising date of the contract, amended as follows:

- The foundation shall be designed for the soils and rock properties and parameters based on the subsurface conditions (character of the soil and rock, presence of ground water, etc.) in the location of, adjacent to and below the drilled shaft foundation excavation determined by the subsurface investigation.
- The specified compressive strength,  $f'_c$ , of the concrete used in the design shall be 4,000 psi. The concrete cover for reinforcing in a drilled shaft shall conform to the following:

Shaft Diameter	Minimum Cover
Less than or equal to 3'-0"	3"
Greater than 3'-0" and less than 5'-0"	4"
Greater than or equal to 5'-0"	6"

- The reinforcement shall be uncoated and conform to ASTM A615, Grade 60.
- The foundation shall be designed for the traffic structure support reactions 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.
- For sign support foundations, the minimum drilled shaft diameter shall be 3'-0".
- The design of the drilled shaft foundation shall include embedment of the foundation in soil, the embedment of the foundation in rock or the embedment of the foundation partially in soil and partially in rock, as applicable.

- The design of the drilled shaft embedment depth shall account for the slope of the finished grade.
- The minimum embedment for a drilled shaft foundation, excavated entirely in soil, shall be no less than 15'-0" below the finished grade at the low side of a sloping grade. The minimum embedment for a drilled shaft foundation, excavated entirely in rock shall be no less than 10'-0" below the finished grade at the low side of a sloping grade.
- For sign support foundations, the top of the drilled shaft pedestal shall project 6" to 12" above the level ground or 6" to 12" above the finished grade at the high side of a sloping grade.
- The embedment depth for a drilled shaft foundation, determined by the Brom's design method, shall have a minimum factor of safety of 3.25 applied to the shear and moment load effects. The factor of safety applied to the torsional load effect shall be no less than 1.3.
- The load factor method shall be used for the structural design of the drilled shaft. The load factor applied to all loads, dead, wind and ice, and their effects, axial, shear, flexure and torsion, shall be no less than 1.6. The drilled shaft may be designed in accordance with the load factor method presented in the latest edition of the Building Code Requirements for Reinforced Concrete", ACI 318.
- The structural design of the drilled shaft shall be based on stress and strain compatibility in the circular drilled shaft cross section. The use of methods equating circular to rectangular drilled shaft cross sections is not permitted.
- The drilled shaft foundation shall be reinforced with longitudinal and transverse reinforcement. The area of longitudinal reinforcement should be no less than the sum of the reinforcement required for flexure and the longitudinal reinforcement required for torsion. The area of transverse reinforcement should be no less than the sum of the reinforcement required for shear and the transverse reinforcement required for torsion. Additional transverse reinforcement may be required at the top of the drilled shaft within the limits of the pedestal due to the torsional load on the anchor bolt group.
- The minimum number of longitudinal reinforcing bars shall be 16. The minimum size of longitudinal reinforcing bars shall be #8. The minimum area of longitudinal reinforcing bars shall be no less than 1% of the gross cross-sectional area of the shaft. The minimum clear distance between longitudinal reinforcing bars shall be no less than 5 times the maximum aggregate size or 5", whichever is greater. The reinforcement shall extend full length of the drilled shaft foundation, including the pedestal. Splicing of the longitudinal reinforcement is not permitted.

- The drilled shaft shall be transversely reinforced with spirals or circular, one piece, enclosed ties. The minimum size of the reinforcement shall be #4. The maximum spacing/pitch of the reinforcement shall be no more than 6". The spiral reinforcement shall be terminated at the top and the bottom with 1 ½ turns of the reinforcing and a 135° standard hook. Spirals may be spliced with lap splices or mechanical connectors. For spirals, the minimum lap splice length shall be 1.7 times the tension development length (including modification factors) of the bar or 48 bar diameters, whichever is greater. For spirals, the mechanical connectors shall develop both in tension and compression 125% of the specified yield strength of the bar and conform to the latest edition of the AASHTO LRFD Bridge Design Specifications, including the latest interim specifications. For ties, the minimum lap splice length shall be no less than 1.7 times the tension development length (including modification factors) of the bar. Tie lap splices shall be alternated. The ends of the bars in lap splices shall be anchored with a 135° standard hook around longitudinal reinforcement.
- For sign support foundations, the top of the drilled shaft shall be designed with a square pedestal to facilitate the installation of the anchor bolts and rigid metal conduits. The dimensions of the pedestal shall equal the diameter of the drilled shaft. The top and sides of the pedestal shall be reinforced with a grillage of reinforcement. The minimum size reinforcement shall be #5. The minimum concrete cover shall be 3"
- The design of the foundation shall be coordinated with the traffic structure support to avoid conflicts between the embedded support anchorage and the foundation reinforcement.

**Submittal Requirements for Foundations:** Prior to excavating for the foundation, the Contractor shall submit working drawings and design computations for the foundation(s) at each sign support, **based on the reviewed sign structure cross-section**, to the Engineer for review in accordance with Article 1.05.02. The working drawings and design computations for foundations shall conform to working drawings for permanent construction. An individual, independently packaged set of working drawings and computations, with all details and documents necessary for fabrication and construction, including a copy of the certificate of insurance, shall be prepared and submitted for the foundation(s) at **each** support. **A single set of drawings with tabulated data for multiple foundation locations is not permitted.** The alphanumeric support identifier shall be included on these documents. The working drawings and computations shall be prepared in Customary U.S. units. Each working drawing shall be sealed, signed and dated. The cover/first sheet for the computations shall be sealed, signed and dated.

The packaged set of working drawings and computations for the foundations at each support shall be submitted in an individual file in electronic portable document format (.pdf) with appropriate bookmarks commenting enabled. The packaged set shall include the following:

- title sheet
- table of contents
- contact information for designer – contact information should include name and address of design firm, name of contact person with phone number and email address
- copy of the certificate of insurance
- copy of the **reviewed** cross-section
- results of subsurface investigation, including boring logs and geotechnical design recommendations
- foundation working drawings
- foundation design computations

The electronic portable document format (.pdf) working drawings shall be created on ANSI D (22" x 34") full scale (1" electronic file = 1" paper) sheets. (The purpose of creating the drawings on ANSI D sheets is so that the sheets may be printed/plotted at that size or smaller without loss of legibility.) Each drawing shall have a border and title block. Located in the lower right hand corner of the drawing adjacent to the title block, each drawing shall have a rectangular box, 2 1/4" wide x 1 3/4" high, for the reviewers stamp. On the ANSI D full scale sheets, the minimum text height and width shall be 1/8". All letter characters shall be uppercase. The electronic files for the design computations, procedures and other supporting data shall be created on ANSI A (8 1/2" x 11") letter sheets.

The working drawings shall include complete details of all foundation components. The drawings shall include, but not be limited to the following:

- the project number, town and support identification number
- selected type of foundation (spread footing or drilled shaft)
- reference to the design specifications, including interim specifications
- material specifications for all components
- embedment depths for foundation in soil, rock and a combination of soil and rock
- anchor bolt details, including dimensions, embedment and projection

The design computations shall include, but not be limited to the following:

- the project number, town and support identification number
- references to design specifications, including interim specifications, and the applicable code section and articles
- description/documentation for all computer programs used in the design



- drawings/models of the foundation with dimensions, loads and references to the local and global coordinate systems used (as applicable), to facilitate review of the results
- sign support reactions of all group loads and load combinations
- soil and rock design parameters
- computations demonstrating the geotechnical and structural capacity of the foundation for all applicable axial and lateral load combinations

The Contractor shall submit the packaged set of working drawings and calculations to the project's "Engineer of Record". The project's "Engineer of Record" is identified in the signature block on the sign support structural contract plans. A copy of the transmittal shall be sent to the District Construction office administering the project.

The reviewed and stamped working drawings and calculations shall be sent by the reviewer, along with a recommendation regarding acceptance, to the District Construction office for review, comment and distribution. After the District Construction office has reviewed the working drawings and calculations, ensured all comments have been addressed and have found the submittal to be acceptable, in addition to distributing copies of the working drawings and calculations to the Contractor and District offices, a copy of each packaged set of working drawings and calculations shall be sent to the project's "Engineer of Record".

The Contractor shall make printed copies of the stamped working drawings and calculations, of the size and number determined by the Engineer, and deliver the copies as directed by the Engineer.

**Drilled Shaft Foundation Construction:** The Contractor performing the work described in this specification shall have installed drilled shafts of both diameter and length similar to those required for the traffic structures for a minimum of 3 years prior to the bid date for this project. The Contractor shall submit a list containing at least 3 projects completed in the last 3 years on which the Contractor has installed drilled shafts of a diameter and length similar to those shown on the plans. The list of projects shall contain names and phone numbers of owner's representatives who can verify the Contractors' participation on those projects. The Contractor shall provide a list identifying the on-site supervisor(s) and drill operator(s) for approval by the Engineer. The on-site supervisor(s) shall have a minimum 2 years experience in supervising the construction of drilled shafts of a diameter and length similar to those shown on the plans. The drill operator(s) shall have a minimum 1 year experience in drilling for the construction of drilled shafts of a diameter and length similar to those shown on the plans. The list shall contain a summary of each individual's experience. Should the Contractor elect to change personnel during construction of the shaft, the same approval process will need to be completed for the new personnel prior to them starting work on the project. The Contractor shall not be compensated for any delays resulting from their changing of personnel.

Prior to excavating for the foundation, the Contractor shall submit the following:

**Reinforcing Steel Shop Drawings:** Based on the accepted foundation design, the Contractor shall prepare reinforcing steel shop drawings for each foundation in accordance with Subarticle 1.05.02. The drawings shall be reviewed and stamped by the foundation designer. Four copies of each reviewed and stamped drawing shall be submitted to the Engineer at the District Construction office. One copy of each reviewed and stamped drawing shall be submitted to the project's "Engineer of Record".

**Concrete and Slurry Mix Designs:** The Contractor shall submit to the Engineer at the District Construction office the concrete mix designs and the slurry mix design, including admixtures, for review.

**Drilled Shaft Foundation Construction Procedure:** The Contractor shall submit to the Engineer at the District Construction office a written foundation construction procedure outlining the equipment; drilling procedure for soil and rock, including how spoils will be handled; temporary casing placement and removal; slurry placement; reinforcement, anchor bolt and conduit placement; and concrete placement required for the drilled shaft foundation construction for review. The procedure should include contingencies for the various soil, rock and subsurface water conditions that may be encountered during the foundation construction. Also required in this submission are the following:

- list of proposed equipment to be used, including cranes, drills, augers, bailing buckets, final cleaning equipment, desanding equipment, slurry pumps, core sampling equipment, tremies or concrete pumps, casing, etc.
- details of overall construction operation sequence and the sequence of shaft construction in bents or groups
- details of shaft excavation methods
- when the use of slurry is anticipated, details of the mix design and its suitability for the subsurface conditions at the construction site, mixing and storage methods, maintenance methods, and disposal procedures
- details of methods to clean the shaft excavation
- details of reinforcement placement, including support and centralization methods
- details of concrete mix design and test results of both a trial mix and a slump loss test. The tests shall be conducted by an approved testing

laboratory using approved methods to demonstrate that the concrete meets slump loss requirements

- details of concrete placement, including proposed operational procedures for free fall, tremie or pumping methods, proposed concreting log form and computations for time duration of shaft pour estimates
- details of casing installation and removal methods
- details of methods for removal of obstructions. Obstructions the Contractor shall provide details of methods for removal include, but are not necessarily be limited to, boulders, concrete, riprap, steel, timber, etc.

The Engineer will evaluate the foundation construction procedure for conformance with the plans, specifications and special provisions and will then notify the Contractor of any additional information required and/or changes necessary to meet the contract requirements. All procedural approvals given by the Engineer shall be subject to trial in the field and shall not relieve the Contractor of the responsibility to satisfactorily complete the work as detailed in the plans and specifications. The Contractor shall not commence construction of the drilled shafts until the Engineer has accepted the foundation construction procedure.

Excavations required for shafts shall be performed through whatever materials are encountered, to the dimensions and elevations in the working drawings or as ordered by the Engineer. The methods and equipment used shall be suitable for the intended purpose and materials encountered. Shaft excavation may be performed by combinations of augering, rotary drilling, down-the-hole hammer, reverse circulation drilling, clamming, scraping, or other means approved by the Engineer. Generally, either the dry method, wet method, or temporary casing method may be used, as necessary, to produce sound, durable concrete foundation shafts free of defects. The Contractor shall select and use the method that is needed to properly accomplish the work, as determined by site conditions and subject to the approval of the Engineer. The Contractor is responsible for maintaining the stability of the shaft excavation during all phases of construction.

The dry method consists of drilling the shaft excavation, removing accumulated water and loose material from the excavation, and placing the shaft concrete in a relatively dry excavation. The dry construction method shall be used only at sites where the groundwater table and site conditions are suitable to permit construction of the shaft in a relatively dry excavation, and where the sides and bottom of the shaft are stable and may be visually inspected prior to placing the concrete. The use of the dry construction method is permitted if less than one foot of water accumulates in the bottom of a hole without pumping over a one hour period, the excavation remains stable and any loose material and water can be removed prior to placement of concrete.

The wet construction method shall be used at sites where a dry excavation cannot be maintained for placement of the shaft concrete. Wet construction methods consist of using a mineral slurry to maintain stability of the hole perimeter while advancing the excavation to final depth, placing the reinforcing cage and shaft concrete. This procedure may require desanding and cleaning the slurry; final cleaning of the excavation by means of a bailing bucket, air lift, submersible pump or other devices; and placing the shaft concrete with a tremie. Unless it is demonstrated to the satisfaction of the Engineer that the surface casing is not required, temporary surface casings shall be provided to aid shaft alignment and position, and to prevent sloughing of the top of the shaft excavation. Surface casing is defined as the amount of casing required from the ground surface to a point in the shaft excavation where sloughing of the surrounding soil does not occur.

The temporary casing construction method shall be used at all sites where the dry or wet construction methods are inappropriate. Temporary casing construction method consists of advancing the excavation through caving material by the wet method. Temporary casing may be installed by driving or vibratory procedures in advance of excavation to the lower limits of the caving material. When a nearly impervious formation is reached, a casing is placed in the hole and sealed in the nearly impervious formation. After the drilling fluid is removed from the casing, drilling may proceed as with the dry method except that the casing is withdrawn when the shaft concrete is placed. If seepage conditions prevent use of the dry method, excavation is completed using the wet method. Temporary casing may be installed by driving or vibratory procedures in advance of excavation to the lower limits of the caving material. Slurry may be omitted if the casing can be installed with only minor caving of the hole.

If the Engineer determines that the foundation material encountered during excavation is unsuitable or differs from that anticipated in the design of the shaft, or if rock is encountered at an unanticipated elevation, the Contractor's foundation designer shall determine if the foundation embedment should be revised from that shown on the working drawings. If rock is encountered, the Engineer shall be notified to inspect and determine the elevation of the top of competent rock. Any revisions to the foundation embedment during construction shall be reviewed by the Engineer.

Excavated materials which are removed from the shaft excavation and any drilled fluids used shall be disposed of by the Contractor as directed by the Engineer and in accordance with Section 1.10.

Casings shall be metal, smooth, clean, watertight, and of ample strength to withstand both handling and driving stresses and the pressure of both concrete and the surrounding earth materials. The outside diameter of casing shall not be less than the specified size of the shaft. Temporary casings shall be removed while the concrete remains workable (i.e., a slump of 4" or greater). Before the casing is withdrawn and while the casing is being withdrawn, a 5'-0" minimum head of fresh concrete in the casing shall be maintained so that all the fluid trapped behind the casing is displaced upward without contaminating the shaft concrete. The required minimum concrete head may have to be increased to counteract groundwater head outside the casing. Separation of the concrete by hammering or otherwise vibrating the casing, during

withdrawal operations, shall be avoided. Casing extraction shall be at a slow, uniform rate with the pull in line with the shaft axis.

Slurry used in the drilling process shall be a mineral slurry. The slurry shall have both a mineral grain size that will remain in suspension and sufficient viscosity and gel characteristics to transport excavated material to a suitable screening system. The percentage and specific gravity of the material used to make the suspension shall be sufficient to maintain the stability of the excavation and to allow proper concrete placement. The level of the slurry shall be maintained at a height sufficient to prevent caving of the hole.

The mineral slurry shall be premixed thoroughly with clean fresh water at a temperature above 41° F and adequate time allotted for hydration prior to introduction into the shaft excavation. The elevation of the slurry within the shaft foundation shall be maintained within 24” of the top casing and at least 48” above the existing water level during drilling and until the concrete placement is essentially complete. The slurry properties shall be maintained at all times, including non-working periods and stoppages. The slurry shall be circulated and agitated, continuously if necessary, to maintain the slurry properties and to prevent it from setting up in the shaft.

The Contractor, in the presence of the Engineer, shall perform control tests on the slurry to ensure that the density, viscosity, and pH fall within the acceptable limits tabulated below. The Contractor shall provide all equipment required to perform the tests. If desanding is required, sand content shall not exceed 4% (by volume) at any point in the shaft excavation as determined by the American Petroleum Institute sand content test.

Range of Values (at 68°F)

<b>Property (Units)</b>	<b>Time of Slurry Introduction</b>	<b>Time of Concreting (in Hole)</b>	<b>Test Method</b>
Density (pcf)	64.3 to 69.1	64.3 to 75.0	Density Balance
Viscosity (seconds per quart)	28 to 45	28 to 45	Marsh Cone
pH	8 to 11	8 to 11	pH paper or meter

The control tests to determine unit weight (density), viscosity, and pH values of the slurry shall be done during the shaft excavation to establish a consistent working pattern.

Prior to placing shaft concrete, slurry samples shall be taken from the bottom and at intervals not exceeding 10’-0” for the full height of slurry. Any heavily contaminated slurry that has accumulated at the bottom of the shaft shall be eliminated. The mineral slurry shall be within specification requirements immediately before shaft concrete placement.

The hole shall be covered when left unattended.

After completing the shaft excavation, all loose material existing at the bottom of the hole shall be removed.

Prior to placing the reinforcement into the shaft, the Contractor, in the presence of the Engineer, shall determine the shaft dimensions, depth and alignment of the shaft. The concrete shaft shall not be out of plumb by more than ¼ inch per foot of depth. The Contractor shall provide all equipment necessary for checking the shaft excavation. The Engineer shall inspect the shaft and verify that it has been properly cleaned.

The reinforcing steel shall be fabricated and assembled in accordance with Article 6.02.03. All reinforcement shall be assembled with wire ties. Welding to assemble the reinforcement is not permitted.

Immediately after the shaft excavation has been inspected and approved by the Engineer and prior to placement of the concrete, the assembled reinforcing steel cage, including cage stiffener bars, spacers, centralizers, and other necessary appurtenances, shall be carefully placed into the shaft excavation as a unit. Dropping or forcing cages into the shaft will not be allowed. The reinforcing steel in the shaft shall be tied and supported so that the reinforcing steel will remain within allowable tolerances of its intended position until the concrete will support the reinforcing steel. When concrete is placed by tremie methods, temporary hold-down devices shall be used to prevent uplifting of the reinforcing steel cage during concrete placement. Concrete spacers or other approved noncorrosive spacing devices shall be used at sufficient intervals not exceeding 5'-0" along the shaft to insure concentric location of the cage within the shaft excavation. When the size of the longitudinal reinforcing steel is larger than a #8 bar, such spacing shall not exceed 10'-0". After placement of the reinforcing cage, the Engineer shall inspect the shaft to ensure that it has remained clean. If the inspection indicates that loose material has accumulated at the bottom of shaft excavation, the Contractor shall remove the reinforcing cage and reclean the shaft.

Concrete shall be placed in the shaft excavation as soon as possible, but no more than 4 hours after completion of excavation and cleaning of the bottom of the excavation, and no more than 2 hours after placement of the reinforcing steel cage. Concrete shall be placed in a continuous operation to the top of the shaft. The concrete level shall be horizontal during the pouring operations. Concrete placement shall continue after the shaft is full until good quality concrete is evident at the top of the shaft. The elapsed time from the beginning of concrete placement in the shaft to the completion of placement shall not exceed 2 hours.

In dry construction, concrete shall be placed in a single continuous operation with the flow of concrete down the center of the shaft excavation so as to consolidate the concrete on impact. During placement operations, the concrete is not permitted to hit the reinforcing steel. A dropchute, consisting of a hopper and flexible hose, may be used to direct the concrete down the center of the foundation and prevent the concrete from hitting the reinforcing steel. Accumulated water shall be removed before placing the concrete. At the time of concrete

placement, no more than 2" of water may exist at the bottom of the excavation and loose sediment no more than ½" over one-half the base is acceptable.

In wet (slurry) construction, concrete to be placed by the tremie method, where the concrete displaces the slurry from bottom of the excavation to the top. The concrete shall be placed through a top metal hopper and into a rigid leak-proof elephant trunk tremie tube, sufficiently large enough to permit free flow of concrete. The tremie tube shall be positioned so that it can be removed without disturbing the reinforcing. Initially, the discharge end of the tremie tube shall be sealed closed (plugged) to prevent slurry from entering the tube after it is placed in the excavation and before the tube is filled with concrete. After concrete placement has started, the tremie tube shall be kept full of concrete to the bottom of the hopper to maintain a positive concrete head. The flow of concrete shall be induced by slightly raising the discharge end of the tube, always keeping the tube end in the deposited concrete. No horizontal movement of the tremie tube will be permitted.

The shaft concrete shall be vibrated or rodded to a depth of 5'-0" below the ground surface except where soft uncased soil or slurry remaining in the excavation will possibly mix with the concrete.

Exposed concrete shall be cured and finished in accordance with Subarticle 6.01.03-7, 9 and 10.

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.

**Construction of Spread Footing Foundations:** Construction methods for spread footing foundations shall conform to the following:

Temporary earth retaining system shall be safely designed and shall be carried to adequate depths and braced as necessary for proper performance of the work. Construction shall be such as to permit excavation or fill as required. Interior dimensions shall be such as to give sufficient clearance for construction of forms and their inspection and for battered pile clearance when necessary. Movements of the system or bracing which prevent the proper completion of the substructure shall be corrected at the sole expense of the Contractor. No part of the temporary earth retaining system or bracing shall be allowed to extend into the substructure without written permission of the Engineer.

Working drawings and design calculations for temporary earth retaining system shall be submitted in accordance with the requirements of Article 1.05.02.

Unless otherwise ordered by the Engineer, all parts of the temporary earth retaining system shall be removed upon completion of the work for which it was provided. The excavation shall be backfilled and properly compacted, prior to removal of the system unless otherwise permitted by the Engineer. Temporary earth retaining system may be left in place at the option of the Contractor if so permitted by the Engineer, provided that it is cut off at an elevation as directed by the Engineer and the cutoffs removed from the site.

Excavation: Article 2.03.03.

Granular Fill: Article 2.13.03.

Class "F" Concrete: Article 6.01.03.

Deformed Steel Bars: Subarticles 6.02.03-2,3,4,7, and 8.

**Additional construction provisions for all foundation types:** 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.

After the foundation has cured, the Contractor shall submit the top of foundation elevations based on a field survey.

The traffic structures shall not be erected on the foundation unit until **all** concrete has attained a 28 day compressive strength,  $f'_c$ , greater than or equal to 4,000 psi.

**Method of Measurement:** This work will be measured for payment by the number of foundation units, each completely installed and accepted. Two foundation units are required to support each overhead truss sign support.

**Basis of Payment:** The work will be paid for at the contract unit price each for "Overhead Truss Sign Support Foundation," completed and accepted in place, which price shall include all equipment, materials, tools and labor incidental to the design, fabrication, construction and disposal of drilling spoils, of the foundations at the locations specified on the plans.

No additional payment will be made for the Contractor to test the slurry when it is used to construct a drilled shaft foundation. No additional payment will be made for subsurface investigations performed by the Contractor.



The removal of existing roadside barrier systems, installation and removal of temporary roadside barrier systems and resetting existing roadside barrier systems will not be paid for separately, but will be included as part of the work.

The support of excavation areas by temporary earth retaining system will not be paid for separately, but will be included as part of the work.

The temporary support, protection and restoration of utilities (if necessary), including existing underground wiring, conduits, drainage structures, pipes and underdrain systems within the excavation limits will not be paid for separately, but will be included as part of the work.

Backfilling and restoration of adjacent ground surfaces (pavement, slope protection, topsoil & seed, etc.) in all areas disturbed by the work will not be paid for separately, but will be included as part of the work. The Engineer will determine the type, thickness and horizontal limits of the surface treatments to be restored.

The installation of new or upgraded permanent roadside barrier systems, if required, will not be paid for as part of this work, but will be paid for under separate items.

## **ITEM #1202999A – DRILLED SHAFT TRAFFIC STRUCTURE FOUNDATION**

**Description:** Work under this item shall consist of the subsurface investigation, design and construction of drilled shaft foundations for traffic structures, in accordance with the details shown on the plans, in accordance with these specifications and as ordered by the Engineer. For the purposes of this specification, a traffic structure support may be an overhead cantilever or bridge type sign support structure.

**Materials:** The reinforcing steel shall be uncoated, ASTM A615, Grade 60 reinforcement conforming to the requirements of Article M.06.01.

The concrete for the drilled shaft shall be dense, homogeneous, fluid, resistant to segregation and consolidate under self-weight. The concrete for the drilled shaft shall be a Contractor designed Portland cement concrete with a 3/8" (No. 8) maximum coarse aggregate size and a minimum of 705 lbs/cubic yard of cementitious materials. The initial concrete slump shall be 7"  $\pm$  1". The concrete shall maintain a minimum 4" slump for the duration of the concrete placement. The concrete shall contain 1% - 7% air entrainment. The 28 day minimum compressive strength of the concrete in the constructed foundation shall be 4,000 psi. The concrete mix design, including admixtures, shall be submitted to the Engineer for approval.

The concrete for the formed pedestal shall conform to Article M.03 for Class 'F' Concrete. The 28 day minimum compressive strength of the concrete in the constructed pedestal shall be 4,400 psi. The concrete mix design, including admixtures, shall be submitted to the Engineer for approval.

The slurry shall be Contractor designed mineral slurry that meets the range of values listed herein. The slurry mix design, including admixtures, shall be submitted to the Engineer for approval.

Rigid metal conduit, ground rod sleeves and related hardware, and end caps shall be galvanized steel conduit, and shall conform to Article M.15.09.

Ground rods shall be 5/8" in diameter by 12'-0" long copper clad steel. The copper cladding shall be a minimum thickness of 0.128". The ground clamp shall be a square-head bolt type, approved for direct burial.

Bare copper wire shall conform to Article M.15.13.

Topsoil shall conform to Article M.13.01.

Fertilizer shall conform to Article M.13.03.

Seed mixture shall conform to Article M.13.04.

Mulch shall conform to Article M.13.05.

Erosion control matting shall conform to Article M.13.09.

### **Construction Methods:**

**Subsurface Conditions for Bidding:** For the purpose of bidding this item, the Contractor shall assume that the subsurface conditions for each foundation location consists of cohesionless medium dense granular soil (AASHTO A-1 or A-2) with cobbles present and a high groundwater table which requires the use of wet construction/concreting methods.

**Subsurface Conditions for Foundation Design:** As early as possible and prior to preparation of the foundation design, the Contractor **shall** perform a subsurface investigation for **each** sign foundation location. The subsurface data obtained in the exploration program at each site shall be used in the design of the foundation at that site. Use of the assumed subsurface condition (that was provided for the purpose of bidding), an assumed conservative subsurface condition or any other assumed subsurface condition shall not be allowed for use in the foundation design nor shall any assumed subsurface condition relieve the Contractor from their responsibility of obtaining a test boring at each foundation site. The subsurface investigation program should be prepared and executed in accordance with the most recent editions of the AASHTO Manual on Subsurface Investigations and ConnDOT Geotechnical Engineering Manual. The Contractor shall provide a full-time inspector to oversee the subsurface exploration program. The subsurface investigations and all related cost will not be measured for payment and shall be included in the cost of the foundation.

The Contractor shall review results of their subsurface investigation to determine if subsurface conditions for sign foundation locations differ materially from those assumed at the time of bid. Should the subsurface investigation(s) encounter conditions that differ materially, the Contractor shall notify the Engineer in writing prior to the submission of the working drawings and calculations. All matters regarding increased cost relating to agreed upon change in subsurface conditions will be handled per Section 1.04.04 – Differing Site Conditions.

**Foundation Design Requirements:** The design of drilled shaft traffic structure foundations shall conform to the requirements of AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaries and Traffic Signals – latest edition, including the latest interim specifications, available prior to the advertising date of the contract, amended as follows:

- The foundation shall be designed for the soils and rock properties and parameters based on the subsurface conditions (character of the soil and rock, presence of ground water, etc.) in the location of, adjacent to and below the drilled shaft foundation excavation determined by the subsurface investigation.
- The specified compressive strength,  $f'_c$ , of the concrete used in the design shall be 4,000 psi. The concrete cover for reinforcing in a drilled shaft shall conform to the following:

<b>Shaft Diameter</b>	<b>Minimum Cover</b>
Less than or equal to 3'-0"	3"
Greater than 3'-0" and less than 5'-0"	4"
Greater than or equal to 5'-0"	6"

- The reinforcement shall be uncoated and conform to ASTM A615, Grade 60.
- The foundation shall be designed for the traffic structure support reactions for all group loads and load combinations. The reactions shall include axial, shear, flexural and torsional load effects. No reduction of the reactions or increase in the allowable stresses of the materials is permitted.
- For sign support foundations, the minimum drilled shaft diameter shall be 3'-0".
- The design of the drilled shaft foundation shall include embedment of the foundation in soil, the embedment of the foundation in rock or the embedment of the foundation partially in soil and partially in rock, as applicable.
- The design of the drilled shaft foundation embedment depth shall account for the slope of the finished grade.
- The minimum embedment for a drilled shaft foundation, excavated entirely in soil, shall be no less than 15'-0" below the finished grade at the low side of a sloping grade. The minimum embedment for a drilled shaft foundation, excavated entirely in rock shall be no less than 10'-0" below the finished grade at the low side of a sloping grade.
- For sign support foundations, the top of the drilled shaft pedestal shall project 6" to 12" above the level ground or 6" to 12" above the finished grade at the high side of a sloping grade.
- The embedment depth for a drilled shaft foundation, determined by the Brom's design method, shall have a minimum factor of safety of 3.25 applied to the shear and moment load effects. The factor of safety applied to the torsional load effect shall be no less than 1.3.
- The load factor method shall be used for the structural design of the drilled shaft foundation. The load factor applied to all loads, dead, wind and ice, and their effects, axial, shear, flexure and torsion, shall be no less than 1.6. The drilled shaft may be designed in accordance with the load factor method presented in the latest edition of the Building Code Requirements for Reinforced Concrete", ACI 318.

- The structural design of the drilled shaft shall be based on stress and strain compatibility in the circular drilled shaft cross section. The use of methods equating circular to rectangular drilled shaft cross sections is not permitted.
- The drilled shaft foundation shall be reinforced with longitudinal and transverse reinforcement. The area of longitudinal reinforcement should be no less than the sum of the reinforcement required for flexure and the longitudinal reinforcement required for torsion. The area of transverse reinforcement should be no less than the sum of the reinforcement required for shear and the transverse reinforcement required for torsion.
- In drilled shaft foundations for cantilever sign structures, the area of transverse reinforcement provided shall prevent the concrete breakout at the edge of the foundation due to the torsional load on the anchor bolt group. The area of transverse reinforcement provided shall be considered adequate to prevent this condition if the nominal torsional strength of the foundation is greater than the concrete breakout strength. The concrete breakout strength shall be determined in accordance with the latest edition of the Building Code Requirements for Reinforced Concrete”, ACI 318, Appendix D.
- The minimum number of longitudinal reinforcing bars shall be 16. The minimum size of longitudinal reinforcing bars shall be #8. The minimum area of longitudinal reinforcing bars shall be no less than 1% of the gross cross-sectional area of the shaft. The minimum clear distance between longitudinal reinforcing bars shall be no less than 5 times the maximum aggregate size or 5”, whichever is greater. The reinforcement shall extend full length of the drilled shaft foundation, including the pedestal. Splicing of the longitudinal reinforcement is not permitted.
- The drilled shaft foundation shall be transversely reinforced with spirals or circular, one piece, enclosed ties. The minimum size of the transverse reinforcement shall be #4. The maximum spacing/pitch of the transverse reinforcement shall be no more than 6”. The minimum spacing/pitch of the transverse reinforcement shall be no more than 4”. The maximum spacing/pitch of the transverse reinforcement in the top 2'-0” of the foundation shall be no more than 4”. The spiral reinforcement shall be terminated at the top and the bottom with 1 ½ turns of the reinforcing and a 135° standard hook. Spirals may be spliced with lap splices or mechanical connectors. For spirals, the minimum lap splice length shall be 1.7 times the tension development length (including modification factors) of the bar or 48 bar diameters, whichever is greater. For spirals, the mechanical connectors shall develop both in tension and compression 125% of the specified yield strength of the bar and conform to the latest edition of the AASHTO LRFD Bridge Design Specifications, including the latest interim specifications. For ties, the minimum lap splice length shall be no less than 1.7 times the tension development length (including modification factors) of the bar.

Tie lap splices shall be alternated. The ends of the bars in lap splices shall be anchored with a 135° standard hook around longitudinal reinforcement.

- For sign support foundations, the top of the drilled shaft shall be designed with a square pedestal to facilitate the installation of the anchor bolts and rigid metal conduits. The plan dimensions of the pedestal shall equal the diameter of the drilled shaft. The top and sides of the pedestal shall be reinforced with a grillage of reinforcement. The minimum size reinforcement shall be #5. The minimum concrete cover shall be 3”
- The design of the foundation shall be coordinated with the traffic structure support to avoid conflicts between the embedded support anchorage and the foundation reinforcement.

**Submittal Requirements for Foundations:** Prior to excavating for the foundation, the Contractor shall submit working drawings and design computations for the foundation(s) at each sign support, **based on the reviewed sign structure cross-section**, to the Engineer for review in accordance with Article 1.05.02. The working drawings and design computations for foundations shall conform to working drawings for permanent construction. An individual, independently packaged set of working drawings and computations, with all details and documents necessary for fabrication and construction, including a copy of the certificate of insurance, shall be prepared and submitted for the foundation(s) at **each** support. **A single set of drawings with tabulated data for multiple foundation locations is not permitted.** The alpha-numeric support identifier shall be included on these documents. The working drawings and computations shall be prepared in Customary U.S. units. Each working drawing shall be sealed, signed and dated. The cover/first sheet for the computations shall be sealed, signed and dated.

The packaged set of working drawings and computations for the foundation(s) at each support shall be submitted in an individual file in electronic portable document format (.pdf) with appropriate bookmarks commenting enabled. The packaged set shall include the following:

- title sheet
- table of contents
- contact information for designer – contact information should include name and address of design firm, name of contact person with phone number and email address
- copy of the certificate of insurance
- copy of the **reviewed** cross-section
- results of subsurface investigation, including boring logs and geotechnical design recommendations
- foundation working drawings
- foundation design computations

The electronic portable document format (.pdf) working drawings shall be created on ANSI D (22” x 34”) full scale (1” electronic file = 1” paper) sheets. (The purpose of creating the

drawings on ANSI D sheets is so that the sheets may be printed/plotted at that size or smaller without loss of legibility.) Each drawing shall have a border and title block. Located in the lower right hand corner of the drawing adjacent to the title block, each drawing shall have a rectangular box, 2 1/4" wide x 1 3/4" high, for the reviewers stamp. On the ANSI D full scale sheets, the minimum text height and width shall be 1/8". All letter characters shall be uppercase. The electronic files for the design computations, procedures and other supporting data shall be created on ANSI A (8 1/2" x 11") letter sheets.

The working drawings shall include complete details of all foundation components. The drawings shall include, but not be limited to the following:

- the project number, town and support identification number
- reference to the design specifications, including interim specifications
- material specifications for all components
- embedment depths for foundation in soil, rock and a combination of soil and rock
- anchor bolt details, including dimensions, embedment and projection

The design computations shall include, but not be limited to the following:

- the project number, town and support identification number
- references to design specifications, including interim specifications, and the applicable code section and articles
- description/documentation for all computer programs used in the design
- drawings/models of the foundation with dimensions, loads and references to the local and global coordinate systems used (as applicable), to facilitate review of the results
- sign support reactions of all group loads and load combinations
- soil and rock design parameters
- computations demonstrating the geotechnical and structural capacity of the drilled shaft is adequate for all group load combinations

The Contractor shall submit the packaged set of working drawings and calculations to the project's "Engineer of Record". The project's "Engineer of Record" is identified in the signature

block on the sign support structural contract plans. A copy of the transmittal shall be sent to the District Construction office administering the project.

The reviewed and stamped working drawings and calculations shall be sent by the reviewer, along with a recommendation regarding acceptance, to the District Construction office for review, comment and distribution. After the District Construction office has reviewed the working drawings and calculations, ensured all comments have been addressed and have found the submittal to be acceptable, in addition to distributing copies of the working drawings and calculations to the Contractor and District offices, a copy of each packaged set of working drawings and calculations shall be sent to the project's "Engineer of Record".

The Contractor shall make printed copies of the stamped working drawings and calculations, of the size and number determined by the Engineer, and deliver the copies as directed by the Engineer.

**Foundation Construction:** The Contractor performing the work described in this specification shall have installed drilled shafts of both diameter and length similar to those required for the traffic structures for a minimum of 3 years prior to the bid date for this project. The Contractor shall submit a list containing at least 3 projects completed in the last 3 years on which the Contractor has installed drilled shafts of a diameter and length similar to those shown on the plans. The list of projects shall contain names and phone numbers of owner's representatives who can verify the Contractors' participation on those projects. The Contractor shall provide a list identifying the on-site supervisor(s) and drill operator(s) for approval by the Engineer. The on-site supervisor(s) shall have a minimum 2 years experience in supervising the construction of drilled shafts of a diameter and length similar to those shown on the plans. The drill operator(s) shall have a minimum 1 year experience in drilling for the construction of drilled shafts of a diameter and length similar to those shown on the plans. The list shall contain a summary of each individual's experience. Should the Contractor elect to change personnel during construction of the shaft, the same approval process will need to be completed for the new personnel prior to them starting work on the project. The Contractor shall not be compensated for any delays resulting from their changing of personnel.

Prior to excavating for the foundation, the Contractor shall submit the following:

**Reinforcing Steel Shop Drawings:** Based on the accepted foundation design, the Contractor shall prepare reinforcing steel shop drawings for each foundation in accordance with Subarticle 1.05.02. The drawings shall be reviewed and stamped by the foundation designer. Four copies of each reviewed and stamped drawing shall be submitted to the Engineer at the District Construction office. One copy of each reviewed and stamped drawing shall be submitted to the project's "Engineer of Record".

**Concrete and Slurry Mix Designs:** The Contractor shall submit to the Engineer at the District Construction office the concrete mix designs and the slurry mix design, including admixtures, for review.



**Foundation Construction Procedure:** The Contractor shall submit to the Engineer at the District Construction office a written foundation construction procedure outlining the equipment; drilling procedure for soil and rock, including how spoils will be handled; temporary casing placement and removal; slurry placement; reinforcement, anchor bolt and conduit placement; and concrete placement required for the drilled shaft foundation construction for review. The procedure should include contingencies for the various soil, rock and subsurface water conditions that may be encountered during the foundation construction. Also required in this submission are the following;

- list of proposed equipment to be used, including cranes, drills, augers, bailing buckets, final cleaning equipment, desanding equipment, slurry pumps, core sampling equipment, tremies or concrete pumps, casing, etc.
- details of overall construction operation sequence and the sequence of shaft construction in bents or groups
- details of shaft excavation methods
- when the use of slurry is anticipated, details of the mix design and its suitability for the subsurface conditions at the construction site, mixing and storage methods, maintenance methods, and disposal procedures
- details of methods to clean the shaft excavation
- details of reinforcement placement, including support and centralization methods
- details of concrete mix design and test results of both a trial mix and a slump loss test. The tests shall be conducted by an approved testing laboratory using approved methods to demonstrate that the concrete meets slump loss requirements
- details of concrete placement, including proposed operational procedures for free fall, tremie or pumping methods, proposed concreting log form and computations for time duration of shaft pour estimates
- details of casing installation and removal methods
- details of methods for removal of obstructions. Obstructions the Contractor shall provide details of methods for removal include, but are not necessarily be limited to, boulders, concrete, riprap, steel, timber, etc.

The Engineer will evaluate the foundation construction procedure for conformance with the plans, specifications and special provisions and will then notify the Contractor of any additional information required and/or changes necessary to meet the contract requirements. All procedural approvals given by the Engineer shall be subject to trial in the field and shall not relieve the Contractor of the responsibility to satisfactorily complete the work as detailed in the plans and specifications. The Contractor shall not commence construction of the drilled shafts until the Engineer has accepted the foundation construction procedure.

Excavations required for shafts shall be performed through whatever materials are encountered, to the dimensions and elevations in the working drawings or as ordered by the Engineer. The methods and equipment used shall be suitable for the intended purpose and materials encountered. Shaft excavation may be performed by combinations of augering, rotary drilling, down-the-hole hammer, reverse circulation drilling, clamming, scraping, or other means approved by the Engineer. Generally, either the dry method, wet method, or temporary casing method may be used, as necessary, to produce sound, durable concrete foundation shafts free of defects. The Contractor shall select and use the method that is needed to properly accomplish the work, as determined by site conditions and subject to the approval of the Engineer. The Contractor is responsible for maintaining the stability of the shaft excavation during all phases of construction.

The dry method consists of drilling the shaft excavation, removing accumulated water and loose material from the excavation, and placing the shaft concrete in a relatively dry excavation. The dry construction method shall be used only at sites where the groundwater table and site conditions are suitable to permit construction of the shaft in a relatively dry excavation, and where the sides and bottom of the shaft are stable and may be visually inspected prior to placing the concrete. The use of the dry construction method is permitted if less than one foot of water accumulates in the bottom of a hole without pumping over a one hour period, the excavation remains stable and any loose material and water can be removed prior to placement of concrete.

The wet construction method shall be used at sites where a dry excavation cannot be maintained for placement of the shaft concrete. Wet construction methods consist of using a mineral slurry to maintain stability of the hole perimeter while advancing the excavation to final depth, placing the reinforcing cage and shaft concrete. This procedure may require desanding and cleaning the slurry; final cleaning of the excavation by means of a bailing bucket, air lift, submersible pump or other devices; and placing the shaft concrete with a tremie. Unless it is demonstrated to the satisfaction of the Engineer that the surface casing is not required, temporary surface casings shall be provided to aid shaft alignment and position, and to prevent sloughing of the top of the shaft excavation. Surface casing is defined as the amount of casing required from the ground surface to a point in the shaft excavation where sloughing of the surrounding soil does not occur.

The temporary casing construction method shall be used at all sites where the dry or wet construction methods are inappropriate. Temporary casing construction method consists of advancing the excavation through caving material by the wet method. Temporary casing may

be installed by driving or vibratory procedures in advance of excavation to the lower limits of the caving material. When a nearly impervious formation is reached, a casing is placed in the hole and sealed in the nearly impervious formation. After the drilling fluid is removed from the casing, drilling may proceed as with the dry method except that the casing is withdrawn when the shaft concrete is placed. If seepage conditions prevent use of the dry method, excavation is completed using the wet method. Temporary casing may be installed by driving or vibratory procedures in advance of excavation to the lower limits of the caving material. Slurry may be omitted if the casing can be installed with only minor caving of the hole.

If the Engineer determines that the foundation material encountered during excavation is unsuitable or differs from that anticipated in the design of the shaft, or if rock is encountered at an unanticipated elevation, the Contractor's foundation designer shall determine if the foundation embedment should be revised from that shown on the working drawings. If rock is encountered, the Engineer shall be notified to inspect and determine the elevation of the top of competent rock. Any revisions to the foundation embedment during construction shall be reviewed by the Engineer.

Excavated materials which are removed from the shaft excavation and any drilled fluids used shall be disposed of by the Contractor as directed by the Engineer and in accordance with Section 1.10.

Casings shall be metal, smooth, clean, watertight, and of ample strength to withstand both handling and driving stresses and the pressure of both concrete and the surrounding earth materials. The outside diameter of casing shall not be less than the specified size of the shaft. Temporary casings shall be removed while the concrete remains workable (i.e., a slump of 4" or greater). Before the casing is withdrawn and while the casing is being withdrawn, a 5'-0" minimum head of fresh concrete in the casing shall be maintained so that all the fluid trapped behind the casing is displaced upward without contaminating the shaft concrete. The required minimum concrete head may have to be increased to counteract groundwater head outside the casing. Separation of the concrete by hammering or otherwise vibrating the casing, during withdrawal operations, shall be avoided. Casing extraction shall be at a slow, uniform rate with the pull in line with the shaft axis.

Slurry used in the drilling process shall be a mineral slurry. The slurry shall have both a mineral grain size that will remain in suspension and sufficient viscosity and gel characteristics to transport excavated material to a suitable screening system. The percentage and specific gravity of the material used to make the suspension shall be sufficient to maintain the stability of the excavation and to allow proper concrete placement. The level of the slurry shall be maintained at a height sufficient to prevent caving of the hole.

The mineral slurry shall be premixed thoroughly with clean fresh water at a temperature above 41° F and adequate time allotted for hydration prior to introduction into the shaft excavation. The elevation of the slurry within the shaft foundation shall be maintained within 24" of the top casing and at least 48" above the existing water level during drilling and until the concrete placement is essentially complete. The slurry properties shall be maintained at all times,

including non-working periods and stoppages. The slurry shall be circulated and agitated, continuously if necessary, to maintain the slurry properties and to prevent it from setting up in the shaft.

The Contractor, in the presence of the Engineer, shall perform control tests on the slurry to ensure that the density, viscosity, and pH fall within the acceptable limits tabulated below. The Contractor shall provide all equipment required to perform the tests. If desanding is required, sand content shall not exceed 4% (by volume) at any point in the shaft excavation as determined by the American Petroleum Institute sand content test.

Range of Values (at 68°F)

<b>Property (Units)</b>	<b>Time of Slurry Introduction</b>	<b>Time of Concreting (in Hole)</b>	<b>Test Method</b>
Density (pcf)	64.3 to 69.1	64.3 to 75.0	Density Balance
Viscosity (seconds per quart)	28 to 45	28 to 45	Marsh Cone
pH	8 to 11	8 to 11	pH paper or meter

The control tests to determine unit weight (density), viscosity, and pH values of the slurry shall be done during the shaft excavation to establish a consistent working pattern.

Prior to placing shaft concrete, slurry samples shall be taken from the bottom and at intervals not exceeding 10'-0" for the full height of slurry. Any heavily contaminated slurry that has accumulated at the bottom of the shaft shall be eliminated. The mineral slurry shall be within specification requirements immediately before shaft concrete placement.

The hole shall be covered when left unattended.

After completing the shaft excavation, all loose material existing at the bottom of the hole shall be removed.

Prior to placing the reinforcement into the shaft, the Contractor, in the presence of the Engineer, shall determine the shaft dimensions, depth and alignment of the shaft. The concrete shaft shall not be out of plumb by more than ¼ inch per foot of depth. The Contractor shall provide all equipment necessary for checking the shaft excavation. The Engineer shall inspect the shaft and verify that it has been properly cleaned.

The reinforcing steel shall be fabricated and assembled in accordance with Article 6.02.03. All reinforcement shall be assembled with wire ties. Welding to assemble the reinforcement is not permitted.

Immediately after the shaft excavation has been inspected and approved by the Engineer and prior to placement of the concrete, the assembled reinforcing steel cage, including cage stiffener bars, spacers, centralizers, and other necessary appurtenances, shall be carefully placed into the shaft excavation as a unit. Dropping or forcing cages into the shaft will not be allowed. The reinforcing steel in the shaft shall be tied and supported so that the reinforcing steel will remain within allowable tolerances of its intended position until the concrete will support the reinforcing steel. When concrete is placed by tremie methods, temporary hold-down devices shall be used to prevent uplifting of the reinforcing steel cage during concrete placement. Concrete spacers or other approved noncorrosive spacing devices shall be used at sufficient intervals not exceeding 5'-0" along the shaft to insure concentric location of the cage within the shaft excavation. When the size of the longitudinal reinforcing steel is larger than a #8 bar, such spacing shall not exceed 10'-0". After placement of the reinforcing cage, the Engineer shall inspect the shaft to ensure that it has remained clean. If the inspection indicates that loose material has accumulated at the bottom of shaft excavation, the Contractor shall remove the reinforcing cage and reclean the shaft.

Concrete shall be placed in the shaft excavation as soon as possible, but no more than 4 hours after completion of excavation and cleaning of the bottom of the excavation, and no more than 2 hours after placement of the reinforcing steel cage. Concrete shall be placed in a continuous operation to the top of the shaft. The concrete level shall be horizontal during the pouring operations. Concrete placement shall continue after the shaft is full until good quality concrete is evident at the top of the shaft. The elapsed time from the beginning of concrete placement in the shaft to the completion of placement shall not exceed 2 hours.

In dry construction, concrete shall be placed in a single continuous operation with the flow of concrete down the center of the shaft excavation so as to consolidate the concrete on impact. During placement operations, the concrete is not permitted to hit the reinforcing steel. A dropchute, consisting of a hopper and flexible hose, may be used to direct the concrete down the center of the foundation and prevent the concrete from hitting the reinforcing steel. Accumulated water shall be removed before placing the concrete. At the time of concrete placement, no more than 2" of water may exist at the bottom of the excavation and loose sediment no more than 1/2" over one-half the base is acceptable.

In wet (slurry) construction, concrete to be placed by the tremie method, where the concrete displaces the slurry from bottom of the excavation to the top. The concrete shall be placed through a top metal hopper and into a rigid leak-proof elephant trunk tremie tube, sufficiently large enough to permit free flow of concrete. The tremie tube shall be positioned so that it can be removed without disturbing the reinforcing. Initially, the discharge end of the tremie tube shall be sealed closed (plugged) to prevent slurry from entering the tube after it is placed in the excavation and before the tube is filled with concrete. After concrete placement has started, the tremie tube shall be kept full of concrete to the bottom of the hopper to maintain a positive concrete head. The flow of concrete shall be induced by slightly raising the discharge end of the tube, always keeping the tube end in the deposited concrete. No horizontal movement of the tremie tube will be permitted.

The shaft concrete shall be vibrated or rodded to a depth of 5'-0" below the ground surface except where soft uncased soil or slurry remaining in the excavation will possibly mix with the concrete.

Exposed concrete shall be cured and finished in accordance with Subarticle 6.01.03-7, 9 and 10.

Anchor bolt assemblies shall be embedded in the concrete as shown on the working drawings. A template plate shall be used to hold the anchor bolt assemblies, conduits and ground rod sleeve in the correct position. The anchor bolts shall be installed plumb.

All conduit ends terminating below grade shall be capped with a malleable iron caps. All above-grade conduit ends shall be terminated with an insulated bonding bushing with tinned insert.

Ground rod and ground wire shall be installed as shown on the plans.

No construction operations that would cause soil movement adjacent to the shaft, other than mild vibration, shall be conducted for at least 48 hours after shaft concrete has been placed.

The top of the foundations shall be backfilled and the adjacent disturbed ground surfaces restored to match the surrounding area after the concrete has cured and the forms are removed. Placement of topsoil shall conform to Articles 9.44.01 and 9.44.03. Turf establishment shall conform to Article 9.50.03.

After the foundation has cured, the Contractor shall obtain the as-built top of foundation elevations based on a field survey.

The traffic structures shall not be erected on the foundation until both the pedestal concrete and the shaft concrete has attained a 28 day compressive strength,  $f'_c$ , greater than or equal to 4,000 psi.

**Method of Measurement:** This work will be measured for payment by the number of foundation units, each completely installed and accepted. One foundation unit is required to support each cantilever sign support. Two foundation units are required to support each bridge sign support.

**Basis of Payment:** The work will be paid for at the contract unit price each for "Drilled Shaft Traffic Structure Foundation," completed and accepted in place, which price shall include all equipment, materials, tools and labor incidental to the design, fabrication, construction and disposal of drilling spoils, of the foundations at the locations specified on the plans.

No additional payment will be made for the Contractor to test the slurry when it is used to construct a drilled shaft foundation. No additional payment will be made for subsurface investigations performed by the Contractor.

The removal of existing roadside barrier systems, installation and removal of temporary roadside barrier systems and resetting existing roadside barrier systems will not be paid for separately, but will be included as part of the work.

The temporary support, protection and restoration of utilities (if necessary), including existing underground wiring, conduits, drainage structures, pipes and underdrain systems within the excavation limits will not be paid for separately, but will be included as part of the work.

Backfilling and restoration of adjacent ground surfaces (pavement, slope protection, topsoil & seed, etc.) in all areas disturbed by the work will not be paid for separately, but will be included as part of the work. The Engineer will determine the type, thickness and horizontal limits of the surface treatments to be restored.

The installation of new or upgraded permanent roadside barrier systems, if required, will not be paid for as part of this work, but will be paid for under separate items.

**ITEM #1206023A – REMOVAL AND RELOCATION OF EXISTING SIGNS**

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 #1206025A – REMOVAL AND RELOCATION OF EXISTING OVERHEAD SIGNS**

Section 12.06 is supplemented as follows:

### **12.06.01 – Description is supplemented with the following:**

Work under this item shall consist of the removal and/or relocation of designated existing overhead signs, sign supports and foundations, where indicated on the plans or as directed by the Engineer.

### **12.06.03 - Construction Methods is supplemented with the following:**

Overhead sign supports, foundations, and other materials designated for removal shall be removed and disposed of by the Contractor as directed by the Engineer and in accordance with existing standards for Removal of Existing Overhead Signing.

For overhead signs designated for reinstallation and/or relocation, the Contractor shall accomplish the work in a manner so as not to cause twisting, bending or deforming of sign panels, or scratching of the sign face. Any sign panel damaged shall be repaired or replaced at the Contractor's expense. The signs shall be level, correctly aligned as indicated on the plans and shall be properly fastened to the structure or supports with the necessary hardware as indicated on the plans.

### **12.06.04 - Method of Measurement is supplemented with the following:**

This work will be paid for at the contract lump sum price for "Removal and Relocation of Existing Overhead Signs" which price shall include overhead signs designated for relocation, overhead extruded aluminum signs, overhead sign supports, foundations, and other materials designated for removal, and all equipment, material, tools and labor incidental thereto.

### **12.06.05 - Basis of Payment is supplemented with the following:**

This work will be paid for at the contract lump sum price for "Removal and Relocation of Existing Overhead Signs". This price shall include the removal, relocation, and permanent installation of overhead signs. Also, the price shall include all necessary hardware required for the reinstallation of the existing sign panels onto existing or new sign supports, unless such hardware is paid for under separate pay items. The price shall include all equipment, material, labor and tools necessary to complete this work. This price shall also include removing, loading, transporting, and unloading of overhead extruded aluminum signs designated for removal and all equipment, material, tools and labor incidental thereto. This price shall also include removing and disposing of sign supports, foundations, and other materials, and all equipment, material, tools and labor incidental thereto.

<u>Pay Item</u>	<u>Pay Unit</u>
Removal and Relocation of Existing Overhead Signs	L.S.

**ITEM #1207034A – SIGN FACE - EXTRUDED ALUMINUM (TYPE IV RETROREFLECTIVE SHEETING)**

**Article 12.07.01 – Description is revised as follows:** This item shall consist of furnishing and installing sign face extruded aluminum with Type IV retroreflective sheeting at locations indicated on the plans or as ordered and in conformance with the plans and these specifications.

Sign Face – Extruded Aluminum is supplemented with the sign details that follow.

**Article 12.07.02 – Materials is supplemented as follows:** For Article M.18.10.02, the heading “2. Type III Reflective Sheeting” shall be replaced with “2. Type IV Retroreflective Sheeting”.

**Article 12.07.03 – Construction Methods is supplemented as follows:** All overhead sign foundations shall be field staked and the locations approved by an engineer from the Division of Traffic Engineering a minimum of seven days prior to installation.

For all side mounted signs, the edge of the sign closest to the roadway and the sign foundations shall be field staked and approved by an engineer from the Division of Traffic Engineering a minimum of seven days prior to installation.

For side-mounted signs, the offset to the near edge of sign face shall exceed the maximum deflection of the guide rail unless otherwise shown on the plans or otherwise directed by the Engineer.

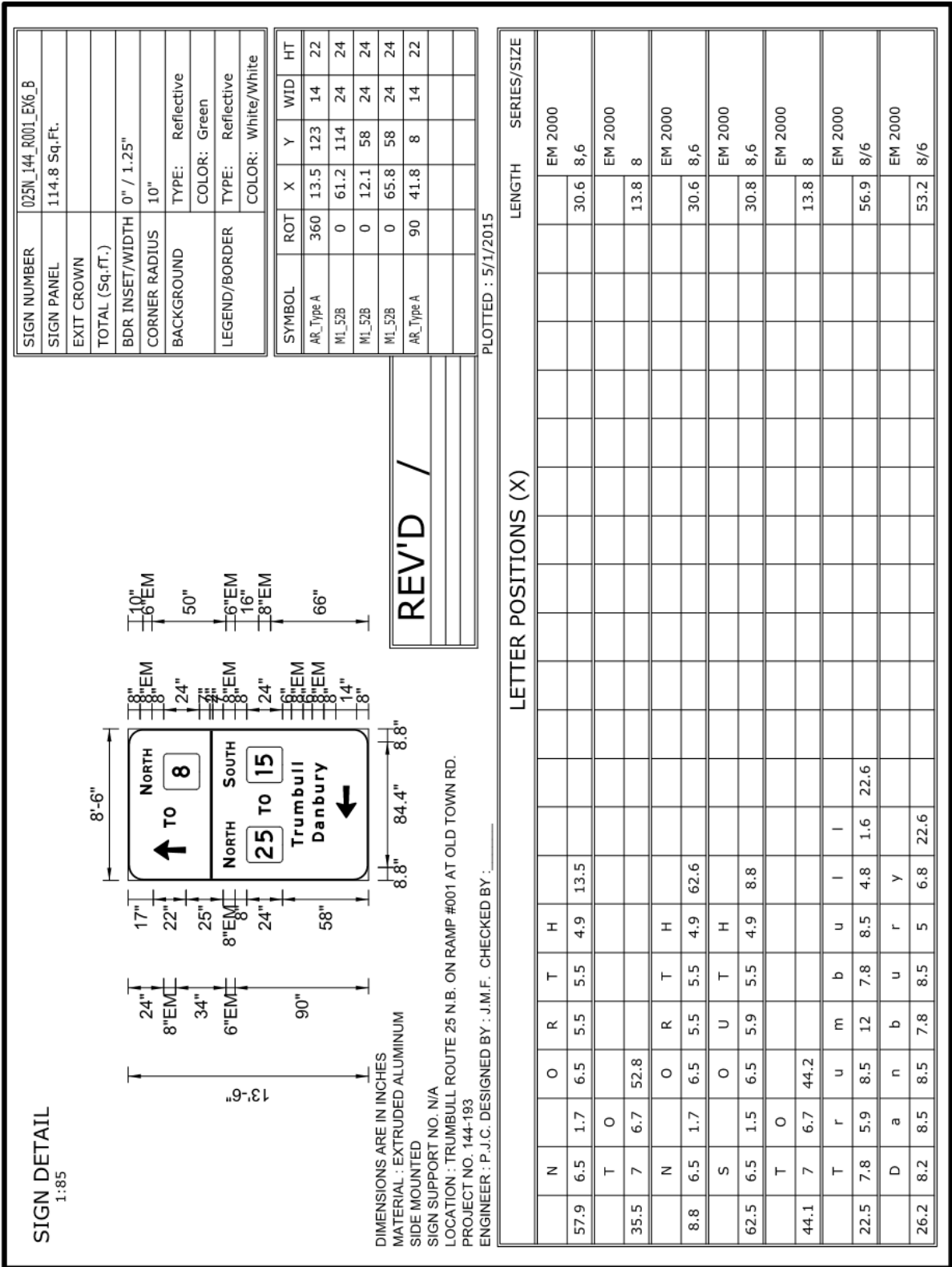
<b>Pay Item</b>	<b>Pay Unit</b>
Sign Face - Extruded Aluminum (Type IV Retroreflective Sheeting)	S.F. (S.M.)

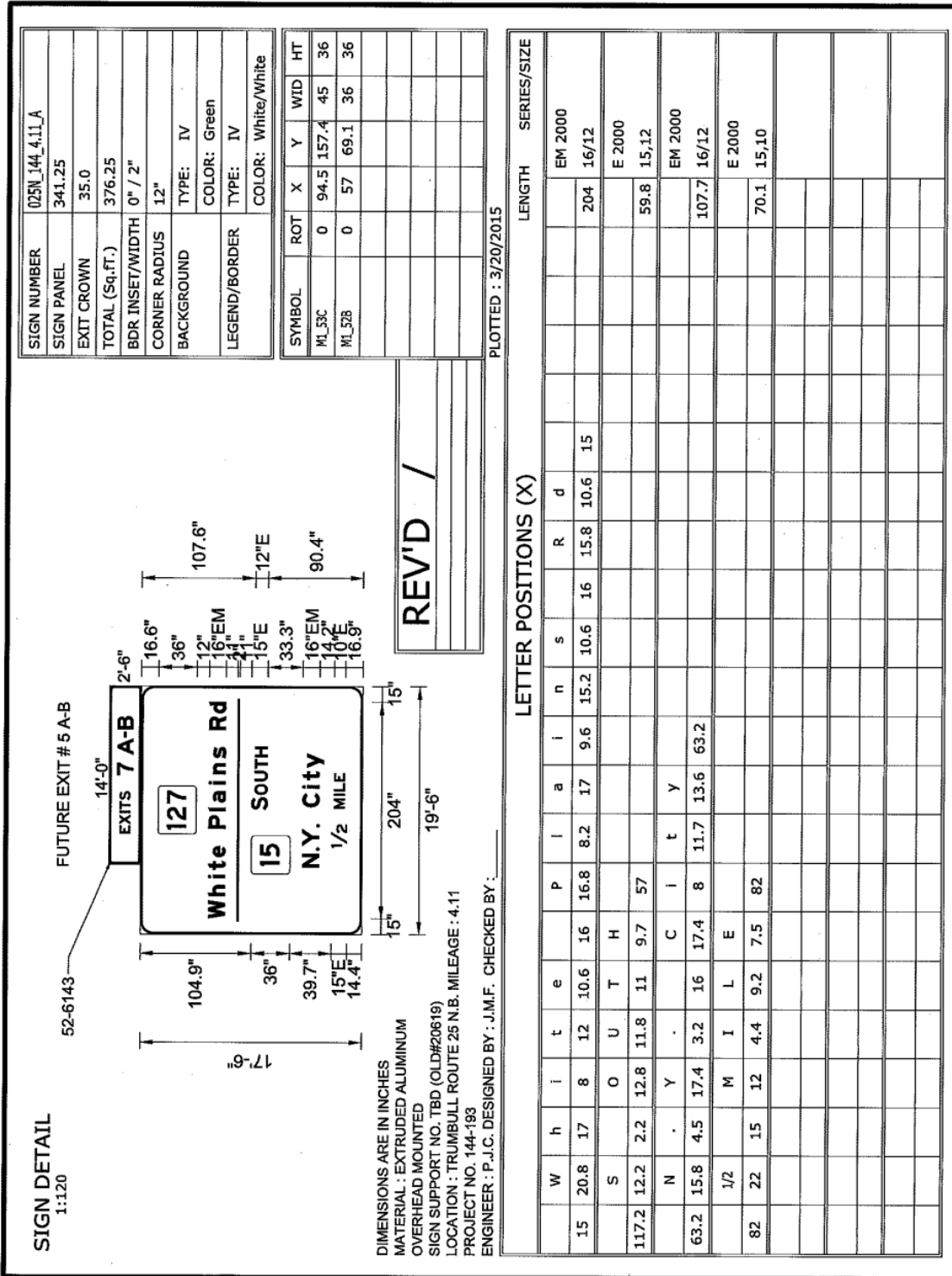






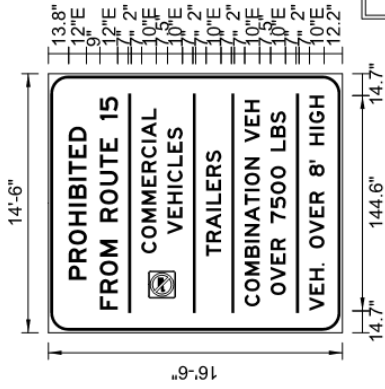








**SIGN DETAIL**  
1:100



DIMENSIONS ARE IN INCHES  
 MATERIAL : EXTRUDED ALUMINUM  
 SIDE MOUNTED  
 SIGN SUPPORT NO. N/A  
 LOCATION : TRUMBULL ROUTE 25 S.B. MILEAGE : 5.73  
 PROJECT NO. 144-193  
 ENGINEER : P.J.C. DESIGNED BY : J.M.F. CHECKED BY : \_\_\_\_\_

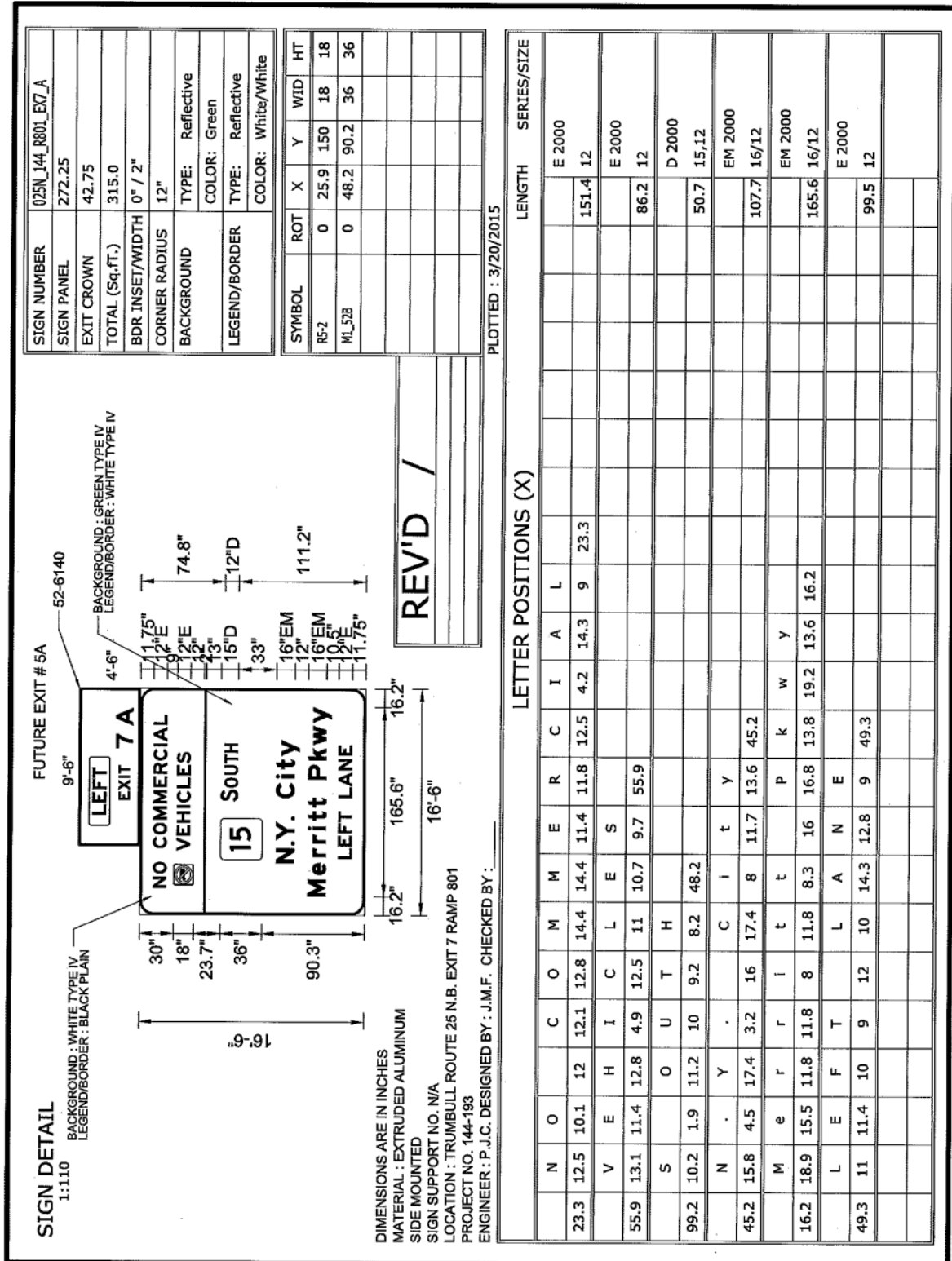
REVID /

SIGN NUMBER	025N_144_4.32_A
SIGN PANEL	239.25
EXIT CROWN	
TOTAL (Sq.ft.)	239.25
BDR INSET/WIDTH	1.25" / 2"
CORNER RADIUS	12"
BACKGROUND	TYPE: IV COLOR: White
LEGEND/BORDER	TYPE: Plain COLOR: Black/Black

SYMBOL	ROT	X	Y	WID	HT
R5-2	0	23.3	112.5	18	18

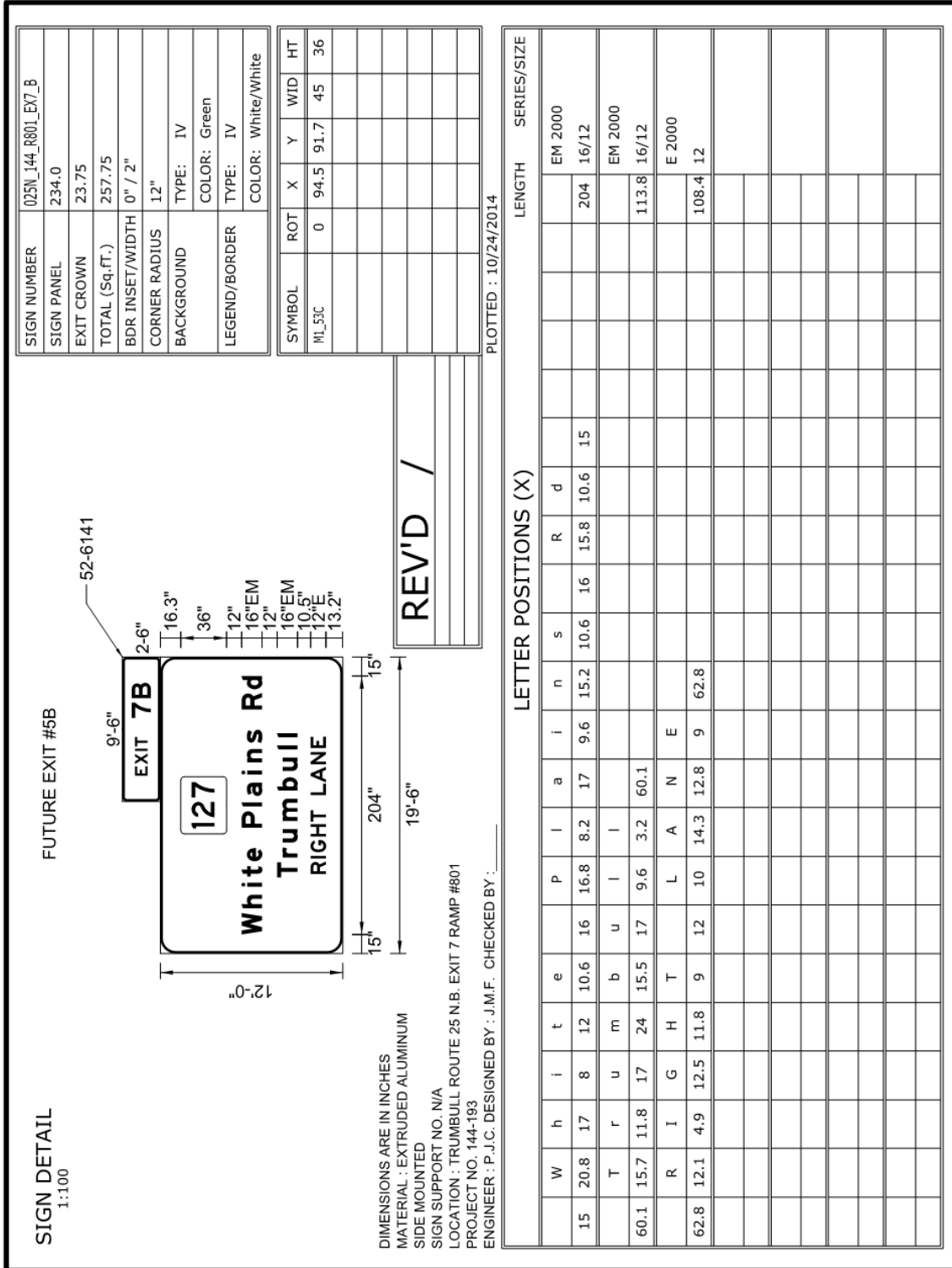
PLOTTED : 5/1/2015

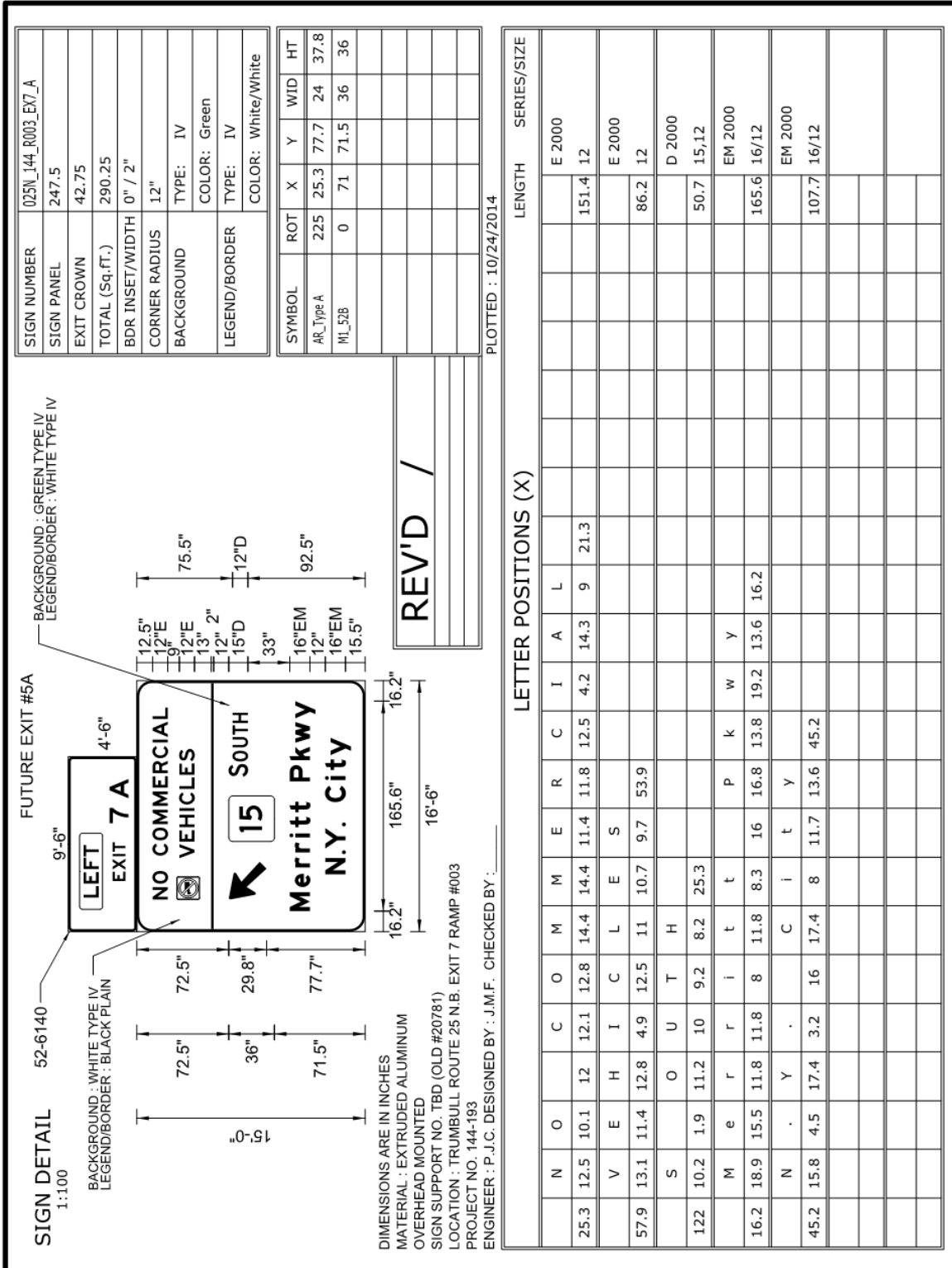
		LETTER POSITIONS (X)													LENGTH	SERIES/SIZE									
		P	R	O	H	I	B	I	T	E	D														
35.5	11.8	11.8	12.8	12.8	5.3	12.1	4.2	11	11.4	9.7	35.5												103	E 2000 12	
15.5	11	11.8	12.8	11.3	12	11.8	12.8	11.8	11	9	12	6	9.7	15.5									143	E 2000 12	
53.3	10.1	10.7	12	12	9.5	9.8	10.4	3.5	11.9	7.5	23.3												97.4	E 2000 10	
66.1	10.9	9.5	10.7	4.1	10.4	9.2	8.9	8.1	36.1														71.8	E 2000 10	
51.5	9.2	9.2	11.9	4.4	9.2	9.5	9.5	8.1	51.5														71	E 2000 10	
17.7	10.1	10.7	12	10.1	4.4	9.8	11	9.2	4.1	10.7	8.1	10	10.9	9.5	8.1	17.7							138.7	E 2000 10	
25.3	9.8	10.9	9.5	8.1	10	9.8	9.8	10.4	8.4	10	9.2	9.5	8.1	25.2									123.5	E 2000 10	



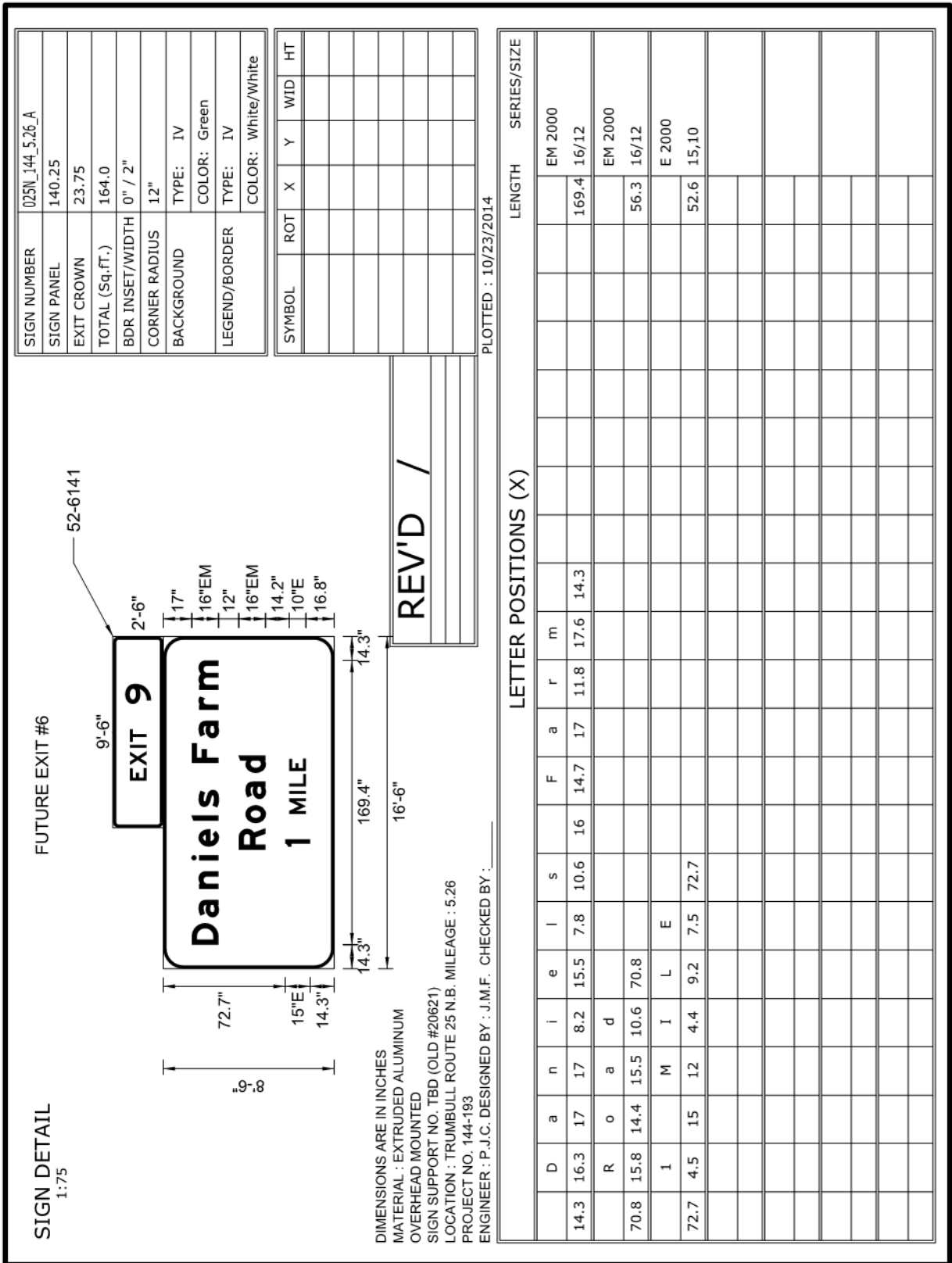
**LETTER POSITIONS (X)**

	N	O	C	O	M	E	R	C	I	A	L	LENGTH	SERIES/SIZE		
23.3	12.5	10.1	12	12.1	12.8	14.4	14.4	11.4	11.8	12.5	4.2	14.3	9	23.3	E 2000
55.9	13.1	11.4	12.8	4.9	12.5	11	10.7	9.7	55.9						E 2000
99.2	10.2	1.9	11.2	10	9.2	8.2	48.2					50.7	15,12		D 2000
45.2	15.8	4.5	17.4	3.2	16	17.4	8	11.7	13.6	45.2		107.7	16/12		EM 2000
16.2	18.9	15.5	11.8	11.8	8	11.8	8.3	16	16.8	13.8	19.2	13.6	16.2		EM 2000
49.3	11	11.4	10	9	12	10	14.3	12.8	9	49.3					E 2000

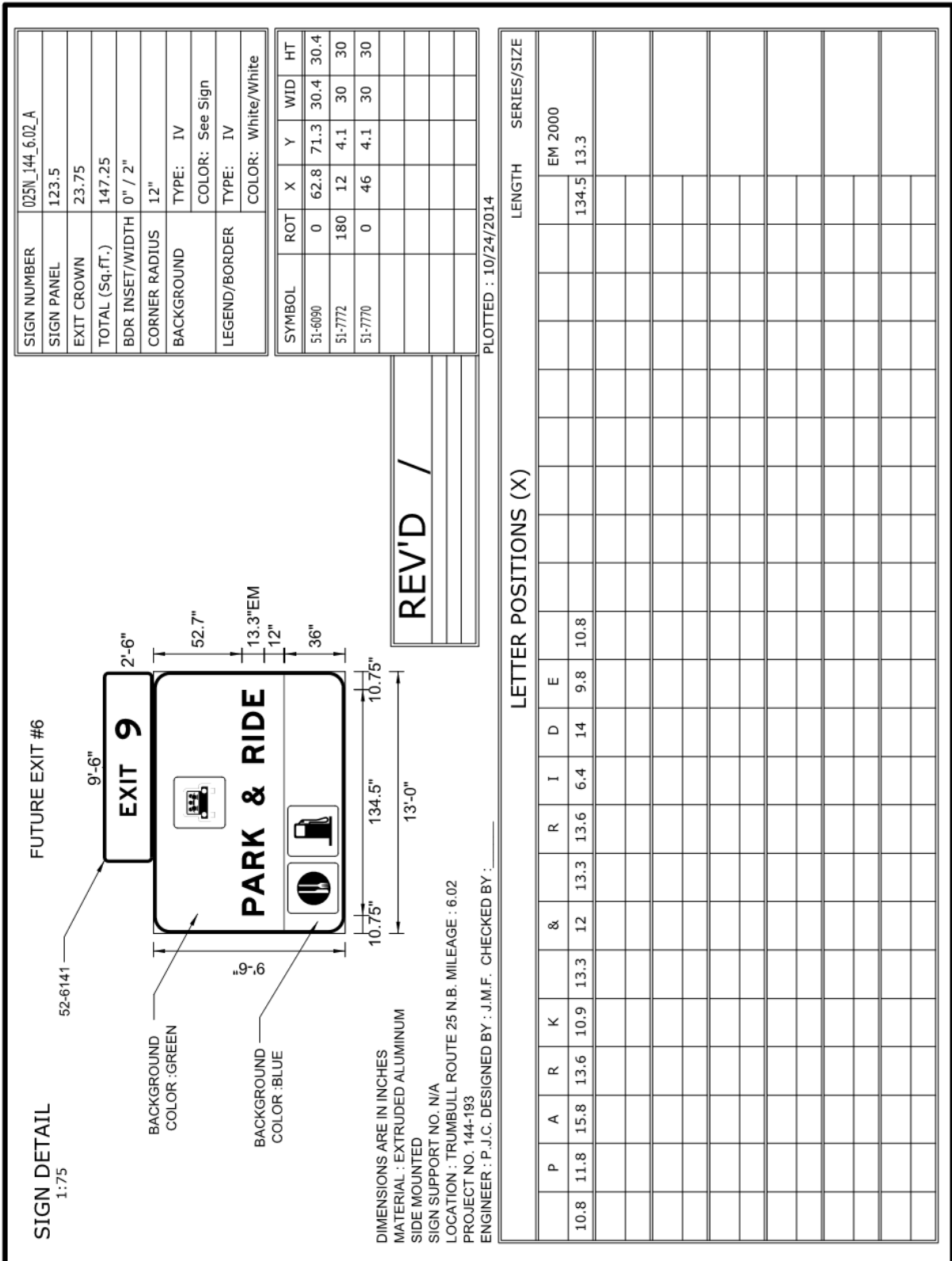










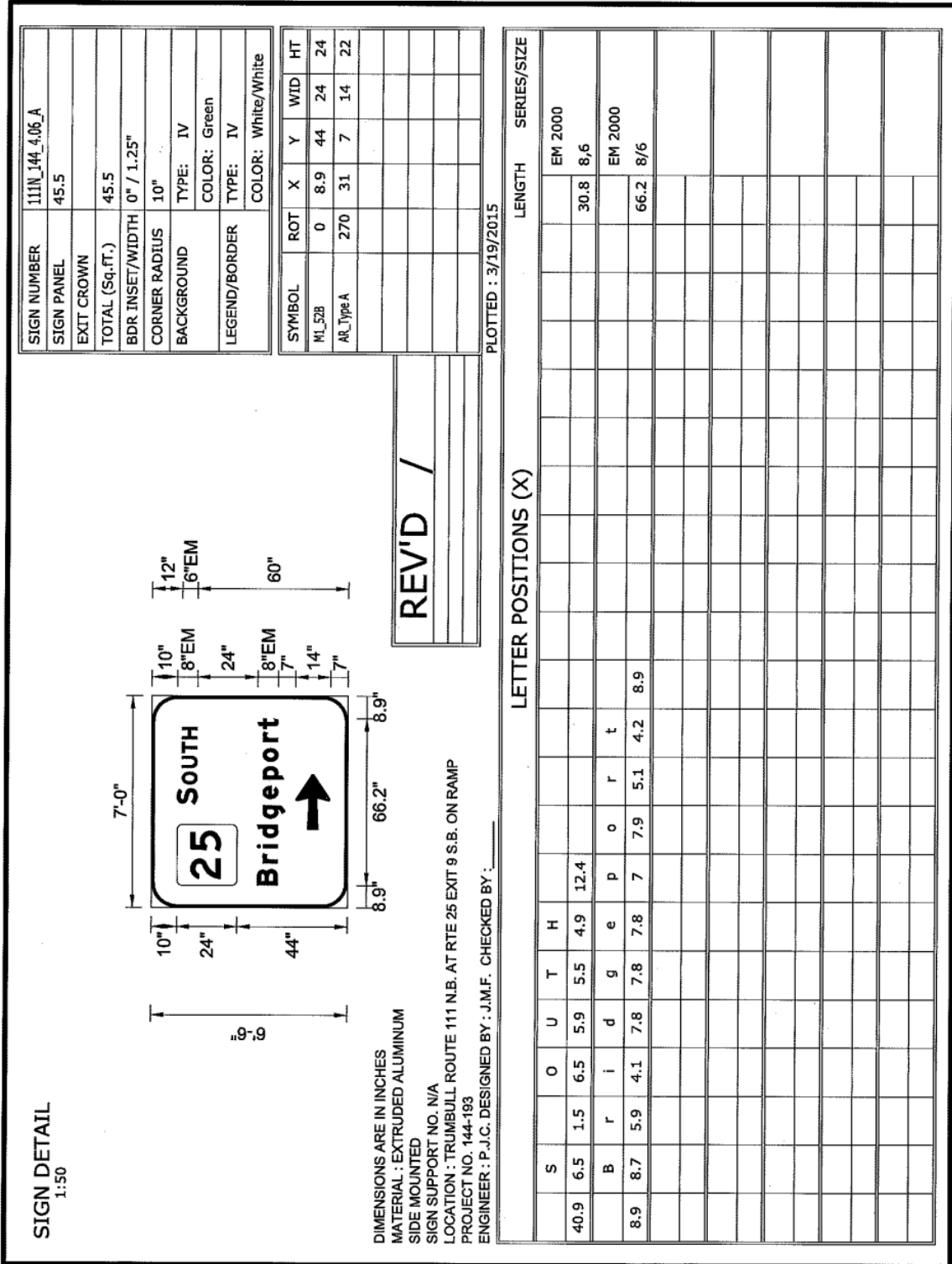












**SIGN DETAIL**  
1:50

**REV'D /**

SIGN NUMBER	111N_144_4.06_B
SIGN PANEL	45.5
EXIT CROWN	
TOTAL (Sq.ft.)	45.5
BDR INSET/WIDTH	0" / 1.25"
CORNER RADIUS	10"
BACKGROUND	TYPE: IV COLOR: Green
LEGEND/BORDER	TYPE: IV COLOR: White/White

SYMBOL	ROT	X	Y	WID	HT
ML_528	0	8.9	44	24	24
AR_Type A	90	31	7	14	22

PLOTTED : 3/19/2015

DIMENSIONS ARE IN INCHES  
 MATERIAL : EXTRUDED ALUMINUM  
 SIDE MOUNTED  
 SIGN SUPPORT NO. N/A  
 LOCATION : TRUMBULL ROUTE 111 N.B. AT RTE 25 EXIT 9 S.B. ON RAMP  
 PROJECT NO. 144-193  
 ENGINEER : P.J.C. DESIGNED BY : J.M.F. CHECKED BY :

		LETTER POSITIONS (X)										LENGTH	SERIES/SIZE		
S	O	U	T	H											
40.9	6.5	1.5	6.5	5.9	5.5	4.9	12.4							EM 2000	
								30.8							8,6
8.9	8.7	5.9	4.1	7.8	7.8	7.8	7	7.9	5.1	4.2	8.9	EM 2000			
								66.2							8/6





**SIGN DETAIL**  
1:90

52-6143

14'-0"

2'-6"

13.3"

12"

9"

12"

8 1/2"

1"

16"EM

12"

16"EM

12.5"

218"

18'-6"

2"

67.6"

36"

16.4"

10'-0"

2"

2"

EXITS 8 B-A

NO COMMERCIAL VEHICLES

Merritt Parkway

15

**REV'D 3/15**  
REVISED EXIT CROWN.  
ORIGINAL PROJ #173-351.

BACKGROUND :  
GREEN TYPE IV  
LEGEND/BORDER :  
WHITE TYPE IV

BACKGROUND :  
WHITE TYPE IV  
LEGEND/BORDER :  
BLACK TYPE PLAIN

DIMENSIONS ARE IN INCHES  
MATERIAL : EXTRUDED ALUMINUM  
OVERHEAD MOUNTED  
SIGN SUPPORT NO. TBD  
LOCATION : TRUMBULL ROUTE 25 S.B. MILEAGE : 7.43  
PROJECT NO. 144-193  
ENGINEER : E.L.B. DESIGNED BY : J.M.F. CHECKED BY :

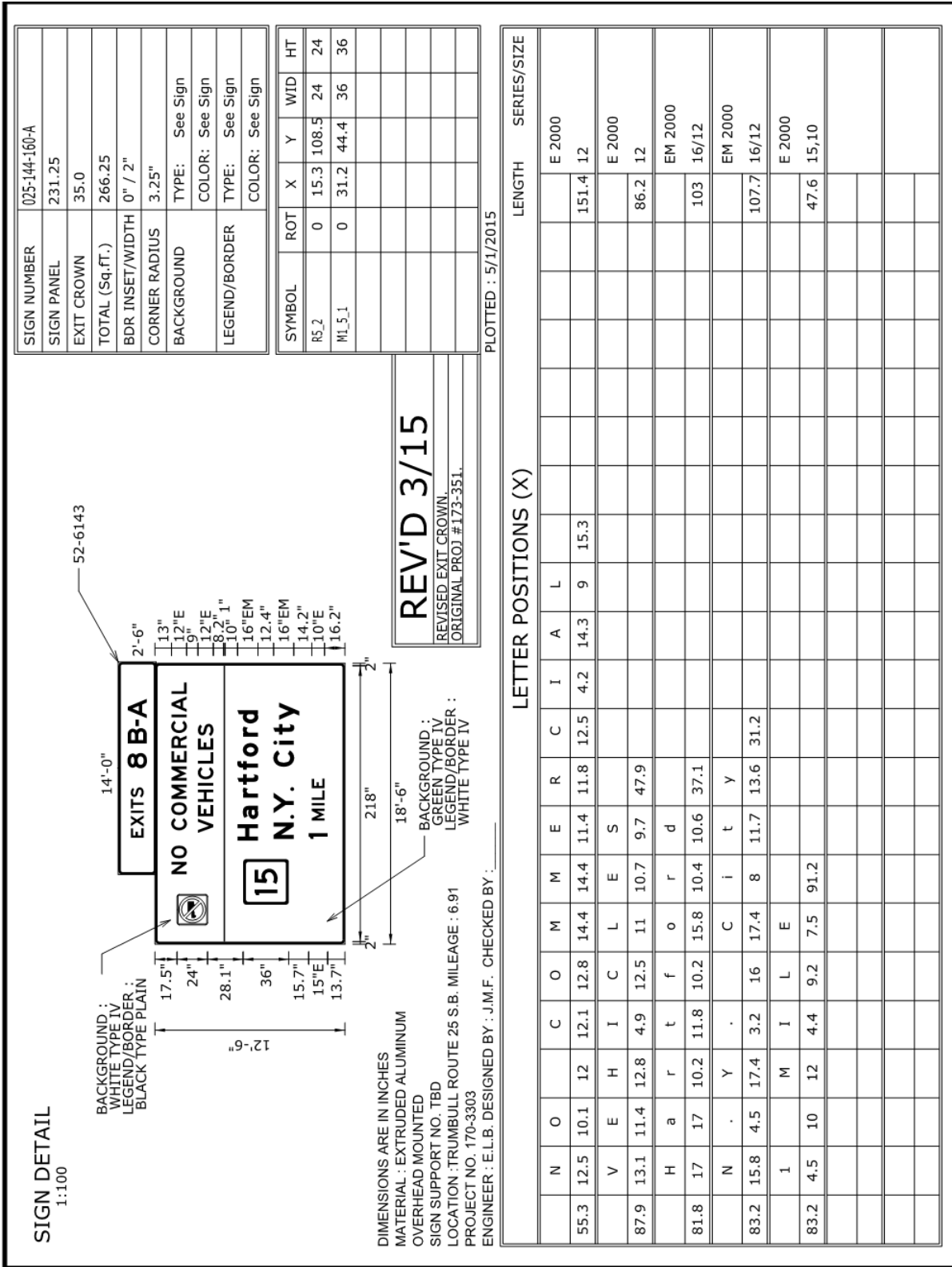
SIGN NUMBER	0255_144_743_A
SIGN PANEL	185.0
EXIT CROWN	35.0
TOTAL (Sq.Ft.)	220.0
BDR INSET/WIDTH	0" / 2"
CORNER RADIUS	12"
BACKGROUND	TYPE: See Sign COLOR: See Sign
LEGEND/BORDER	TYPE: See Sign COLOR: See Sign

SYMBOL	ROT	X	Y	WID	HT
M_5_1	0	31.9	16.4	36	36

PLOTTED : 3/26/2015

LETTER POSITIONS (X)													LENGTH	SERIES/SIZE			
N	O	C	O	M	M	E	R	C	I	A	L						
55.3	12.5	10.1	12	12.1	12.8	14.4	14.4	11.4	11.8	12.5	4.2	14.3	9	15.3		E 2000	
																151.4 12	
																	E 2000
87.9	13.1	11.4	12.8	4.9	12.5	11	10.7	9.7	47.9							86.2 12	
																	EM 2000
93.9	18.9	15.5	11.8	11.8	8	11.8	8.3	41.9								86.2 16/12	
																	EM 2000
83.9	15.4	17	11.8	13.8	19.5	15.2	13.6	31.9								106.2 16/12	











### SIGN DETAIL

1:50

DIMENSIONS ARE IN INCHES  
MATERIAL : EXTRUDED ALUMINUM  
SIDE MOUNTED  
SIGN SUPPORT NO. N/A  
LOCATION : TRUMBULL S.R.734 (DANIELS FARM RD.) AT S.R.739 (PARK ST.)  
PROJECT NO. 144-193  
ENGINEER : P.J.C. DESIGNED BY : J.M.F. CHECKED BY : \_\_\_\_\_

SIGN NUMBER	SR7394S_144_044_A
SIGN PANEL	64.0
EXIT CROWN	
TOTAL (Sq.ft.)	64.0
BDR INSET/WIDTH	0" / 2"
CORNER RADIUS	12"
BACKGROUND	TYPE: IV COLOR: Green
LEGEND/BORDER	TYPE: IV COLOR: White/White

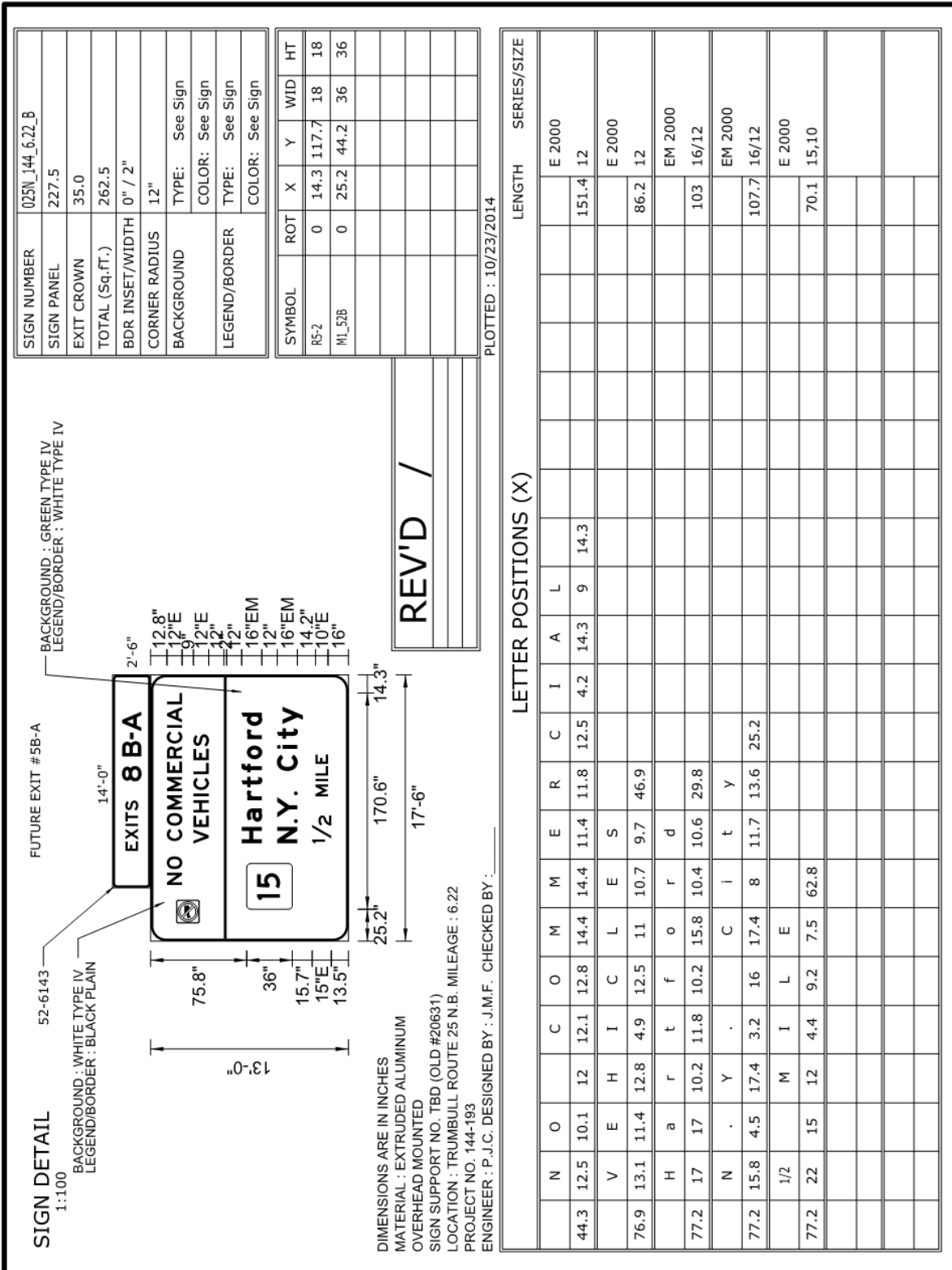
SYMBOL	ROT	X	Y	WID	HT
ML_57B	0	14.5	46	24	24
ML_52B	0	60.9	46	24	24
AR_Type A	270	38.7	9	14	22

REV'D /

PLOTTED : 10/23/2014

		LETTER POSITIONS (X)													LENGTH	SERIES/SIZE			
S	O	U	T	H															
11.1	6.5	1.5	6.5	5.9	5.5	4.9	54.1											EM 2000	
																30.8	8,6		
44.5	5.3	5	41.2											EM 2000					
																10.3	6		
16.6	8.7	5.9	4.1	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	EM 2000	
																			8/6





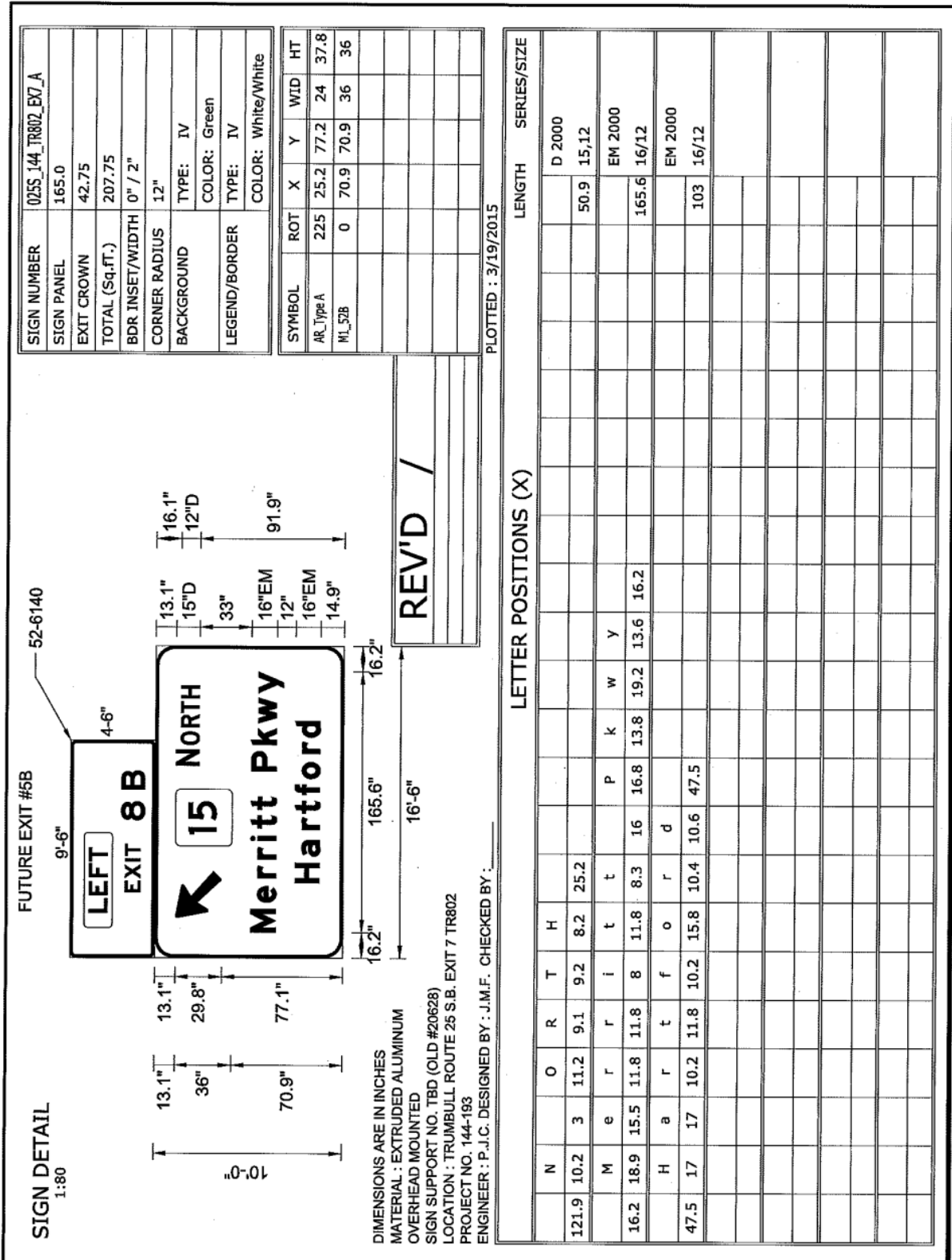


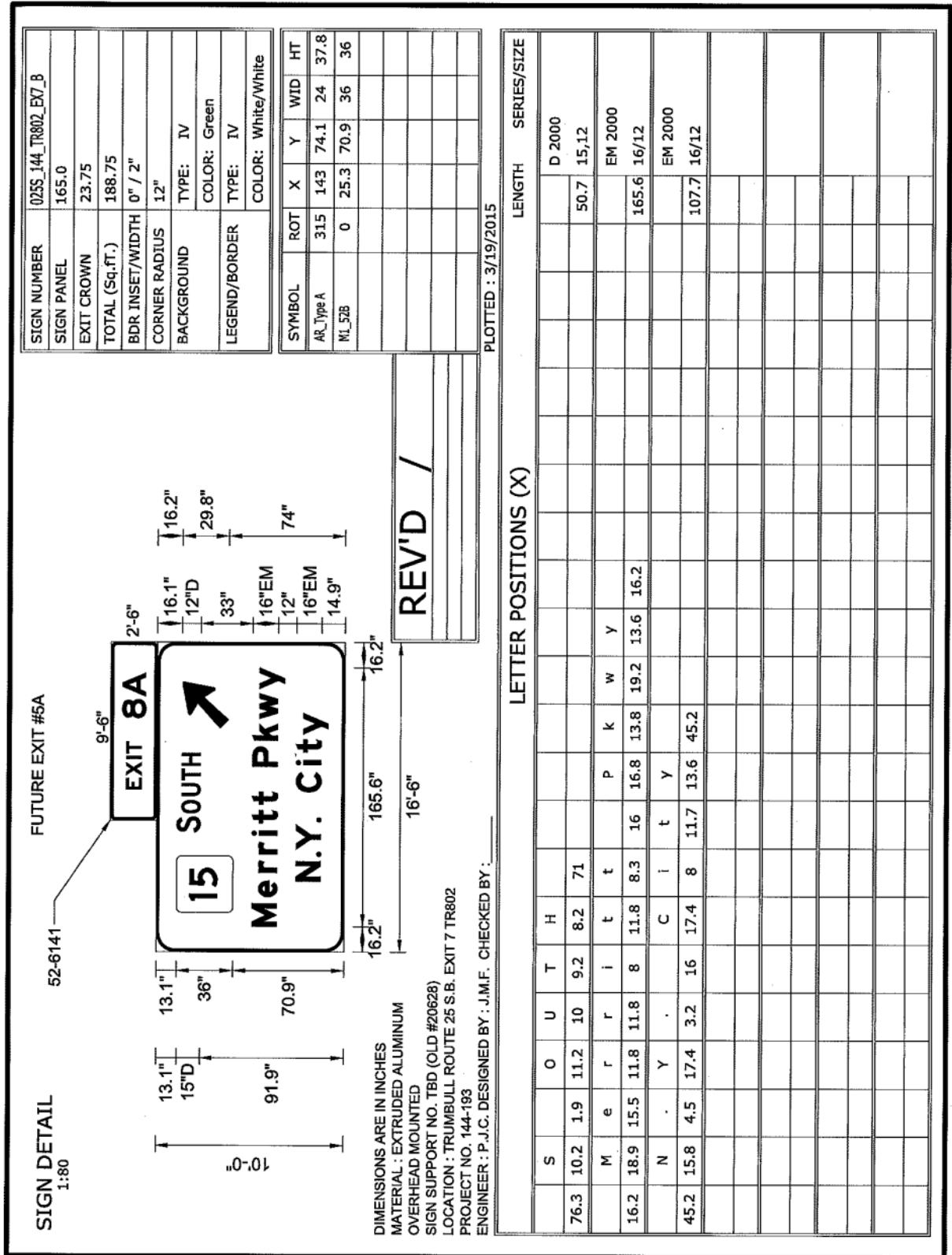










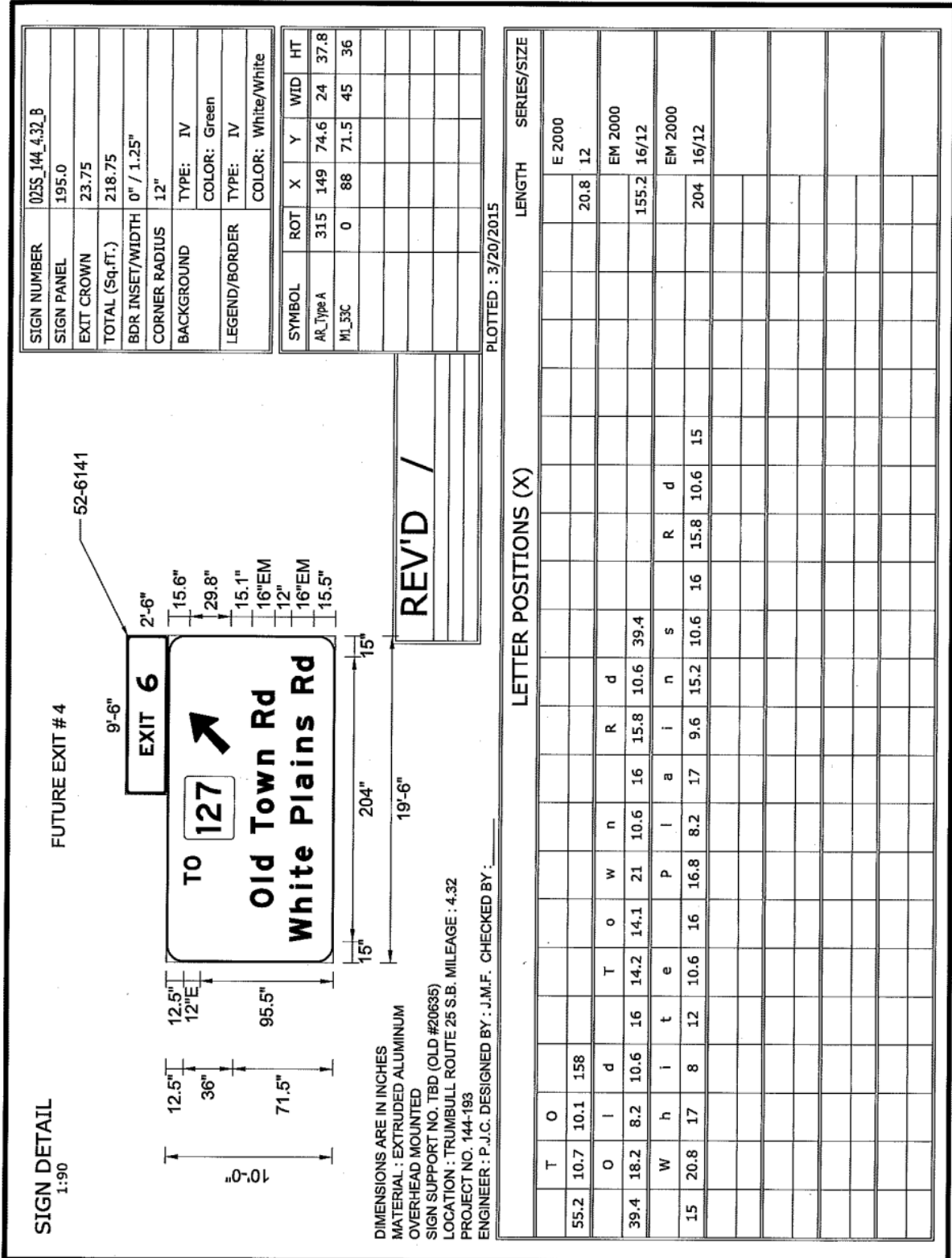














## **ITEM #1220013A – CONSTRUCTION SIGNS - BRIGHT FLUORESCENT SHEETING**

**Article 12.20.01 – Description:** The Contractor shall furnish construction signs with bright fluorescent sheeting and their required portable supports or metal sign posts that conform to the requirements of NCHRP Report 350 (TL-3). The construction signs and their required portable supports or metal sign posts shall conform to the signing requirements stated in Article 9.71 "Maintenance and Protection of Traffic", as shown on the plans and/or as directed by the Engineer.

**Article 12.20.02 – Materials:** Prior to using the construction signs and their portable supports, the Contractor shall submit to the Engineer a copy of the Letter of Acceptance issued by the FHWA to the manufacturer documenting that the devices (both sign and portable support tested together) conform to NCHRP Report 350 (TL-3).

Portable sign supports shall be designed and fabricated so as to prevent signs from being blown over or displaced by the wind from passing vehicles. Portable sign supports shall be approved by the Engineer before they are used. Mounting height of signs on portable sign supports shall be a minimum of 1 foot and a maximum of 2 feet, measured from the pavement to the bottom of the sign.

All sign faces shall be rigid and reflectorized. Sheet aluminum sign blanks shall conform to the requirements of Article M.18.13. Metal sign posts shall conform to the requirements of Article M.18.14. Application of reflective sheeting, legends, symbols, and borders shall conform to the requirements specified by the reflective sheeting manufacturer. Attachments shall be provided so that the signs can be firmly attached to the portable sign supports or metal posts without causing damage to the signs. A Materials Certificate and Certified Test Report conforming to Article 1.06.07 shall be required for the reflective sheeting.

The following types of construction signs shall not be used: mesh, non-rigid, roll-up, corrugated or waffle board types substrates, foam core and composite aluminum sign substrates.

### **Reflective sheeting shall conform to the following:**

The fluorescent orange prismatic retroreflective sheeting shall consist of prismatic lenses formed in a transparent fluorescent orange synthetic resin, sealed, and backed with an aggressive pressure sensitive adhesive protected by a removable liner. The sheeting shall have a smooth surface.

#### Physical Properties:

##### A. Photometric - Coefficient of Retroreflection $R_A$

When the sheeting applied on test panels is measured in accordance with ASTM E 810, it shall have minimum coefficient of retroreflection values as shown in Table I. The rotation angle shall be as designated by the manufacturer for test purposes, the observation angles

shall be 0.2 degrees and 0.5 degrees, the entrance angles (component B<sub>1</sub>) shall be -4 degrees and +30 degrees.

**TABLE I**  
Minimum Coefficient of Retroreflection R<sub>A</sub>  
Candelas per footcandle per square foot

Observation Angle (deg.)	Entrance Angle (deg.)	R <sub>A</sub> Orange
0.2	- 4	200
0.2	+ 30	90
0.5	- 4	80
0.5	+ 30	50

The rotation shall be as designated by the manufacturer.

**B. Daytime Color**

Color shall conform to the requirements of Table II. Daytime color and maximum spectral radiance factor (peak reflectance) of sheeting mounted on test panels shall be determined instrumentally in accordance with ASTM E 991. The values shall be determined on a Hunter Lab Labscan 6000 0/45 Spectrocolorimeter with option CMR 559 (or approved equal 0/45 instrument with circumferential viewing illumination). Computations shall be done in accordance with ASTM E 308 for the 2 degree observer.

**TABLE II**  
Color Specification Limits\*\* (Daytime)

Color	1		2		3		4		Reflectance Limit Y (%)	
	X	Y	X	Y	X	Y	X	Y	MIN	MAX
Orange (new)	.583	.416	.523	.397	.560	.360	.631	.369	28	-
Orange (weathered)	.583	.416	.523	.397	.560	.360	.631	.369	20	45

Maximum Spectral Radiance Factor, new: 110%, min.  
weathered: 60%, min.

\*\* The four pairs of chromaticity coordinates determine the acceptable color in terms of the CIE 1931 standard colorimetric system measured with standard illuminant D65.

**C. Nighttime Color**

Nighttime color of the sheeting applied to test panels shall be determined instrumentally in accordance with ASTM E 811 and calculated in the u', v' coordinate system in accordance with ASTM E 308. Sheeting shall be measured at 0.33 degrees observation

and -4 degree entrance at rotation as determined by the manufacturer for test purposes. Color shall conform to the requirements of Table III.

**TABLE III**  
Color Specification Limits \*\* (Nighttime)

Color	1		2		3		4	
	u'	v'	u'	v'	u'	v'	u'	v'
Orange (new and weathered)	.400	.540	.475	.529	.448	.522	.372	.534

#### D. Resistance to Accelerated Weathering

The retroreflective surface of the sheeting shall be weather resistant and show no appreciable cracking, blistering, crazing, or dimensional change after one year's unprotected outdoor exposure in south Florida, south-facing and inclined 45 degrees from the vertical, or after 1500 hours exposure in a xenon arc weatherometer in accordance with ASTM G26, Type B, Method A. Following exposure, panels shall be washed in a 5% HCL solution for 45 seconds, rinsed thoroughly with clean water, blotted with a soft clean cloth and brought to equilibrium at standard conditions. After cleaning, the coefficient of retroreflection shall be not less than 100 when measured as in D.2, below, and the color is expected to conform to the requirements of Tables II and III for weathered sheeting. The sample shall:

1. Show no appreciable evidence of cracking, scaling, pitting, blistering, edge lifting or curling or more than 0.031 inch shrinkage or expansion.
2. Be measured only at angles of 0.2 degrees observation, -4 degrees entrance, and rotation as determined by the manufacturer for test purposes. Where more than one panel of color is measured, the coefficient of retroreflection shall be the average of all determinations.

#### E. Impact Resistance

The retroreflective sheeting applied according to the manufacturer's recommendations to a test panel of alloy 6061-T6, 0.040 inch by 3 inches by 5 inches and conditioned for 24 hours, shall show no cracking outside the impact area when the face of the panel is subjected to an impact of 100 inch-pounds, using a weight with a 0.625 inch diameter rounded tip dropped from a height necessary to generate an impact of 100 inch-pounds, at test temperatures of both 32° F and 72° F.

#### F. Resistance to Heat

The retroreflective sheeting, applied to a test panel as in E., above, and conditioned for 24 hours, shall be measured in accordance with Paragraph A. at 0.2 degree observation and -4 degree entrance angles at rotation as determined by the manufacturer for test purposes and

exposed to  $170^{\circ} \pm 5^{\circ}$  F for 24 hours in an air circulating oven. After heat exposure the sheeting shall retain a minimum of 70% of the original coefficient of retroreflection.

**G. Field Performance:**

Retroreflective sheeting processed and applied to sign blank materials in accordance with the sheeting manufacturer's recommendations, shall perform effectively for a minimum of 3 years. The retroreflective sheeting will be considered unsatisfactory if it has deteriorated due to natural causes to the extent that: (1) the sign is ineffective for its intended purpose when viewed from a moving vehicle under normal day and night driving conditions; or (2) the coefficient of retroreflection is less than 100 when measured at 0.2 degrees observation and -4 degree entrance. All measurements shall be made after sign cleaning according to the sheeting manufacturer's recommendations.

**Article 12.20.03 – Construction Methods:** Ineffective signs, as determined by the Engineer and in accordance with the ATSSA guidelines contained in "Quality Standards for Work Zone Traffic Control Devices", shall be replaced by the Contractor at no cost to the State.

Signs and their portable sign supports or metal posts that are no longer required shall be removed from the project and shall remain the property of the Contractor.

**Article 12.20.04 – Method of Measurement:** Construction Signs - Bright Fluorescent Sheeting will be measured for payment by the number of square feet of sign face. Sign supports will not be measured for payment.

**Article 12.20.05 – Basis of Payment:** "Construction Signs - Bright Fluorescent Sheeting" required and used on the project will be paid for at the Contact unit price per square foot. This price shall include the furnishing and maintenance of the signs, portable sign supports, metal sign posts and all hardware. Each sign and support or posts will be paid for once, regardless of the number of times it is used.

Pay Item

Construction Signs – Bright Fluorescent Sheeting

Pay Unit

S.F.

## **PERMITS AND/OR SUPPLEMENTAL TO FORM 816 AND REQUIRED PROVISIONS:**

The following Permits and/or Supplemental to Form 816 and Required Provisions follow this page and are hereby made part of this Contract.

- **PERMITS AND/OR PERMIT APPLICATIONS**

No Permits are required for this contract

- **SUPPLEMENTAL SPECIFICATIONS TO STANDARD SPECIFICATIONS FORM 816**

- **Construction Contracts - Required Contract Provisions (FHWA Funded Contracts)**

**State of Connecticut**

**Department of Transportation**

**SUPPLEMENTAL SPECIFICATIONS**

**TO**

**THE STANDARD SPECIFICATIONS**

**FOR**

**ROADS, BRIDGES AND INCIDENTAL CONSTRUCTION**

*FORM 816*

**2004**

**JULY 2014**



July 2014

**DIVISION I**  
**GENERAL REQUIREMENTS AND COVENANTS**

<u>SECTION</u>		<u>SPECIFICATION NUMBER</u>
1.01	Definition of Terms and Permissible Abbreviations	101
1.02	Proposal Requirements and Conditions	102
1.03	Award and Execution of Contract	103
1.05	Control of the Work	105
1.07	Legal Relations and Responsibilities	107
1.08	Prosecution and Progress	108
1.09	Measurement and Payment	109
1.10	Environmental Compliance	110
1.11	Claims	111
1.20	General Clauses for Facilities Construction	120

**DIVISION II**  
**CONSTRUCTION DETAILS**

<u>SECTION</u>		<u>SPECIFICATION NUMBER</u>
2.02	Roadway Excavation, Formation of Embankment and Disposal of Surplus Material	202
2.05	Trench Excavation	205
2.12	Subbase	212
2.16	Pervious Structure Backfill	216
3.04	Processed Aggregate Base	304
4.01	Concrete Pavement	401
5.14	Prestressed Concrete Members	514
6.01	Concrete for Structures	601
6.03	Structural Steel	603
6.12	Concrete Cylinder Curing Box	612
6.51	Culverts	651
7.01	Drilled Shafts	701
7.02	Piles	702
7.06	Micropiles	706
8.22	Temporary Precast Concrete Barrier Curb	822
9.01	Bollard	901
9.10	Metal Beam Rail	910
9.18	Three-Cable Guide Railing (I-Beam Post) and Anchorages	918
9.22	Bituminous Concrete Sidewalk	
	Bituminous Concrete Driveway	922
9.44	Topsoil	944
9.49	Furnishing, Planting and Mulching Trees, Shrubs, Vines and Ground Cover Plants	949
9.75	Mobilization and Project Closeout	975
10.00	General Clauses for Highway Illumination and Traffic Signal Projects	1000
10.01	Trenching and Backfilling	1001
10.03	Light Standards	1003
10.09	Cast Iron Junction Box	1009
10.10	Concrete Handhole	1010
10.14	Cable in Duct	1014
10.19	Pre-Assembled Aerial Cable, Aerial Cable (3 No. 2)	1019
10.20	Wood Pole, Temporary Illumination Unit	1020
11.13	Control Cable	1113
12.10	Epoxy Resin Pavement Markings, Symbols and Legends	1210

July 2014

**DIVISION III**  
**MATERIALS SECTION**

<u>SECTION</u>		<u>SPECIFICATION NUMBER</u>
M.03	Portland Cement Concrete	M03
M.06	Metals	M06
M.08	Drainage	M08
M.11	Masonry Facing, Cement and Dry Rubble Masonry, Brick, Mortar	M11
M.13	Roadside Development	M13
M.16	Traffic Control Signals	M16
M.17	Elastomeric Materials	M17
M.18	Signing	M18

**July 2014**  
**STANDARD SPECIFICATIONS**  
**FOR**  
**ROADS, BRIDGES AND INCIDENTAL CONSTRUCTION**  
**FORM 816**

**ERRATA**

<u>PG.</u>	<u>ARTICLE OR SUBARTICLE</u>	<u>LINE NO.</u>	<u>CORRECTION</u>	<u>REV. DATE</u>
i	Table of Contents	20	Insert "1.11 Claims".....	July10
iii	Table of Contents	10	Insert "7.01 Drilled Shafts".....	July14
iii	Table of Contents	15	Insert "7.06 Micropiles".....	July14
iv	Table of Contents	11	Change "Guild" to "Guide" .....	Jan05
v	Table of Contents	2	Change "Mobilization" to "Mobilization and Project Closeout".....	July14
12	1.01.03	31	Insert "AOEC – Area of Environmental Concern".....	Jan05
12	1.01.03	31	Insert "AWG – American Wire Gauge".....	Jan05
13	1.01.03	16	Insert "HASP – Health and Safety Plan".....	Jan05
13	1.01.03	29	Insert "PCC – Portland Cement Concrete".....	Jan05
14	1.01.03	25	Insert "VOC – Volatile Organic Compound".....	Jan05
14	1.01.03	26	Insert "WSA – Temporary Waste Stockpile Area".....	Jan05
32	1.05.01	38	Change "Connecticut General Statutes" to "CGS".....	Jan05
97	1.10.03-2	32	Change "D.E.P." to "DEEP".....	Jan14
97	1.10.03-2	39	Change "D.E.P," to "DEEP,".....	Jan14
98	1.10.03-2.1	13	Change "D.E.P." to "DEEP".....	Jan14
99	1.10.03-2.6	23	Change "D.E.P." to "DEEP".....	Jan14
100	1.10.03-2.9	32	Change "D.E.P." to "DEEP".....	Jan14
101	1.10.03-2.12	22	Change "D.E.P." to "DEEP".....	Jan14
102	1.10.04	26	Change "D.E.P." to "DEEP".....	Jan14
105	1.20	29	Change "Workmen and Equipment" to "Personnel and Equipment".....	Jan05
105	1.20	31	Delete "Completion of Construction Work and".....	Jan05
108	1.20-1.04.01	26	Change "othewise" to "otherwise".....	July07
110	1.20-1.05.02-2	17	Change "DEP" to "DEEP" .....	Jan14
122	1.20-1.06.08	3	Change "Certificate of Compliance" to "C.O.C.".....	July07
131	1.20-1.08.05	34	Change "Workmen and Equipment" to "Personnel and Equipment".....	Jan05
132	1.20-1.08.11	12	Change "Certificate of Compliance" to "C.O.C.".....	July07
133	1.20-1.08.13	7	Delete "Completion of Construction Work and".....	Jan05
133	1.20-1.08.13	9	Change "Certificate of Compliance" to "C.O.C.".....	July07
133	1.20-1.08.13	15	Change "Certificate of Compliance" to "C.O.C.".....	July07
133	1.20-1.08.13	20	Change "Certificate of Compliance" to "C.O.C.".....	July07
164	2.04.03-1	2	Change "6.01.03-10" to "6.01.03-6".....	Jan14
196	3.03.02	33	Change "Article M.03.01" to "Section M.03".....	Jan14
245	4.06.04	11	Change " <b>Over weight (mass) Adjustments -</b> " and replace with indented "Over weight (mass) Adjustments -" as a subsection of " <b>1. Bituminous Concrete Class ( )</b> .".....	Jan05
256	5.01.02	22	Change "DEP" to "DEEP".....	Jan14
259	5.03.03	24	Change "Such requirements of Article 5.02.03 ... equally to this construction." to "All such plans prepared by the Contractor	

<u>PG.</u>	<u>ARTICLE OR SUBARTICLE</u>	<u>LINE NO.</u>	<u>CORRECTION</u>	<u>REV. DATE</u>
			shall be considered working drawings and shall be submitted with engineering calculations to the Engineer for review in accordance with the requirements of Article 1.05.02.".....	July10
262	5.06.02	26	Change "Article M.03.01" to "Section M.03".....	Jan14
262	5.06.02	27	Change "Article M.03.01" to "Section M.03".....	Jan14
265	5.07.02	19	Change "Subarticle M.03.01-11" to "Article M.03.09".....	Jan14
265	5.07.02	23	Change "Approved Products List for Geotextiles referred to in Subarticle M.08.01-26." to "Qualified Products List referred to in Subarticle M.08.01-19 Geotextiles".....	July14
270	5.08.02	4	Change "M.06.02-12" to "M.06.02-4 Welded Stud Shear Connectors".....	July10
271	5.09.02	39	Change "M.06.02-12" to "M.06.02-4 Welded Stud Shear Connectors".....	July10
272	5.13.02	22	Change "M.08.01-27" to "M.08.01-20 PVC Pipe or M.08.01-21 PVC Gravity Pipe".....	July13
378	6.52.02	2	Change "M.08.01-22" to "M.08.01-11 Reinforced Concrete Culvert End".....	July13
378	6.52.02	3	Change "M.08.01-23" to "M.08.01-6 Metal Culvert End".....	July13
404	7.05.02	11	Change "Article M.03.01" to "Section M.03".....	Jan14
416	7.51.02-(4)	7	Change "M.08.01-26" to "M.08.01-19 Geotextiles".....	July13
418	7.55.02	26	Change "M.08.01-26" to "M.08.01-19 Geotextiles".....	July13
420	8.11.02	37	Change "Article M.03.01" to "Section M.03".....	Jan14
420	8.11.02	38	Change "Article M.03.01" to "Subarticle M.03.08-2".....	Jan14
421	8.11.02	1	Change "Article M.03.01" to "Section M.03".....	Jan14
426	8.16.02	28	Change "Subarticle M.03.01-8" to "Article M.03.08".....	Jan14
428	8.18.02	10	Change "Subarticle M.03.01-11" to "Article M.03.09".....	Jan14
429	8.21.02-6	30	Change "M.03.01-11" to "Article M.03.09".....	Jan14
430	8.21.03-6	37	Change "M.03.01-11" to "Article M.03.09".....	Jan14
434	9.04.02	14	Change "Subarticle M.06.02-1" to "Article 6.03.02".....	July10
434	9.04.02	15	Change "M.06.02-9(d) for metal bridge rail (cast post—aluminum)" to "Malleable castings shall conform to the requirements of the specifications for malleable iron castings, ASTM A 47, Grade No. 32510 (22010). Ductile iron castings shall conform to the Specifications for Ductile Iron Castings, ASTM A 536, Grade 60-40-18 (414-276-18) unless otherwise specified. In addition to the specified test coupons, test specimens from parts integral with the castings, such as risers, shall be tested for castings having a weight (mass) of more than 1000 pounds (455 kilograms) to determine that the required quality is obtained in the castings in the finished condition.".....	July10
445	9.11.02	14	Change "Subarticle M.03.01-12" to "Article M.03.05".....	Jan14
452	9.14.02	2	Change "Subarticle M.06.02-8" to "ASTM A 53, Type E or S, Grade A, Schedule 40 Black Finish.".....	July10
452	9.14.02	4	Change "Subarticle M.06.02-9(d) except that the grade shall be 32510" to "the specifications for malleable iron castings, ASTM A 47, Grade No. 32510 (22010). Ductile iron castings shall conform to the Specifications for Ductile Iron Castings, ASTM A 536, Grade 60-40-18 (414-276-18)	

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			unless otherwise specified. In addition to the specified test coupons, test specimens from parts integral with the castings, such as risers, shall be tested for castings having a weight (mass) of more than 1000 pounds (455 kilograms) to determine that the required quality is obtained in the castings in the finished condition.”.....	July10
454	9.16.02	20	Change “Article M.03.01” to “Section M.03”.....	Jan14
459	9.21.02	9	Change “Article M.03.01” to “Section M.03”.....	Jan14
459	9.21.02	17	Change “Article M.03.01” to “Section M.03”.....	Jan14
464	9.24.02-1	19	Change “Article M.03.01” to “Section M.03”.....	Jan14
475	9.47.02-5	34	Change “Article M.03.01” to “Section M.03”.....	Jan14
496	9.70.01	37	Change “CDOT” to “ConnDOT”.....	Jan05
507	9.77.02	35	Change “M.18.09.01” to “M.18.09-1”.....	July14
508	9.78.02	32	Change “M.18.09.01” to “M.18.09-1”.....	July14
508	9.78.02	37	Delete the sentence “Retroreflective sheeting shall ... the requirements of Article M.18.09.01.”.....	July14
514	9.81.02	21	Change “M.18.09.01” to “M.18.09-1”.....	July14
514	9.81.03	24	Change “manufacturers” to “manufacturer's”.....	July14
517	10.00	21	Add “10.00.14—Maintenance of Illumination During Construction”.....	July14
518	10.00.03(2)	41	Change “pre-emotion” to “pre-emption”.....	July14
519	10.00.04	12	Capitalize “Section”.....	July14
519	10.00.04	18	Capitalize “Project”.....	July14
533	10.02.02	6	Change “Article M.03.01” to “Section M.03”.....	Jan14
544	10.11.02	5	Change “M.08.01-25 or M.08.01-27” to “M.08.01-20 or M.08.01-21”.....	July13
548	10.17.03	14	Change “6.01.03-21” to “6.01.03-10”.....	Jan14
552	11.03.03-1	18	Change “M.03.01-12” to “M.03.05”.....	Jan14
569	11.14.05	19	Change “Span Wire” to “Span Wire (Type)”.....	July12
576	12.01.02	40	Change “Subarticle M.03.01-12” to “Article M.03.05”.....	Jan14
577	12.01.03	7	Change “6.03.03-19” to “6.03.03-4 (f) High Strength Bolted Connections”.....	July10
577	12.01.03	23	Change “Article 6.03.03-15” to “Subarticle 6.03.03-4(c) Bearings”.....	July10
577	12.01.03	27	Change “Article 6.03.03-19 (c)(3)” to “Subarticle 6.03.03-4 (f) High Strength Bolted Connections Turn-of-Nut Installation Method”.....	July10
578	12.02.02	23	Change “M.03.01-12” to “M.03.05”.....	Jan14
580	12.02.03	16	Change “6.01.03-21” to “6.01.03-10”.....	Jan14
583	12.05.02	16	Change “M.18.09.01” to “M.18.09-1”.....	July14
583	12.05.02	17	Change “M.18.09.02” to “M.18.09-2”.....	July14
583	12.05.04	35	Change “12.05.040” to “12.05.04”.....	July14
587	12.08.02	40	Change “Section M.18.09.01” to “Subarticle M.18.09-1”.....	July14
604	18.00.02	7	Change “National Cooperative Highway Research Program (NCHRP)” to “NCHRP”.....	Jan05
604	18.02.02	36	Change “Approved Products List” to “Qualified Products List”.....	July14
609	18.07.02	30	Change “M18” to “M.18”.....	July14
705	M.09.02-2	18	Change “Article M.09.02(1)” to “Subarticle M.09.02-1”.....	July14

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708	M.09.02-5	5	Change "Article M.03.01" to "Section M.03".....	Jan14
708	M.09.02-6	40	Change "Article M.03.01-2" to "Subarticle M.03.01-2".....	July14
638	M.04.02	37	Change "Asphalt Institute's" to "AI's".....	Jan05
711	M.10.02-1	17	Change "Subarticle M.06.02-1(b)" to "Article M.06.02".....	July10
713	M.10.02-7	8	Change "Article M.03.01" to "Section M.03".....	Jan14
720	M.10.08-3	2	Change "Subarticle M.06.02-1(b)" to "Article M.06.02".....	July10
720	M.10.08-4	10	Change "Article M.03.01" to "Section M.03".....	Jan14
726	M.12.03	18	After "M.03.01" add "and M.03.02".....	Jan14
731	M.12.08-3	20	Change "Article M.06.01-1" to "Subarticle M.06.01-1".....	July14
748	M.14.01-3	42	Change "Article M.06.01-1" to "Subarticle M.06.01-1".....	July14
749	M.14.01-4	2	Change "Article M.08.01-5" to "Subarticle M.08.01-5".....	July14
749	M.14.01-7	22	Change "Article M.14.01-2" to "Subarticle M.14.01-2".....	July14
749	M.14.01-8	32	Change "Article M.03.01-12" to "Article M.03.05".....	Jan14
758	M.15.10	9	Change "Article M.15.09-1" to "Subarticle M.15.09-1".....	July14
759	M.15.15-4	23	Change "Article M.16.03.2" to "Subarticle M.16.03-2".....	July14
759	M.15.15-5	26	Change Article M.15.02.2" to "Subarticle M.15.02-2".....	July14
759	M.15.15-5	24	Change "Article M.03.01" to "Section M.03".....	Jan14
759	M.15.15-6	27	Change "Article M.03.01" to "Section M.03".....	Jan14
760	M.15.15-16	21	Change "non-fusible" to "fused".....	Jan05
828	Pay Items	29	Add "7.01, Furnishing Drilled Shaft Drilling Equipment, I.s. (I.s.)".....	July14
828	Pay Items	30	Add "7.01, Drilled Shaft (Diameter), I.f. (m).....	July14
828	Pay Items	31	Add "7.01, Drilled Shaft Earth Excavation (Diameter), I.f. (m)".....	July14
828	Pay Items	32	Add "7.01, Drilled Shaft Rock Excavation (Diameter), I.f. (m)".....	July14
828	Pay Items	33	Add "7.01, Obstructions, hr. (hr.)".....	July14
828	Pay Items	34	Add "7.01, Trial Drilled Shaft (Diameter), I.f. (m)".....	July14
828	Pay Items	35	Add "7.01, Exploration Test Boring, I.f. (m)".....	July14
828	Pay Items	36	Add "7.01, Permanent Casing (Diameter), I.f. (m)".....	July14
828	Pay Items	37	Add "7.01, Access Tubes, I.f. (m)".....	July14
829	Pay Items	4	Add "7.02, Dynamic Pile Driving Analysis (PDA) Test, ea. (ea.)".....	July13
829	Pay Items	5	Add "7.02, Pre-Augering of Piles, I.f. (m)".....	July13
829	Pay Items	13	Add "7.06, Micropiles, ea. (ea.)".....	July14
829	Pay Items	14	Add "7.06, Verification Test for Micropiles, ea. (ea.)".....	July14
829	Pay Items	15	Add "7.06, Proof Test for Micropiles, ea. (ea.)".....	July14
829	Pay Items	16	Add "7.06, Micropile Length Adjustment, I.f. (m)".....	July14
835	Pay Items	3	Change "Mobilization" to "Mobilization and Project Closeout".....	July14
837	Pay Items	24	Change "Span Wire" to "Span Wire (Type)".....	July12
845	Index	6	Add page 133 to "Acceptance of Project".....	Jan05
846	Index	13	Add page 107 to "Bids: Consideration of".....	Jan05
847	Index	28	Add page 132 to "Cleaning Up, Final".....	Jan05
849	Index	25	Add page 107 to "Consideration of Bids".....	Jan05
849	Index	39	Add page 108 to "Contract: Intent of".....	Jan05
850	Index	3	Add page 133 to "Contractor's: Responsibility, Termination of the".....	Jan05
850	Index	13	Add page 114 to "Cooperation by Contractor".....	Jan05

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850	Index	15	Add page 114 to "Coordination of Special Provisions, Plans, Supplemental Specifications and Standard Specifications and Other Contract Requirements".....	Jan05
850	Index	40	Add page 128 to "Cutting and Patching:".....	Jan05
852	Index	16	Add page 106 to "Examination of Plans, Specifications, Special Provisions and Site of Work".....	Jan05
852	Index	38	Insert "Facilities, Temporary...126".....	Jan05
853	Index	7	Add page 132 to "Final: Cleaning Up".....	Jan05
854	Index	35	Add page 115 to "Inspection".....	Jan05
855	Index	11	Add page 108 to "Intent of Contract".....	Jan05
855	Index	22	Add page 106 to "Knowledge of Applicable Laws".....	Jan05
855	Index	25	Add page 106 to "Laws: Knowledge of Applicable".....	Jan05
856	Index	27	Add page 120 to "Materials: Source of Supply and Quality"....	Jan05
856	Index	28	Add page 121 to "Materials: Storage of".....	Jan05
857	Index	33	Add page 133 to "Operation and Maintenance Manuals:".....	Jan05
857	Index	34	Change page 133 to 136 for "Equipment and Systems Maintenance Manual".....	Jan05
859	Index	2	Add page 131 to "Personnel and Equipment".....	Jan05
860	Index	6	Add page 114 to "Plans: Coordination of Special Provisions, Supplemental Specifications and Standard Specifications and Other Contract Requirements".....	Jan05
860	Index	7	Add page 106 to "Plans: Examination of".....	Jan05
860	Index	30	Change page 108 to 112 for "Product Data".....	Jan05
860	Index	31	Change page 108 to 112 for "Product Samples".....	Jan05
860	Index	32	Add page 124 to "Product Selection:".....	Jan05
861	Index	12	Add page 126 to "Prosecution of Work".....	Jan05
861	Index	38	Change page 115 to 135 for "Record Drawings".....	Jan05
863	Index	3	Add page 125 to "Sanitary Provisions".....	Jan05
863	Index	18	Insert "Services, Temporary...126".....	Jan05
863	Index	23	Add page 111 to "Shop Drawings".....	Jan05
864	Index	4	Add page 106 to "Site of Work, Examination of".....	Jan05
864	Index	12	Add page 120 to "Source of Supply and Quality".....	Jan05
864	Index	19	Add page 114 to "Special Provisions: Coordination of Plans, Supplemental Specifications and Standard Specifications and Other Contract Requirements".....	Jan05
864	Index	20	Add page 106 to "Special Provisions: Examination of".....	Jan05
864	Index	26	Add page 114 to "Specifications: Coordination of Plans, Special Provisions and Other Contract Requirements".....	Jan05
864	Index	27	Add page 106 to "Specifications: Examination of".....	Jan05
864	Index	43	Add page 121 to "Storage".....	Jan05
865	Index	27	Delete page 108 from "Submittals: Shop Drawings".....	Jan05
865	Index	45	Insert "Temporary Utilities, Services, and Facilities...126"....	Jan05
866	Index	2	Add page 133 to "Termination of Contractor's Responsibility".....	Jan05
866	Index	23	Insert "Training...137".....	Jan05
866	Index	45	Add page 133 to "Utility Services".....	Jan05
867	Index	8	Insert "Warranties...121".....	Jan05
867	Index	24	Add page 126 to "Work: Prosecution of".....	Jan05



**CONNECTICUT  
SUPPLEMENTAL SPECIFICATION  
SECTION 1.01  
DEFINITIONS OF TERMS AND  
PERMISSIBLE ABBREVIATIONS**

**1.01.01 — Definitions:**

*After the end of the definition for “Plans” insert the following Subarticle:*

- “ A. Standard Sheets – Standardized plans containing details approved by the Department and the FHWA, for construction of a given type on any project, included in contracts on an as-needed basis.”

*After the definition for “Subcontractor” add the following definition:*

**“SUBSTANTIAL COMPLETION:** The date at which the performance of all work on the Project has been completed except minor or incidental items, final cleanup, work required under a warranty, and repair of unacceptable work, and provided the Engineer has determined that:

- A. The Project is safe and convenient for use by the public, and
- B. All traffic lanes including all safety appurtenances are in their final configuration, and
- C. Failure to complete the work and repairs excepted above does not result in the deterioration of other completed work; and provided further, that the value of work remaining to be performed, repairs, and cleanup is less than one percent (1%) of the estimated final Contract amount, and
- D. If applicable a Certificate of Compliance has been issued.”

**1.01.02 — Abbreviations, Publications, and Standards:**

*Delete the entire Article and replace with the following:*

“ **1.01.02—Abbreviations, Publications and Standards:** Whenever one of the following abbreviations is used in the Contract, its meaning shall be interpreted as follows:

AA—Aluminum Association, Inc. (The)

AABC—Associated Air Balance Council

AAMA—American Architectural Manufacturers Association

AAPA—American Association of Port Authorities

AASHTO—American Association of State Highway and Transportation Officials:

Wherever reference is made to an AASHTO Standard Method of Test or Standard Specification, it refers by letter and number to the method or specification published by AASHTO in the "Standard Specifications for Transportation Materials and Methods of Sampling and Testing". The edition governing the work shall be in effect on the date the Contract was advertised for solicitation of bids shall govern.

ABMA—American Bearing Manufacturers Association  
ACGIH—American Council of Government Industrial Hygienists  
ACI—ACI International (American Concrete Institute)  
ADAAG—Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities  
ADSC—The International Association of Foundation Drilling  
AF&PA—American Forest & Paper Association  
AGA—American Gas Association  
AGC—Associated General Contractors of America (The)  
AHA—American Hardboard Association  
AHAM—Association of Home Appliance Manufacturers  
AI—Asphalt Institute  
AIA—The American Institute of Architects (The)  
AISC—American Institute of Steel Construction  
AISI—American Iron and Steel Institute  
AITC—American Institute of Timber Construction  
A.L.I.—Automotive Lift Institute  
ALSC—American Lumber Standard Committee, Incorporated  
AMCA—Air Movement and Control Association International, Inc.  
ANLA—American Nursery and Landscape Association  
ANSI—American National Standards Institute  
AOAC—AOAC International  
AOSA—Association of Official Seed Analysts  
APA—APA-The Engineered Wood Association  
API—American Petroleum Institute  
AREMA—American Railway Engineering and Maintenance-of-Way Association  
ARI—Air-Conditioning & Refrigeration Institute  
ARTBA—American Road and Transportation Builders Association  
ASA—Acoustical Society of America  
ASC—Adhesive and Sealant Council  
ASCE—American Society of Civil Engineers  
ASHRAE—American Society of Heating, Refrigerating and Air-Conditioning Engineers  
ASME—ASME International (The American Society of Mechanical Engineers International)  
ASSE—American Society of Sanitary Engineering  
ASTM—American Society of Testing and Materials (ASTM International): Wherever reference is made to an ASTM specification, test method, or practice, it refers by letter, number, or both to standards published by ASTM International in the "ASTM Standards Source™ Database". The edition governing the work shall be in effect on the date the Contract was advertised for solicitation of bids shall govern.  
ATSSA—American Traffic Safety Services Association  
AWI—Architectural Woodwork Institute  
AWPA—American Wood-Preservers' Association  
AWPI—American Wood Preservers Institute  
AWS—American Welding Society: Wherever reference is made to an AWS materials specification, inspection methods, or welding procedures, it refers by section number to standards of the American Welding Society published in the applicable steel, or aluminum welding code. The edition governing the work shall be in effect on the date the Contract was advertised for solicitation of bids shall govern.

AWWA—American Water Works Association  
 BHMA—Builders Hardware Manufacturers Association  
 BIA—Brick Industry Association (The)  
 BOCA—BOCA International, Inc.  
 CBM—Certified Ballast Manufacturers Association  
 CCRL—Cement and Concrete Reference Laboratory  
 CDA—Copper Development Association (The)  
 CGA—Compressed Gas Association  
 Cisca—Ceilings and Interior Systems Construction Association  
 CLFMI—Chain Link Fence Manufacturers Institute  
 ConnDOT—Connecticut Department of Transportation  
 CFR—Code of Federal Regulations  
 CGS—Connecticut General Statutes  
 CISPI—Cast Iron Soil Pipe Institute  
 CRI—Carpet and Rug Institute (The)  
 CRSI—Concrete Reinforcing Steel Institute  
 CSI—Construction Specifications Institute (The)  
 CSSB—Cedar Shake & Shingle Bureau  
 CTI—Cooling Technology Institute  
 DASMA—Door and Access Systems Manufacturers Association, International  
 DEEP—Connecticut Department of Energy and Environmental Protection  
 DHI—Door and Hardware Institute  
 DOD—Department of Defense Military Specifications and Standards  
~~DPUC—Department of Public Utility Control~~ see *PURA*  
 EIA—Electronic Industries Alliance  
 EPA—Environmental Protection Agency  
 FAA—Federal Aviation Administration  
 FCC—Federal Communications Commission  
 FCICA—Floor Covering Installation Contractors Association  
 FHWA—Federal Highway Administration  
 FMG—FM Global  
 FRA—Federal Railway Administration  
 FS—Wherever reference is made to FS in the contract, it refers by number, letter, or both, to the latest standard or tentative standard of the Federal Specification Unit, General Services Administration, Federal Supply Service, as to materials, specifications, or methods of testing, whichever the case may be.  
 FTA—Federal Transit Administration  
 HPVA—Hardwood Plywood & Veneer Association  
 GA—Gypsum Association  
 GANA—Glass Association of North America  
 GSA—General Services Administration  
 HI—Hydraulics Institute  
 HPVA—Hardwood Plywood & Veneer Association  
 ICC—International Code Council  
 ICC-ES—ICC Evaluation Service, Inc.  
 ICEA—Insulated Cable Engineers Association, Inc.  
 IEC—International Electrotechnical Commission  
 IEEE—Institute of Electrical and Electronics Engineers, Inc. (The)  
 IES—Illuminating Engineers Society

IESNA—Illuminating Engineering Society of North America  
IGCC—Insulating Glass Certification Council  
IGMA—Insulating Glass Manufacturers Alliance  
IMSA—International Municipal Signal Association  
IRI—HSB Industrial Risk Insurers  
ISO—International Organization for Standardization  
ITE—Institute of Traffic Engineers  
KCMA—Kitchen Cabinet Manufacturers Association  
LMA—Laminating Materials Association  
LPI—Lightning Protection Institute  
MBMA—Metal Building Manufacturers Association  
MILSPEC—Military Specification and Standards  
MMA—Monorail Manufacturers Association  
MSHA—Mine Safety and Health Administration  
MSS—Manufacturers Standardization Society of The Valve and Fittings the Valve Industry, Inc.  
MUTCD—Manual on Uniform Traffic Control Devices  
NAAMM—National Association of Architectural Metal Manufacturers  
NADCA—National Air Duct Cleaners Association  
NAIMA—North American Insulation Manufacturers Association (The)  
NBFU—National Board of Fire Underwriters  
NCHRP—National Cooperative Highway Research Program  
NCMA—National Concrete Masonry Association  
NCPI—National Clay Pipe Institute  
NEBB—Natural Environmental Balancing Bureau  
NEC—National Electrical Code  
NECA—National Electrical Contractors Association  
NEMA—National Electrical Manufacturers Association  
NEPCOAT—North East Protective Coatings Committee  
NESC—National Electrical Safety Code  
NETA—InterNational Testing Association  
NFPA—National Fire Protection Association  
NFRC—National Fenestration Rating Council  
NHLA—National Hardwood Lumber Association  
NICET—National Institute for Certification in Engineering Technologies  
NIOSH—National Institute of Occupational Safety and Health  
NIST—National Institute of Standards and Technology  
NLGA—National Lumber Grades Authority  
NOAA—National Oceanic and Atmospheric Administration  
NRCA—National Roofing Contractors Association  
NSF—NSF International  
NTMA—National Terrazzo and Mosaic Association, Inc.  
OEO—Office of Equal Opportunity  
OSHA—Occupational Safety and Health Administration  
PCA—Portland Cement Association  
PCI—Precast/Prestressed Concrete Institute  
PDI—Plumbing & Drainage Institute  
PTI—Post-Tensioning Institute  
PURA—Public Utilities Regulatory Authority

RMA—Rubber Manufacturers Association  
SAE—SAE International  
SDI—Steel Deck Institute or  
.....—Steel Door Institute  
SFPA—Southern Forest Products Association  
SJI—Steel Joist Institute  
SMACNA—Sheet Metal and Air Conditioning Contractors National Association  
SPIB—Southern Pine Inspection Bureau (The)  
SPRI—Single Ply Roofing Institute  
SSPC—Where reference is made to SSPC in the Contract, it refers by number, letter, or both, to the latest standard or tentative standard specification of The Society for Protective Coatings, Formerly the Steel Structures Painting Council, as to materials specifications, methods of testing, systems, procedures, inspection or other specification pertaining to any or all phases of cleaning or painting, whichever may apply.  
SWRI—Sealant, Waterproofing, & Restoration Institute  
TCA—Tile Council of America, Inc.  
TIA—Telecommunications Industry Association  
TIA/EIA—Telecommunications Industry Association/Electronics Industries Alliance  
TPI—Truss Plate Institute, Inc.  
TRB—Transportation Research Board  
UFAS—Uniform Federal Accessibility Standards  
UL—Underwriters Laboratories Inc.  
USDA—United States Department of Agriculture  
USGBC—U.S. Green Building Council  
WCLIB—West Coast Lumber Inspection Bureau  
WCSC—Window Covering Safety Council  
WDMA—Window & Door Manufacturers Association  
WWPA—Western Wood Products Association”

### **1.01.03 — Abbreviations and Terms:**

*Add the following abbreviations:*

“**cu.dm** - Cubic Decimeter  
**cu.m** - Cubic Meters  
**dm<sup>3</sup>** - Cubic Decimeter  
**m<sup>2</sup>** - Square Meter  
**m<sup>3</sup>** - Cubic Meters  
**sq.m** - Square Meter  
**Vert. M** - Vertical Meter  
**vert.m** - Vertical Meter”

**CONNECTICUT  
SUPPLEMENTAL SPECIFICATION  
SECTION 1.02  
PROPOSAL REQUIREMENTS AND CONDITIONS**

**1.02.01—Contract Bidding and Award**

*Replace the entire article with the following:*

**“1.02.01—Contract Bidding and Award:** All bids for construction contracts must be submitted electronically. It is the responsibility of each bidder and all other interested parties to obtain all bidding related information and documents from the Department of Administrative Services (DAS) State Contracting Portal.

Connecticut Department of Transportation bidding and other information and documents which are obtained from any other source must not be submitted to the Department. Reproduced, reformatted or altered forms of documents are not authorized or acceptable.

For information about the bidding and award of Department construction contracts, consult the “State of Connecticut Department of Transportation Construction Contract Bidding and Award Manual,” available from the Division of Contracts. In order to be eligible for award of a Department construction contract, a bidder must follow the requirements of this Bid Manual, and all bidding and award matters regarding Department construction contracts shall be governed by the terms of the Bid Manual, unless treated otherwise in the Contract, including these Specifications.”

**CONNECTICUT  
SUPPLEMENTAL SPECIFICATION  
SECTION 1.03  
AWARD AND EXECUTION OF THE CONTRACT**

*Replace Article 1.03.07 in its entirety with the following:*

**1.03.07—Insurance:**

**Coverage shall be on a primary basis.**

The Contractor shall carry and maintain at all times during the term of the Contract the insurance coverages required by this Article and any additional coverages(s) or higher minimum insurance coverage amount(s) required by the Special Provisions of the Contract.

If the Project includes work on or adjacent to railroad property additional insurance may be required as specified by the railroad. Please refer to the Special Provisions for any additional insurance requirements by the railroad.

**1. Worker's Compensation Insurance:** With respect to all operations the Contractor performs and all those performed for it by subcontractors, the Contractor shall carry, and require each subcontractor to carry, Workers' Compensation insurance as required by the laws of the State of Connecticut.

Employer's Liability insurance shall be provided in amounts not less than \$100,000 per accident for bodily injury by accident; \$100,000 policy limit by disease and \$100,000 per employee for bodily injury by disease. Each Workers' Compensation policy shall contain the U.S. Longshoreman's and Harbor Workers' Act endorsement when work is to be performed over or adjacent to navigable water.

**2. Commercial General Liability Insurance:** With respect to the operations the Contractor performs and also those performed for it by subcontractors, the Contractor shall carry, and require each subcontractor to carry, Commercial General Liability insurance, including Contractual Liability, Products and Completed Operations, Broad Form Property Damage and Independent Contractors.

Products and completed operations insurance for ongoing and completed operations shall be maintained for a period of one (1) year after the acceptance of the project by the Department in accordance with Article 1.08.14. See chart below for applicable minimum coverage amounts.

Contract Amount (\$)	Minimum Single Occurrence Amount (\$)	Minimum Annual Aggregate Amount (\$)
0-2,000,000	1,000,000	2,000,000
>2,000,001-10,000,000	2,000,000	4,000,000
>10,000,000	4,000,000	8,000,000

In Facilities construction projects, if underground work is to be undertaken, each policy shall have coverage for and exclusions removed for “Explosion, Collapse and Underground” (“XCU”).

**3. Automobile Liability Insurance:** The Contractor shall obtain automobile liability insurance covering the operation of all motor vehicles, including those hired or borrowed, that are used in connection with the Project for all damages arising out of: (1) bodily injury to or death of all persons and/or (2) injury to or destruction of property; in any one accident or occurrence. This policy shall not be subject to an annual aggregate limitation. See chart above for applicable minimum coverage amounts.

**4. Owner’s and Contractor’s Protective Liability Insurance for and in the Name of the State:** With respect to the Contractor’s Project operations and also those of its subcontractors, the Contractor shall carry, for and on behalf of the State for each accident or occurrence resulting in damages from (1) bodily injury to or death of persons and/or (2) injury to or destruction of property. See chart below for applicable minimum coverage amounts.

Contract Amount (\$)	Minimum Single Occurrence Amount (\$)	Minimum Annual Aggregate Amount (\$)
0 - 20 Million	1,000,000	1,000,000
20 Million - 50 Million	2,000,000	2,000,000
> 50 Million	4,000,000	4,000,000

**5. Railroad Protective Liability Insurance:** When the Contract involves work within fifty (50) feet of the railroad right-of-way or State-owned rail property, with respect to Project operations and also those of its subcontractors, the Contractor shall carry Railroad Protective Liability Insurance providing coverage of at least \$2,000,000 for each accident or occurrence resulting in damages from (1) bodily injury to or death of all persons and/or (2) injury to or destruction of property, and subject to that limit per accident or occurrence, an aggregate coverage of at least \$6,000,000 for all damages during the policy period, and with all entities falling within any of the following listed categories named as insured parties: (i) the owner of the railroad right-of-way, (ii) the owner of any railcar licensed or permitted to travel within that affected portion of railroad right-of-way, and (iii) the operator of any railcar licensed or permitted to travel within that affected portion of the railroad right-of-way, and with the State, if not falling within any of the above-listed categories, also named as an insured party.

**6. Blasting:** When explosives are to be used in the Project, the Commercial General Liability insurance policy shall include XCU coverage, in the same limits as the per occurrence policy limits.



## **7. Protection and Indemnity Insurance for Marine Construction Operations in Navigable Waters:**

If a vessel of any kind will be involved in Project work, the Contractor shall obtain the following additional insurance coverage:

- A.** Protection and Indemnity Coverage of at least \$300,000 per vessel or equal to at least the value of hull and machinery, whichever is greater.
- B.** If there is any limitation or exclusion with regard to crew and employees under the protection and indemnity form, the Contractor must obtain and keep in effect throughout the Project a workers' compensation policy, including coverage for operations under admiralty jurisdiction, with a limit of liability of at least \$300,000 per accident or a limit equal to at least the value of the hull and machinery, whichever is greater, or for any amount otherwise required by statute.

**8. Builder's Risk Insurance:** For Facilities construction projects, the Contractor shall maintain comprehensive replacement cost builder's risk (completed value) insurance providing coverage for the entire work at the Project site, including all fixtures, machinery and equipment, any heating, cooling and constituting a permanent part of the building and shall cover portions of work located away from the site, but intended for use at the site. If it is determined that all or a portion of the project is located within an area designated as a Special Flood Hazard Area, the Contractor shall maintain flood insurance (no less than \$10,000,000 sublimit). The State of Connecticut shall be named as Loss Payee. Equipment breakdown coverage may be sub limited to 50% of the project cost.

**9. Architects and Engineer's Professional Liability Insurance for Structural Engineer:** If required, limits will be specified in Article 1.03.07 of the Special Provisions of the Contract or Article 1.05.02.

**10. Umbrella Liability Insurance:** The Contractor may satisfy the minimum limits required for Commercial General Liability and Automobile Liability Insurance using Umbrella Liability Insurance. In the event that the Contractor obtains Umbrella Liability Insurance to meet the minimum coverage requirements for Commercial General Liability or Automobile Liability Insurance coverage, the Umbrella Liability Insurance policy shall have an annual aggregate at a limit not less than twice the single occurrence and must specifically endorse the State of Connecticut as an additional insured. Specifically for Bridge Projects with a low bid equal to or higher than \$80,000,000, the Umbrella Liability Insurance policy must have a minimum limit of at least \$25,000,000.

**11. Certificate of Insurance:** Before the Contract is executed, the Contractor must provide to the Department a certificate of insurance acceptable to the Commissioner and executed by an insurance company or companies satisfactory to the State of Connecticut for the insurance coverage(s) required by this Article and the Special

Provisions of the Contract. The Contractor shall maintain the required insurance coverage during the entire term of the Contract. The certificate of insurance must clearly include the name of the insured and identify the project for which it is being issued.

**12. Copies of Policies:** The Contractor shall provide, within five (5) business days, a copy or copies of all applicable insurance policies when requested by the State. In providing said policies, the Contractor may redact provisions of the policy that are proprietary. This provision shall survive the expiration or termination of the Contract.

**13. Sovereign Immunity:** The Contractor may not assert the defense of sovereign immunity in the adjustment of claims or in the defense of any claim or suit brought against the Contractor or the State, unless the State, in writing, requests that the Contractor do so or consents to its doing.

**14. Contractor Assumes Costs:** The Contractor shall assume and pay all costs and billings for premiums, deductibles, self-insured retentions and audit charges earned and payable under the required insurance.

**15. State Named as Additional Insured:** The State must be named as an additional insured party for the Commercial General Liability and Automobile Liability insurance policies required by this Article and the Special Provisions to the Contract, and any Umbrella Liability Insurance, as applicable, obtained in accordance with this Article. Each policy shall waive right of recovery (waiver of subrogation) against the State of Connecticut.

**16. Termination or Change of Insurance:**

A. The Contractor shall notify the Department of any cancelation of insurance carrier or change to the required insurance coverage by submitting a new insurance certificate to the Department immediately following said cancelation or change in required coverage.

B. It is the responsibility of the Contractor to maintain evidence of a current insurance coverage with the Department for the duration of contract. It is the responsibility of the Contractor to file with the Department all renewals and new certificates of insurance issued due to changes in policy terms or changes in insurance carriers prior to the expiration dates on the forms already on file with the Department.

**17. Duration of Coverage.** The Contractor shall keep all the required insurance in continuous effect until the date that the Department designates for the termination of the Contractor's responsibility, as defined by Article 1.08.14.

**18. Compensation:** There shall be no direct compensation allowed the Contractor on account of any premium or other charge necessary to obtain and keep in effect any insurance or bonds in connection with the Project, but the cost thereof shall be considered included in the general cost of the Project work.

**CONNECTICUT  
SUPPLEMENTAL SPECIFICATION  
SECTION 1.05  
CONTROL OF THE WORK**

**1.05.08–Vacant:**

*Replace with the following:*

**“1.05.08—SCHEDULES AND REPORTS:**

When a project coordinator is not required by the Contract the following shall apply:

**Baseline Bar Chart Construction Schedule:** Within 20 calendar days after contract award the Contractor shall develop a comprehensive bar chart as a baseline schedule for the project. The bar chart schedule shall be submitted to the Engineer for approval and shall be based on the following guidelines:

1. The bar chart schedule shall contain a list of activities that represents the major activities of the project. At a minimum, this list should include a breakdown by individual structure or stage, including major components of each. The bar chart schedule shall contain sufficient detail to describe the progression of the work in a comprehensive manner. As a guide, 10 to 15 bar chart activities should be provided for each \$1 million of contract value. The following list is provided as an example only and is not meant to be all-inclusive or all-applicable:

General Activities Applicable to all projects

Project Constraints

- Winter shutdowns
- Environmental permits/application time of year restrictions
- Milestones
- Third Party approvals
- Long lead time items (procurement and fabrication of major elements)
- Adjacent Projects or work by others

Award

Notice to Proceed

Signing (Construction, temporary, permanent by location)

Mobilization

Permits as required

Field Office

Utility Relocations

Submittals/shop drawings/working drawings/product data

Construction of Waste Stock pile area

Clearing and Grubbing

Earthwork (Borrow, earth ex, rock ex etc.)

Traffic control items (including illumination and signalization)

Pavement markings

Roadway Construction (Breakdown into components)

Drainage (Breakdown into components)

Culverts  
Plantings (including turf establishment)  
Semi-final inspection  
Final Cleanup

As required the following may supplement the activities listed above for the specific project types indicated:

a. For bridges and other structures, include major components such as abutments, wingwalls, piers, decks and retaining walls; further breakdown by footings, wall sections, parapets etc.

Temporary Earth Retention Systems  
Cofferdam and Dewatering  
Structure Excavation  
Piles/test piles  
Temporary Structures  
Removal of Superstructure  
Bearing Pads  
Structural Steel (Breakdown by fabrication, delivery, installation, painting etc.)  
Bridge deck

b. Multiple location projects such as traffic signal, incident management, lighting, planting and guiderail projects will be broken down first by location and then by operation. Other major activities of these types of projects should include, but are not limited to:

Installation of anchors  
Driving posts  
Foundations  
Trenching and Backfilling  
Installation of Span poles/mast arms  
Installation of luminaries  
Installation of cameras  
Installation of VMS  
Hanging heads  
Sawcut loops  
Energizing equipment

c. Facility Projects – Facilities construction shall reflect the same breakdown of the project as the schedule of values:

Division 2 – Existing Conditions  
Division 3 – Concrete  
Division 4 – Masonry  
Division 5 – Metals  
Division 6 – Wood, Plastic, and Composites  
Division 7 – Thermal and Moisture Protection  
Division 8 – Openings

Division 9 – Finishes  
Division 10 – Specialties  
Division 11 – Equipment  
Division 12 - Furnishings  
Division 13 – Special Construction  
Division 14 – Conveying Equipment  
Division 21 – Fire Suppression  
Division 22 – Plumbing  
Division 23 – Heating, Ventilating, and Air Conditioning  
Division 26 – Electrical  
Division 27 – Communications  
Division 28 – Electronic Safety and Security  
Division 31 – Earthwork  
Division 32 – Exterior Improvements  
Division 33 - Utilities

2. If the Engineer determines that additional detail is necessary, the Contractor shall provide it.
3. Each activity shall have a separate schedule bar. The schedule timeline shall be broken into weekly time periods with a vertical line to identify the first working day of each week.
4. The bar chart schedule shall show relationships among activities. The critical path for the Project shall be clearly defined on the schedule. The schedule shall show milestones for major elements of work, and shall be prepared on a sheet, or series of sheets of sufficient width to show data for the entire construction period.
5. If scheduling software is used to create the bar chart schedule, related reports such as a predecessor and successor report, a sort by total float, and a sort by early start shall also be submitted.
6. Project activities shall be scheduled to demonstrate that the construction completion date for the Project will occur prior to expiration of the Contract time. In addition, the schedule shall demonstrate conformance with any other dates stipulated in the Contract.
7. The Contractor is responsible to inform its subcontractor(s) and supplier(s) of the project schedule and any relevant updates.
8. There will be no direct payment for furnishing schedules, the cost thereof shall be considered as included in the general cost of the work.
9. For projects without a Mobilization item, 5% of the contract value will be withheld until such time as the Baseline Schedule is approved.

**Monthly Updates:** No later than the 10th day of each month, unless directed otherwise by the Engineer, the Contractor shall deliver to the Engineer three copies of the schedule to show the work actually accomplished during the preceding month, the actual time spent on each activity, and the estimated time needed to complete any activity which has been started but not completed. Each time bar shall indicate, in 10% increments, the estimated percentage of that activity which remains to be completed. As the Project progresses, the Contractor shall place a contrasting mark in each bar to indicate the actual percentage of the activity that has been completed.

The monthly update shall include revisions of the schedule necessitated by revisions to the Project directed by the Engineer (including, but not limited to extra work), during the month preceding the update. Similarly, any changes of the schedule required due to changes in the Contractor's planning or progress shall also be included. The Engineer reserves the right to reject any such revisions. If the schedule revisions extend the contract completion date, due to extra or added work or delays beyond the control of the Contractor, the Contractor shall submit a request in writing for an extension of time in accordance with Article 1.08.08. This request shall be supported by an analysis of the schedules submitted previously.

Any schedule revisions shall be identified and explained in a cover letter accompanying the monthly update. The letter shall also describe in general terms the progress of the Project since the last schedule update and shall identify any items of special interest.

If the Contractor fails to provide monthly schedule updates, the Engineer has the right to hold 10% of the monthly estimated payment, or \$5,000, whichever is less, until such time as an update has been provided in accordance with this provision.

**Biweekly Schedules:** Each week, the Contractor shall submit to the Engineer a two week look-ahead schedule. This short-term schedule may be handwritten but shall clearly indicate all work planned for the following two week period.

**Recovery Schedules:** If the updated schedule indicates that the Project has fallen behind schedule, the Contractor shall either submit a time extension request in accordance with 1.08.08 or immediately institute steps acceptable to the Engineer to improve its progress of the Project. In such a case, the Contractor shall submit a recovery plan, as may be deemed necessary by the Engineer, to demonstrate the manner in which an acceptable rate of progress will be regained.”

#### **1.05.12–Payrolls:**

*Replace the first paragraph with the following:*

“For each week of the Project from the first week during which an employee of the Contractor does Project work to which prevailing wage requirements apply, until the last week on which such an employee does such work, the Contractor shall furnish to the Engineer certified copies of payrolls showing (a) the names of the employees who worked on the Project and whose work is subject to prevailing wage requirements, (b) the specific days and hours and numbers of hours that each such employee worked on the Project, and (c) the amount of money paid to each such employee for Project work. Each such payroll shall include the statement(s) of compliance with prevailing wage laws required by the State of Connecticut and, if applicable, by the Federal government.

Said payrolls must contain all information required by Connecticut General Statutes Section 31-53 (as it may be revised). For contracts subject to Federal prevailing wage requirements, each payroll shall also contain the information required by the Davis Bacon and Related Acts (DBR). All of the payroll requirements in this Article shall also apply to the work of any subcontractor or other party that performs work on the Project site, and the Contractor shall be responsible for ensuring that each such party meets said requirements.”

### 1.05.15–Markings for Underground Facilities:

*Replace the beginning of the first sentence with the following:*

“In conformance with Sections 16-345 through 16-359 of the Regulations of the PURA state statutes, the Contractor is responsible for notifying ‘Call Before You Dig’ ...”

*After Article 1.05.16–Dimensions and Measurements, add the following article:*

### “1.05.17 - WELDING

The Contractor shall ensure that all welding of materials permanently incorporated into the work, and welding of materials used temporarily during construction of the work is performed in accordance with the following codes:

- American Welding Society (AWS) Structural Welding Code – Steel – ANSI/AWS D1.1: Miscellaneous steel items that are statically loaded including but not limited to columns, and floor beams in buildings, railings, sign supports, cofferdams, tubular items, and modifications to existing statically loaded structures.
- AWS Structural Welding Code – Aluminum – AWS D1.2/D1.2M: Any aluminum structure or member including but not limited to brackets, light standards, and poles.
- AWS Structural Welding Code – Sheet Steel – AWS D1.3/D1.3M: Sheet steel and cold-formed members 0.18 in.(4.6 mm) or less in thickness used as, but not limited, to decking and stay-in-place forms.
- AWS Structural Welding Code – Reinforcing Steel – AWS D1.4/D1.4M: Steel material used in the reinforcement of cast-in-place or pre-cast Portland cement concrete elements including but not limited to bridge decks, catch basin components, walls, beams, deck units, and girders.
- AASHTO/AWS – Bridge Welding Code, AASHTO/AWS D1.5/D1.5M: Steel highway bridges and other dynamically loaded steel structures. Also includes sign supports, and any other fracture critical structure.

The edition governing the work shall be in effect on the date the Contract was advertised for solicitation of bids.

The Contractor is responsible to provide a Certified Welding Inspector in accordance with the above noted codes. The cost for this service is included in the general cost of the work.

All welders shall be certified by the Engineer in accordance with Section 6.03.”

**CONNECTICUT  
SUPPLEMENTAL SPECIFICATION  
SECTION 1.07  
LEGAL RELATIONS AND RESPONSIBILITIES**

**1.07.05 – Load Restrictions**

*Delete the entire article and replace with the following:*

**“1.07.05 – Load Restrictions**

**(a) Vehicle Weights:** This subarticle will apply to travel both on existing pavements and pavements under construction. The Contractor shall comply with all legal load restrictions as to vehicle size, the gross weight of vehicles, and the axle weight of vehicles while hauling materials. Throughout the duration of the contract, the Contractor shall take precautions to ensure existing and newly installed roadway structures and appurtenances are not damaged by construction vehicles or operations.

Unless otherwise noted in contract specifications or plans, on and off road equipment of the Contractor, either loaded or unloaded, will not be allowed to travel across any bridge or on any highway when such a vehicle exceeds the statutory limit or posted limit of such bridge or highway. Should such movement of equipment become necessary the Contractor shall apply for a permit from the Department for such travel, as provided in the Connecticut General Statutes (CGS). The movement of any such vehicles within the project limits or detour routes shall be submitted to the Engineer for project record. Such permit or submittal will not excuse the Contractor from liability for damage to the highway caused by its equipment.

The Contractor is subject to fines, assessments and other penalties that may be levied as a result of violations by its employees or agents of the legal restrictions as to vehicle size and weight.

**(b) Storage of Construction Materials/Equipment on Structures:** Storage is determined to be non-operating equipment or material. The Contractor shall not exceed the statutory limit or posted limit for either an existing or new structure when storing materials and/or construction equipment. When a structure is not posted, then the maximum weight of equipment or materials stored in each 12 foot wide travel lane of any given span shall be limited to 750 pounds per linear foot combined with a 20,000 pound concentrated load located anywhere within the subject lane. If anticipated storage of equipment or material exceeds the above provision, then the Contractor shall submit his proposal of storage supported by calculations stamped by a Professional Engineer registered in the State of Connecticut, to the Engineer for approval 14 days prior to the storage operation. Operations related to structural steel demolition or erection shall follow the guidelines under Section 6.03. All other submittals shall include a detailed description of the material/equipment to be stored, the quantity of storage if it is stockpiled materials, the storage location, gross weight with supporting calculations if applicable, anticipated duration of storage and any environmental safety, or traffic protection that may be required. Storage location on the structure shall be clearly defined in the field. If structures are in a state of staged construction or demolition, additional structural analysis may be required prior to authorization of storage.”

**1.07.18 – Use of State Property**

*After Subarticle (h) add the following sentence:*

“Gore areas are not available for disposal of surplus material.”



**CONNECTICUT  
SUPPLEMENTAL SPECIFICATION  
SECTION 1.08  
PROSECUTION AND PROGRESS**

**1.08.01 – Transfer of Work or Contract:**

*Replace the last paragraph with the following paragraphs:*

“ The Contractor shall not sublet, sell, transfer, assign, or otherwise dispose of the Contract or any portion thereof, or of the work provided for therein, or of its right, title, or interest therein, to any individual or entity without the written consent of the Commissioner. No payment will be made for such work until written consent is provided by the Commissioner.

The Contractor shall pay the subcontractor for work performed within thirty (30) days after the Contractor receives payment for the work performed by the subcontractor. Withholding retainage by the Contractor, subcontractor or lower tier subcontractors is not allowed.

Payment for work that has been performed by a subcontractor does not eliminate the Contractor’s responsibilities for all the work as defined in Article 1.07.12, “Contractor’s Responsibility for Work.”

Payment for work that has been performed by a subcontractor also does not release the subcontractor from its responsibility for maintenance and other periods of subcontractor responsibility specified for the subcontractor’s items of work. Failure of a subcontractor to meet its maintenance, warranty or defective work responsibilities may result in administrative action on future Department contracts.

For any dispute regarding prompt payment, the alternate dispute resolution provisions of this article shall apply.

The above requirements are also applicable to all sub-tier subcontractors and the above provisions shall be made a part of all subcontract agreements.

Failure of the Contractor to comply with the provisions of this section may result in a finding that the Contractor is nonresponsible as a bidder for a Department contract.”

**1.08.07 – Determination of Contract Time:**

*Replace the fifth paragraph with the following:*

“ The total elapsed time in calendar days, computed as described above, from the commencement date specified in the Engineer's "Notice to Proceed" to the “Substantial Completion” date specified in the Engineer's "Notice of Substantial Completion" shall be considered as the time used in the performance of the Contract work.”

**1.08.09 – Failure to Complete Work on Time:**

*Replace the second paragraph with the following:*

“ If the last day of the initial Contract time or the initial Contract date determined for

Substantial Completion is before December 1 in the given year, liquidated damages as specified in the Contract shall be assessed against the Contractor per calendar day (including any days during a winter shutdown period) from that day until the date on which the Project is substantially completed.”

**1.08.12—Final Inspection:**

*Replace the first paragraph with the following:*

“ If the Engineer determines that the work may be substantially complete, a Semi Final Inspection will be held as soon as practical. After the Semi Final Inspection is held and the Engineer determines that the requirements for Substantial Completion have been satisfied the Engineer will prepare a “Notice of Substantial Completion”.

When the Contractor has completed all work listed in the “Notice of Substantial Completion” the Contractor shall prepare a written notice requesting a Final Inspection and a “Certificate of Acceptance of Work”. The Engineer will hold an Inspection of the Project as soon as practical after the Engineer determines that the Project may be completed. If the Engineer deems the Project complete, said inspection shall constitute the Final Inspection, and the Engineer will notify the Contractor in writing that the Final Inspection has been performed.”

**1.08.13 – Acceptance of Work and Termination of the Contractor’s Responsibility:**

*Replace the only paragraph with the following:*

“ The Contractor’s responsibility for non-administrative Project work will be considered terminated when the final inspection has been held, any required additional work and final cleaning-up have been completed, all final operation and maintenance manuals have been submitted, and all of the Contractor’s equipment and construction signs have been removed from the Project site. When these requirements have been met to the satisfaction of the Engineer, the Commissioner will accept the work by certifying in writing to the Contractor that the non-administrative Project work has been completed.”

**CONNECTICUT  
SUPPLEMENTAL SPECIFICATION  
SECTION 1.09  
MEASUREMENT AND PAYMENT**

**1.09.04 – Extra and Cost-Plus Work**

*Delete existing subarticle (e) and replace with the following:*

**“(e) Administrative Expense:** When extra work on a cost-plus basis is performed by an authorized subcontractor, the Department will pay the Contractor an additional 7.5% for that work; such payment will be in addition to the percentage payments described in (a), (b), (c) and (d) above, as a reimbursement for the Contractor's administrative expense in connection with such work. Approval of such additional payments will be given only after the Contractor provides to the Engineer receipted invoices for all relevant costs.”

**1.09.06 – Partial Payments:**

*In the first paragraph under A. Monthly and Semi-monthly Estimates:, delete the second, third and fourth sentences and replace the remainder of subarticle (1) with the following:*

“Retainage will not be held.

Exceptions may be made as follows:

- (a) When not in conflict with the interests of the State, the Contractor may request, and the Engineer may make, semi-monthly estimates for payment.
- (b) If, in the judgment of the Assistant District Engineer, the Project is not proceeding in accordance with the Contract the Engineer may decline to make a payment estimate.
- (c) If the total value of the Project work complete since the last estimate amounts to less than \$2,500 the Engineer also may decline to make a payment estimate.”

*Replace the first paragraph of subarticle B. Payment for Stored Materials: with the following:*

**“B. Payment for Stored Materials:** Non-perishable materials that are required for Project construction and that the Contractor has produced or purchased specifically for incorporation into the Project, but which have not yet been so incorporated, may be included in a payment estimate if

- (i) the materials meet all applicable Contract specifications,
- (ii) the materials have been delivered to the Project site or to another location approved by the Engineer, and
- (iii) the Contractor has submitted to the Engineer, as evidence of the Contractor's purchase of the materials, either a copy of a receipted bill for same or a Certificate of Title to the materials, in the form approved by the Department, duly-executed by the Contractor and Vendor.

The Engineer will decide at what fair and appropriate fraction of the applicable Contract price such materials may be included in a payment estimate.”

**1.09.07 – Final Payment:**

*Replace the entire article with the following:*

**“1.09.07 – Final Payment:** When the Commissioner has accepted the Project in accordance with Article 1.08.14, the Engineer will prepare a final payment estimate.”

**CONNECTICUT  
SUPPLEMENTAL SPECIFICATION  
SECTION 1.10  
ENVIRONMENTAL COMPLIANCE**

*Add the following Article:*

**"1.10.08 – VEHICLE EMISSIONS**

All motor vehicles and/or construction equipment (both on-highway and non-road) shall comply with all pertinent State and Federal regulations relative to exhaust emission controls and safety.

The Contractor shall establish staging zones for vehicles that are waiting to load or unload at the contract area. Such zones shall be located where the emissions from the vehicles will have minimum impact on abutters and the general public.

Idling of delivery trucks, dump trucks, and other equipment shall not be permitted in excess of 3 minutes during periods of non-activity except as allowed by the Regulations of Connecticut State Agencies Section 22a-174-18(b)(3)(c):

No mobile source engine shall be allowed "to operate for more than three (3) consecutive minutes when the mobile source is not in motion, except as follows:

- (i) When a mobile source is forced to remain motionless because of traffic conditions or mechanical difficulties over which the operator has no control,
- (ii) When it is necessary to operate defrosting, heating or cooling equipment to ensure the safety or health of the driver or passengers,
- (iii) When it is necessary to operate auxiliary equipment that is located in or on the mobile source to accomplish the intended use of the mobile source,
- (iv) To bring the mobile source to the manufacturer's recommended operating temperature,
- (v) When the outdoor temperature is below twenty degrees Fahrenheit (20 degrees F) [negative seven degrees Celsius (-7 degrees C)],
- (vi) When the mobile source is undergoing maintenance that requires such mobile source be operated for more than three (3) consecutive minutes, or
- (vii) When a mobile source is in queue to be inspected by U.S. military personnel prior to gaining access to a U.S. military installation."

All work shall be conducted to ensure that no harmful effects are caused to adjacent sensitive receptors. Sensitive receptors include but are not limited to hospitals, schools, daycare facilities, elderly housing and convalescent facilities. Engine exhaust shall be located away from fresh air intakes, air conditioners, and windows.

A Vehicle Emissions Mitigation plan will be required for areas where extensive work will be performed within (less than 50 feet (15 meters)) to sensitive receptors. No work will proceed until a sequence of construction and a Vehicle Emissions Mitigation plan is submitted in writing to the Engineer for review and all comments are addressed in a manner acceptable to the Engineer. The mitigation plan must address the control of vehicle emissions from all vehicles and construction equipment.

Any costs associated with this "Vehicle Emissions" article 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."

**CONNECTICUT  
SUPPLEMENTAL SPECIFICATION  
SECTION 1.11  
CLAIMS**

*Add the following Section:*

**SECTION 1.11  
CLAIMS**

**1.11.01 – General**

**1.11.02 – Notice of Claim**

**1.11.03 – Record Keeping**

**1.11.04 – Claim Compensation**

**1.11.05 – Required Claim Documentation**

**1.11.06 – Auditing of Claims**

**1.11.01 – General:** When filing a formal claim under Section 4-61 (referred to as “Section 4-61” below) of the C.G.S. (as revised), either as a lawsuit in the Superior Court or as a demand for arbitration, the Contractor must follow the procedures and comply with the requirements set forth in this Section of the Specifications. This Section does not, unless so specified, govern informal claims for additional compensation which the Contractor may bring before the Department. The Contractor should understand, however, that the Department may need, before the Department can resolve such a claim, the same kinds of documentation and other substantiation that it requires under this Section. It is the intent of the Department to compensate the Contractor for actual increased costs caused by or arising from acts or omissions on the part of the Department that violate legal or contractual duties owed to the Contractor by the Department.

**1.11.02 – Notice of Claim:** Whenever the Contractor intends to file a formal claim against the Department under Section 4-61, seeking compensation for additional costs, the Contractor shall notify the Commissioner in writing (in strict compliance with Section 4-61) of the details of said claim. Such written notice shall contain all pertinent information described in Article 1.11.05 below.

Once formal notice of a claim under C.G.S. Section 4-61 (b) (as revised) has been given to the Commissioner, the claimant may not change the claim in any way, in either concept or monetary amount, (1) without filing a new notice of claim and demand for arbitration to reflect any such change and (2) without the minimum period of six months after filing of the new demand commencing again and running before any hearing on the merits of the claim may be held. The only exception to this limitation will be for damages that continue to accrue after submission of the notice, in ways described and anticipated in the notice.

**1.11.03 – Record Keeping:** The Contractor shall keep daily records of all costs incurred in connection with its construction-related activities on behalf of the Department. These daily records shall identify each aspect of the Project affected by

matters related to any claim for additional compensation that the Contractor has filed, intends to file, or has reason to believe that it may file against the Department; the specific Project locations where Project work has been so affected; the number of people working on the affected aspects of the Project at the pertinent time(s); and the types and number of pieces of equipment on the Project site at the pertinent time(s). If possible, any potential or anticipated effect on the Project's progress or schedule which may result in a claim by the Contractor should also be noted contemporaneously with the cause of the effect, or as soon thereafter as possible.

**1.11.04 – Claim Compensation:** The payment of any claim, or any portion thereof, that is deemed valid by the Engineer shall be made in accordance with the following provisions of this Article:

**(a) Compensable Items:** The liability of the Department for claims will be limited to the following specifically-identified items of cost, insofar as they have not otherwise been paid for by the Department, and insofar as they were caused solely by the actions or omissions of the Department or its agents (except that with regard to payment for extra work, the Department will pay to the Contractor the mark-ups provided for in Article 1.04.05.):

- (1) Additional Project-site labor expenses.
- (2) Additional costs for materials.
- (3) Additional, unabsorbed Project-site overhead (**e.g.**, for mobilization and demobilization).
- (4) Additional costs for active equipment.
- (5) For each day of Project delay or suspension caused solely by actions or omissions of the Department, either
  - (i) an additional ten percent (10%) of the total amount of the costs identified in Subarticles (1) through (4) above; except that if the delay or suspension period prevented the Contractor from incurring enough Project costs under Subarticles (1) through (4) during that period to require a payment by the Department that would be greater than the payment described in subparagraph (ii) below, then the payment for affected home office overhead and profit shall instead be made in the following *per diem* amount:
  - (ii) six percent (6%) of the original total Contract amount divided by the original number of days of Contract time.

Payment under either (i) or (ii) hereof shall be deemed to be complete and mutually-satisfactory compensation for any unabsorbed home office overhead and any profit related to the period of delay or suspension.

- (6) Additional equipment costs. Only actual equipment costs shall be used in the calculation of any compensation to be made in response to claims for additional Project compensation. Actual equipment costs shall be based upon records kept in the normal course of business and in accordance with generally-accepted accounting principles. Under no circumstances shall Blue Book or other guide or rental rates be used for this purpose (unless the Contractor had to rent the equipment from an unrelated party, in which case the actual rental charges paid by the Contractor, so long as they are reasonable, shall be used). Idle equipment, for instance, shall be paid for based only on its actual cost to the Contractor.



- (7) Subcontractor costs limited to, and determined in accordance with, Subarticles (1), (2), (3), (4), and (5) above and applicable statutory and case law. Such subcontractor costs may be paid for by the Department only (a) in the context of an informal claims settlement or (b) if the Contractor has itself paid or legally-assumed, present unconditional liability for those subcontractor costs.

**(b) Non-Compensable Items:** The Department will have no liability for the following specifically-identified non-compensable items:

- (1) Profit, in excess of that provided for herein.
- (2) Loss of anticipated profit.
- (3) Loss of bidding opportunities.
- (4) Reduction of bidding capacity.
- (5) Home office overhead in excess of that provided for in Article 1.11.04(a)(5) hereof.
- (6) Attorneys fees, claims preparation expenses, or other costs of claims proceedings or resolution.
- (7) Any other consequential or indirect expenses or costs, such as tort damages, or any other form of expense or damages not provided for in these Specifications or elsewhere in the Contract.

**1.11.05 – Required Claim Documentation:** All claims shall be submitted in writing to the Commissioner, and shall be sufficient in detail to enable the Engineer to ascertain the basis and the amount of each claim, and to investigate and evaluate each claim in detail. As a minimum, the Contractor must provide the following information for each and every claim and sub-claim asserted:

- (a) A detailed factual statement of the claim, with all dates, locations and items of work pertinent to the claim.
- (b) A statement of whether each requested additional amount of compensation or extension of time is based on provisions of the Contract or on an alleged breach of the Contract. Each supporting or breached Contract provision and a statement of the reasons why each such provision supports the claim, must be specifically identified or explained.
- (c) Excerpts from manuals or other texts which are standard in the industry, if available, that support the Contractor's claim.
- (d) The details of the circumstances that gave rise to the claim.
- (e) The date(s) on which any and all events resulting in the claim occurred, and the date(s) on which conditions resulting in the claim first became evident to the Contractor.
- (f) Specific identification of any pertinent document, and detailed description of the substance of any material oral communication, relating to the substance of such claim.
- (g) If an extension of time is sought, the specific dates and number of days for which it is sought, and the basis or bases for the extension sought. A critical path method, bar chart, or other type of graphical schedule that supports the extension must be submitted.
- (h) When submitting any claim over \$50,000, the Contractor shall certify in writing, under oath and in accordance with the formalities required by the contract, as to the following:
  - (1) That supporting data is accurate and complete to the Contractors best

- knowledge and belief;
- (2) That the amount of the dispute and the dispute itself accurately reflects what the Contractor in good faith believes to be the Departments liability;
  - (3) The certification shall be executed by:
    - a. If the Contractor is an individual, the certification shall be executed by that individual.
    - b. If the Contractor is not an individual, the certification shall be executed by a senior company official in charge at the Contractor's plant or location involved or an officer or general partner of the Contractor having overall responsibility for the conduct of the Contractors affairs.

**1.11.06 – Auditing of Claims:** All claims filed against the Department shall be subject to audit by the Department or its agents at any time following the filing of such claim. The Contractor and its subcontractors and suppliers shall cooperate fully with the Department's auditors. Failure of the Contractor, its subcontractors, or its suppliers to maintain and retain sufficient records to allow the Department or its agents to fully evaluate the claim shall constitute a waiver of any portion of such claim that cannot be verified by specific, adequate, contemporaneous records, and shall bar recovery on any claim or any portion of a claim for which such verification is not produced. Without limiting the foregoing requirements, and as a minimum, the Contractor shall make available to the Department and its agents the following documents in connection with any claim that the Contractor submits:

- (1) Daily time sheets and foreman's daily reports.
- (2) Union agreements, if any.
- (3) Insurance, welfare, and benefits records.
- (4) Payroll register.
- (5) Earnings records.
- (6) Payroll tax returns.
- (7) Records of property tax payments.
- (8) Material invoices, purchase orders, and all material and supply acquisition contracts.
- (9) Materials cost distribution worksheets.
- (10) Equipment records (list of company equipment, rates, etc.).
- (11) Vendor rental agreements
- (12) Subcontractor invoices to the Contractor, and the Contractor's certificates of payments to subcontractors.
- (13) Subcontractor payment certificates.
- (14) Canceled checks (payroll and vendors).
- (15) Job cost reports.
- (16) Job payroll ledger.
- (17) General ledger, general journal (if used), and all subsidiary ledgers and journals, together with all supporting documentation pertinent to entries made in these ledgers and journals.
- (18) Cash disbursements journals.
- (19) Financial statements for all years reflecting the operations on the Project.
- (20) Income tax returns for all years reflecting the operations on the Project.
- (21) Depreciation records on all company equipment, whether such records are maintained by the company involved, its accountant, or others.

- (22) If a source other than depreciation records is used to develop costs for the Contractor's internal purposes in establishing the actual cost of owning and operating equipment, all such other source documents.
- (23) All documents which reflect the Contractor's actual profit and overhead during the years that the Project was being performed, and for each of the five years prior to the commencement of the Project.
- (24) All documents related to the preparation of the Contractor's bid, including the final calculations on which the bid was based.
- (25) All documents which relate to the claim or to any sub-claim, together with all documents that support the amount of damages as to each claim or sub-claim.
- (26) Worksheets used to prepare the claim, which indicate the cost components of each item of the claim, including but not limited to the pertinent costs of labor, benefits and insurance, materials, equipment, and subcontractors' damages, as well as all documents which establish the relevant time periods, individuals involved, and the Project hours and the rates for the individuals.
- (27) The name, function, and pertinent activity of each Contractor's or subcontractor's official, or employee involved in or knowledgeable about events that give rise to, or facts that relate to, the claim.
- (28) The amount(s) of additional compensation sought and a break-down of the amount(s) into the categories specified as payable under Article 1.11.04 above.
- (29) The name, function, and pertinent activity of each Department official, employee or agent involved in or knowledgeable about events that give rise to, or facts that relate to, the claim.

**CONNECTICUT  
SUPPLEMENTAL SPECIFICATION  
SECTION 1.20  
GENERAL CLAUSES FOR FACILITIES CONSTRUCTION**

**1.20-1.00 – General:**

*Delete the last sentence of the first paragraph and replace with the following:*

“Facilities Construction is defined as the type of construction that requires the issuance of a Certificate of Compliance (C.O.C.) by the State Building Inspector or his authorized representative at the completion of a project, and includes site work considered ancillary to this type of construction.”

*Add the following article:*

**“1.20-1.01.01—Definitions:**

OWNER: Where used herein, it is synonymous with Department or State.”

**1.20-1.02.04 – Examination of Plans, Specifications, Special Provisions and Site of Work:**

*Delete the first sentence of the first paragraph and replace with the following:*

“CSI-formatted specifications are organized into Divisions and Sections based on the CSI’s “MasterFormat” numbering system.”

**1.20-1.02.13 – Knowledge of Applicable Laws:**

*Delete Items 1 through 9 in their entirety and replace with the following:*

1. “The 2003 International Building Code with the State Building Code, including latest Connecticut Supplement and Amendments.
2. The 2003 International Plumbing Code.
3. The 2003 International Mechanical Code.
4. The 2003 International Existing Building Code.
5. The 2009 International Energy Conservation Code.
6. The 2011 NFPA 70 National Electrical Code.
7. The 2003 ICC/ANSI A117.1.
8. The Fire Safety Code, including latest Connecticut Supplement and Amendments.
9. The 2003 International Fire Code.
10. The 2003 NFPA 1 Uniform Fire Code.

11. The 2003 NFPA 101 Life Safety Code.”

*Add the following as the new last paragraph:*

*“All work to be performed by the Contractor shall comply with the “Americans with Disabilities Act Accessibility Guidelines.””*

**1.20-1.03.01 – Consideration of Bids:**

*Delete the entire article and replace with the following:*

“The apparent low bidder shall submit to the Manager of Contracts a Schedule of Values within 14 days after bid opening. Any other Contractor that the Department may subsequently designate as the apparent lowest bidder shall make the aforesaid submission within 14 days from the date on which the Department notifies said Contractor that it has become the apparent lowest bidder. If, however, the Department deems it necessary for such a subsequently designated Contractor to make said submission within a shorter period of time, the Contractor shall make the submission within the time designated by the Department.

The total in the Schedule of Values shall equal the bid dollar amount for the Major Lump Sum Item (MLSI).

The Schedule of Values shall be divided into “Line Items” listed separately for each CSI Section of the Special Provisions. An additional line item for “Mobilization” shall be incorporated into the Schedule of Values; however, this item may not exceed 7.5% of the value of the MLSI. The “Mobilization” line item will also include costs associated with “General Conditions” and “Insurance/Bonding.” An additional line item for “Project Closeout” shall be incorporated into the Schedule of Values; however, this item must be at least 2.5% of the value of the MLSI. Where requested by the Department, the Contractor shall break down the line items further into more specific line items.

In the event that this Contract is terminated or a portion of this Contract is deleted for any reason or in any way allowable by law under this Contract after the apparent low bidder has been awarded the Contract, the Schedule of Values will not be used for estimating payment due the Contractor for work completed prior to such termination of the Contract or deletion of work thereunder. In the case of Contract termination, payment shall be made in accordance with Article 1.05.14.”

**1.20-1.05.02--Shop Drawings, Product Data, Product Samples and Quality Assurance Submittals:**

*Delete the last sentence of the first paragraph and replace with the following:*

“All facsimiles or other electronic documents from the Contractor shall be followed by an

official transmittal.”

*Delete the third paragraph and replace with the following:*

“The Contractor shall number each submittal consecutively: When resubmitting a “Revise and Resubmit” or “Rejected” submittal, the Contractor shall label the transmittal with the original submittal number followed by a letter to designate the additional submission. All submittals shall be numbered conforming to the following examples:”

*In column B of line 001, line 001a, and line 001b of the table in subsection 1, replace “07511” with “075110.”*

*Add the following to the end of the first paragraph of subsection 2:*

“The Department reserves the right to return partial submittals unreviewed to the Contractor.”

*Revise the third paragraph of subsection 2 to read:*

“The Contractor shall allow at least 60 calendar days for review of any submittal requiring approval by FAA, FTA, any railroad, DEEP, U.S. Coast Guard, Army Corps of Engineers, or any other outside agency.”

*Delete the third and fourth paragraphs of subsection 3 and replace with the following:*

“The Designer will not review submittals and the Engineer will not process payment estimates until the initial submittal schedule has been provided. Any delays in construction due to the Contractor's failure to provide a submittal schedule shall be the responsibility of the Contractor.

The Contractor must update its submittal schedule at least once a month, and distribute and post each updated schedule in the manner described above. The Engineer reserves the right not to process payment estimates without a recently updated submittal schedule on file.”

*Replace the first sentence of the first paragraph of subsection 4 with the following:*

“Shop Drawings consist of fabrication and installation drawings, roughing-in and setting drawings, schedules, patterns, templates and similar drawings, and wiring diagrams showing field-installed wiring, including power, signal, and control wiring.”

*Replace the second paragraph of subsection 4 with the following:*

“Shop drawings shall include the following information: Contract number, Project

description, number and title of the drawing, date of drawing, revision number, name of Contractor and subcontractor submitting drawings, dimensions, identification of products, shopwork manufacturing instructions, design calculations, statement of compliance with Contractual standards, notation of dimensions established by field measurement, relationship to adjoining construction clearly indicated, seal and signature of a professional engineer if specified, and any other information required by individual Contract provisions.”

*Replace the first sentence of the first paragraph of subsection 5 with the following:*

“Product data consist of printed information such as manufacturer’s product specifications, manufacturer’s installation instructions, manufacturer’s catalog cuts, standard color charts, wiring diagrams showing factory-installed wiring, printed performance curves, operational range diagrams, and mill reports.”

*Replace the first sentence of the first paragraph of subsection 7 with the following:*

“Quality assurance submittals consist of qualification data, design data, certifications, manufacturer’s instructions, manufacturer’s field reports, test reports, Material Safety Data Sheets (MSDSs), and other quality assurance information required by individual Contract provisions.”

**1.20-1.05.04—Coordination of Special Provisions, Plans, Supplemental Specifications and Standard Specifications and Other Contract Requirements:**

*Delete the first and second paragraphs and replace with the following:*

“Industry Standards: Each entity engaged in construction of the Contract shall be familiar with industry standards applicable to that entity's construction activities. If printed standards have been established by organizations referenced in Article 1.01.02 or in the Contract, the Contractor shall obtain copies of said standards directly from the publication source.

Unless the Special Provisions include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Special Provisions to the extent referenced. Such standards are made a part of the Contract by reference.”

*Add the following article:*

**1.20-1.05.08—Schedules and Reports:**

**Daily Construction Reports:** The Contractor 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.

*Add the following article:*

**1.20-1.05.23—Requests for Information (RFIs):**

The Contractor shall forward all RFIs to the Engineer in writing (facsimile or other electronic document) for review. The Engineer will forward the RFI to the Designer for review. Upon receipt of an RFI, the Designer will attempt to determine if additional information is required from the Contractor to respond to the RFI, and request said information from the Engineer.

All other RFIs will be responded to within 10 calendar days of receipt by the Designer.

**1.20-1.05.24—Project Meetings:**

*Delete the third paragraph under subsection 1.*

*Delete the second paragraph under subsection 2 and replace with the following:*

“The meeting participants shall review progress of other construction activities and preparations for the particular activity under consideration, including requirements of Contract documents, related requests for interpretations, related construction orders, purchases, deliveries, submittals, review of mockups, possible conflicts, compatibility problems, time schedules, weather limitations, manufacturer's written recommendations, warranty requirements, compatibility of materials, acceptability of substrates, temporary facilities and controls, space and access limitations, regulations of authorities having jurisdiction, testing and inspecting requirements, installation procedures coordination with other work, required performance results, protection of adjacent work, and protection of construction and personnel.”

*Delete the second, third and fourth paragraph under subsection 3 and replace with the following:*

“The Contractor shall provide the Engineer with a detailed agenda for the proposed meeting, specifying what topics will be covered. In addition to representatives of the Engineer, each subcontractor, supplier or other entity concerned with current progress or involved in planning, coordination or performance of future activities shall attend these meetings. All participants at the meeting shall be familiar with the Project and authorized to conclude matters relating to the Project.

At each progress meeting, the participants shall (1) review items of significance that could affect progress; (2) discuss topics appropriate to the current status of the Project;



(3) review progress since the last meeting; (4) determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to the Contractor's Construction Schedule; (5) determine how to expedite any Project work that may be behind schedule; (6) discuss whether or not schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract time; and (7) review the present and future needs of each entity represented at the meeting, including such items as interface requirements, time, sequences, deliveries, off-site fabrication problems, access, site utilization, temporary facilities and controls, hours of work, hazards and risks, housekeeping, quality and work standards, status of correction of deficient items, field observations, requests for interpretations, status of proposal requests, pending changes, status of construction orders, and documentation of information for payment requests. The Engineer will distribute copies of minutes of the meeting to the Designer and the Contractor. The Contractor shall distribute copies to parties who were or should have been at the meeting."

*Delete article 1.20-1.05.25—Schedules and Reports in its entirety*

**1.20-1.06.08—Warranties:**

*Delete the eighth and ninth paragraph and replace with the following:*

"The Contractor shall:

(a) Bind warranties in heavy-duty, commercial-quality, durable 3-ring vinyl-covered loose-leaf binders, thick enough to accommodate the contents, and sized to receive 8 1/2-inch x 11-inch paper (216-millimeter x 279-millimeter) paper.

(b) Identify the binder's contents on the binder's front and spine with the typed or printed title "WARRANTIES," the Project title or name, and the name of the Contractor.

(c) Provide a heavy paper divider with a tab for each separate warranty.

(d) Mark the tab to identify the related product or installation.

(e) Provide a typed description of the product or installation, including the name of the product, and the name, address and telephone number of the Contractor or pertinent subcontractor.

(f) Furnish to the Department a written warranty for all Project work accompanied by a cover letter with the following contents:

[Addressed to:]

Commissioner of Transportation  
Department of Transportation  
P.O. Box 317546  
Newington, Connecticut 06131-7546

Project Title and Number

[We] hereby warrant all materials and workmanship for all work performed under this Contract for a period of one (1) year from [date of issuance of C.O.C.] against failures of

workmanship and materials in accordance with the Contract. Furthermore, as a condition of this warranty, [we] agree to have in place all insurance coverage identified in the Contract for the performance of any warranty work.

[Signature:] [Name of authorized signatory]  
[Title]

(g) Submit to the Engineer, upon completion of installation of materials or assemblies that are required to have either a flame-rating or a fire-endurance hourly rating, a detailed letter certifying that the required rating has been attained.

Upon determination by the Engineer that Project work covered by a warranty has failed, the Contractor shall replace or rebuild the work to an acceptable condition complying with Contract requirements. The Contractor is responsible for the cost of replacing or rebuilding defective construction or components and those which may have needed to be damaged or removed in order to cure the defective work including costs of material, equipment, labor, and material disposal, regardless of whether or not the State has benefited from use of the work through a portion of its anticipated useful service life. The Contractor shall respond to the Project Site when Project work covered by a warranty has failed within 3 calendar days, unless in the Engineer's opinion said failure is deemed to be an emergency, in which case the Contractor shall respond to the Project Site as directed by the Engineer."

#### **1.20-1.08.03—Prosecution of Work:**

*Under subsection '3. Cutting and Patching,' delete the heading 'B. Protection of Structural Elements' and replace with the following:*

#### **"B. Protection:"**

*Move the existing first and second paragraphs to under the following subparagraph:*

"1. Structural Elements:"

*Add the following after the first paragraph under B:*

"2. Operational Elements: The Contractor shall not cut and patch operating elements and related components in a manner that results in their reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety.

3. Miscellaneous Elements: The Contractor shall not cut and patch miscellaneous elements or related components in a manner that could change their load-carrying capacity, that results reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety."

*Add the following after subsection 3:*

#### **“4. Selective Demolition:**

##### **A. Definitions:**

**Remove:** The Contractor shall detach materials from existing construction and legally dispose or recycle them off-site, unless indicated to be removed and salvaged or removed and reinstalled. Except for materials indicated to be reused, salvaged, reinstalled, or otherwise indicated to remain Engineer's property, demolished materials shall become Contractor's property and shall be removed from the Project Site.

**Remove and Salvage:** The Contractor shall detach materials from existing construction and deliver them to Engineer. The Engineer reserves the right to identify other materials for salvage during the course of demolition.

**Remove and Reinstall:** The Contractor shall detach materials from existing construction, prepare them for reuse, and reinstall them where indicated.

**Existing to Remain:** Existing materials of construction that are not to be removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

##### **B. Approval Process:**

The Contractor shall submit pre-demolition photographs to the Engineer prior to the commencement of Project work to show existing conditions of adjoining construction and site improvements, including finish surfaces, that might be misconstrued as damage caused by selective demolition operations.

Well in advance of performing any selective demolition on the Project, the Contractor shall submit to the Engineer a proposal describing the procedures that the Contractor intends to use for same.

The Contractor shall include the following information, as applicable, in its proposal: (1) detailed sequence of selective demolition and removal work with starting and ending dates for each activity while ensuring that the Engineer's on-site operations are not disrupted; (2) interruption of utility services; (3) coordination for shutoff, capping, and continuation of utility services; (4) use of elevators and stairs; (5) locations of temporary partitions and means of egress; (6) coordination of Engineer's continuing occupancy of portions of existing building and of Engineer's partial occupancy of completed Project work; and (7) means of protection for items to remain and items in path of waste removal from building.

The Contractor shall comply with (1) governing EPA notification regulations before beginning selective demolition; (2) hauling and disposal regulations of authorities having jurisdiction; (3) ANSI A10.6; and (4) NFPA 241.

The Engineer will conduct a Pre-Demolition Meeting at the Project site in accordance with Article 1.20-1.05.24. Said meeting will review the methods and procedures related to selective demolition including, but not limited to, the following: (1) an inspection and discussion of the condition of construction to be selectively demolished; (2) a review of the structural load limitations of the existing structure; (3) a review and finalization of the selective demolition schedule and a verification of the availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays; (4) a review of requirements of Project work performed by other trades that rely on substrates exposed by selective demolition operations; and (5) a review of areas where existing construction is to remain and requires protection.

#### **C. Repair Materials:**

The Contractor shall comply with Article 1.20-1.08.03 subsection 3E for repair materials and shall comply with material and installation requirements specified in other Contract provisions.

#### **D. Examination:**

The Contractor shall (1) verify that utilities have been disconnected and capped; (2) survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required; (3) inventory and record the condition of items to be removed and reinstalled and items to be removed and salvaged; (4) investigate and measure the nature and extent of unanticipated mechanical, electrical, or structural elements that conflict with intended function or design and submit a written report to Engineer; and (5) perform surveys as the Project work progresses to detect hazards resulting from selective demolition activities.

#### **E. Utility Services:**

The Contractor shall (1) maintain existing utility services indicated to remain and protect them against damage during selective demolition operations; (2) not interrupt existing utilities serving occupied or operating facilities unless authorized in writing by the Engineer; (3) provide temporary services during interruptions to existing utilities, as acceptable to Engineer; (4) provide at least 3 calendar days' notice to the Engineer if shutdown of service is required during changeover; and (5) locate, identify, disconnect, and seal or cap off indicated utilities serving areas to be selectively demolished. The Contractor shall arrange to shut off indicated utilities with utility companies. If utility services are required to be removed, relocated, or abandoned, before proceeding with selective demolition the Contractor shall provide temporary utilities that bypass area of selective demolition and that maintain continuity of service to other parts of building.

The Contractor shall cut off pipe or conduit in walls or partitions to be removed and shall cap, valve, or plug and seal remaining portion of pipe or conduit after bypassing.

The Contractor shall refer to other Contract provisions for shutting off, disconnecting, removing, and sealing or capping utilities. The Contractor shall not start selective demolition work until utility disconnecting and sealing have been completed and verified by the Engineer in writing.

#### **F. Preparation:**

The Contractor shall conduct selective demolition and debris-removal operations to ensure minimum interference with adjacent occupied and used facilities on the Project site. The Contractor shall not disrupt the Owner's operations without the Engineer's permission. The Contractor shall protect existing site improvements, appurtenances, and landscaping to remain.

The Contractor shall provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain. The Contractor shall provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas. The Contractor shall protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations. The Contractor shall cover and protect furniture, furnishings, and equipment that have not been removed.

The Contractor shall provide temporary enclosures for protection of existing building and construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. The Contractor shall provide temporary weathertight enclosure for building exterior. Where heating is needed and permanent enclosure is not complete, the Contractor shall provide insulated temporary enclosures and shall coordinate enclosure with ventilating and material drying or curing requirements to avoid dangerous conditions and effects.

The Contractor shall erect and maintain dustproof partitions and temporary enclosures to limit dust and dirt migration and to separate areas from fumes and noise.

The Contractor shall provide and maintain interior and exterior shoring, bracing, or structural support to preserve stability and prevent movement, settlement, or collapse of construction to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished. The Contractor shall strengthen or add new supports when required during progress of selective demolition.

#### **G. Pollution Controls:**

The Contractor shall comply with governing regulations pertaining to environmental protection.

The Contractor shall not use water when it may create a hazardous or objectionable condition such as ice, flooding, or pollution.

The Contractor shall remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas. The Contractor shall remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.

The Contractor shall clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. The Contractor shall return adjacent areas to condition existing before selective demolition operations began.

#### **H. Performance:**

The Contractor shall not use explosives for demolition purposes.

The Contractor shall demolish and remove existing construction only to the extent required by new construction and as indicated. The Contractor shall (1) proceed with selective demolition systematically; (2) neatly cut openings and holes plumb, square, and true to dimensions required; (3) use cutting methods least likely to damage remaining or adjoining construction; (4) use hand tools or small power tools designed for sawing or grinding, not hammering and chopping, to minimize disturbance of adjacent surfaces; (5) temporarily cover openings to remain; (6) cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces; (7) not use cutting torches until work area is cleared of flammable materials; (8) verify condition and contents of concealed spaces such as duct and pipe interiors before starting flame-cutting operations; (9) maintain fire watch and portable fire-suppression devices during flame-cutting operations; (10) maintain adequate ventilation when using cutting torches; (11) remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site; (12) remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation; (13) locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing; and (14) dispose of demolished items and materials promptly.

The Contractor shall comply with the Engineer's requirements for using and protecting walkways, building entries, and other building facilities during selective demolition operations.

The Contractor shall demolish and remove foundations and other below-grade structures completely unless otherwise indicated on the plans. The Contractor shall fill below-grade areas and voids resulting from demolition of structures with granular fill materials. Prior to placement of fill materials, the Contractor shall ensure that the areas

to be filled are free of standing water, frost, frozen material, trash, and debris. After fill placement and compaction, grade surface to meet adjacent contours and provide flow to surface drainage structures. Backfilling and grading related to demolition is included in the Major Lump Sum Item (MLSI) for the Project. There will be no separate payment for this backfilling and grading.

The Contractor shall (1) demolish concrete in sections; (2) cut concrete at junctures with construction to remain to the depth shown on the Contract plans and at regular intervals using power-driven saw; and (3) remove concrete between saw cuts.

The Contractor shall (1) demolish masonry in small sections; (2) cut masonry at junctures with construction to remain using power-driven saw; and (3) remove masonry between saw cuts.

The Contractor shall (1) saw-cut perimeter of concrete slabs-on-grade to be demolished as shown on the Contract plans; and (2) break up and remove concrete slabs-on-grade.

The Contractor shall (1) remove floor coverings and adhesive according to recommendations in RFCI-WP and its Addendum; and (2) remove residual adhesive and prepare substrate for new floor coverings by one of the methods recommended by RFCI.

The Contractor shall (1) only remove existing roofing in one day to the extent that it can be covered by new roofing; and (2) refer to other Contract provisions for new roofing requirements.

The Contractor shall remove air conditioning equipment without releasing refrigerants.

#### **I. Reuse of Building Elements:**

The Contractor shall not demolish building elements beyond what is indicated on the plans without the Engineer's approval.

#### **J. Removed and Salvaged Materials:**

Unless otherwise directed by the Engineer, the Contractor shall (1) store materials in a secure area until delivery to the owner; (2) transport materials to the owner's storage area off-site; and (3) protect materials from damage during transport and storage.

#### **K. Removed and Reinstalled Materials:**

Unless otherwise directed by the Engineer, the Contractor shall (1) clean and repair materials to functional condition adequate for intended reuse; (2) paint equipment to match the color of new equipment; (3) protect materials from damage during transport and storage; and (4) reinstall items in locations indicated complying with installation

requirements for new materials and equipment and providing connections, supports, and miscellaneous materials necessary to make item functional for use indicated.

**L. Existing Materials to Remain:**

The Contractor shall protect construction indicated to remain against damage and soiling during selective demolition.

The Contractor shall drain piping and cap or plug piping with the same or a compatible piping material for piping to be abandoned in place.

The Contractor shall cap or plug ducts with the same or a compatible ductwork material for ducts to be abandoned in place.

The Contractor shall cut and remove concealed conduits and wiring to be abandoned in place 2-inches (50-mm) below the surface of the adjacent construction, cap the conduit end, and patch the surface to match the existing finish. The Contractor shall cut existing conduits installed in concrete slabs to be abandoned in place flush with the top of the slab and fill conduit end with a minimum of 4-inches (100-mm) of concrete.

**M. Patching and Repairing:**

The Contractor shall comply with Article 1.20-1.08.03 subsection 3H for patching and repairing damage to adjacent construction caused by selective demolition operations.

**N. Disposal of Demolished Materials:**

The Contractor shall (1) not allow demolished materials to accumulate or be sold on the Project Site; (2) not burn demolished materials on the Project Site; and (3) promptly and legally dispose or recycle demolished materials off the Project Site.”

**1.20-1.08.05—Personnel and Equipment:**

*Replace “FM with “FMG” in subsection (a)*

*Add the following article:*

**“1.20-1.08.12—Semi-Final and Final Inspections:**

**1. Semi-Final Inspection:** Before requesting the Semi-Final Inspection, the Contractor shall show 100% completion for all Project work claimed as complete. The Contractor shall submit final test/adjust/balance records including the final air and water balance report. For all incomplete Project work, the Contractor shall prepare its own “Punch List” of the incomplete items and reasons the work is not complete. The Contractor shall submit final test/adjust/balance records including the final air and water balance report.



On receipt of a Contractor request for inspection, the Engineer will proceed with inspection or notify the Contractor of unfulfilled requirements. The Engineer will prepare a "Punch List" of unfilled, substandard, or incomplete items. During this inspection, the Contractor shall have all technicians necessary to demonstrate the complete operation of all systems on-site. Examples of such systems include, but are not limited to, the following: boiler, HVAC, fire alarm, and building automation. The Engineer will advise the Contractor of the construction that must be completed or corrected before the issuance of the C.O.C. Results of the completed inspection will form the basis of requirements for the Final Inspection. The Engineer reserves the right to issue the C.O.C. after the Semi-Final Inspection if there are no Building Code or Fire Code compliance issues or any major "Punch List" items.

**2. Final Inspection:** Before requesting Final Inspection for issuance of the C.O.C., the Contractor shall: (1) submit specific warranties, maintenance service agreements, final certifications and similar documents; (2) submit Record Drawings, Record Specifications, operations and maintenance manuals, final project photographs, property surveys, and similar final record information; (3) deliver spare parts; (4) make final changeover of permanent locks and deliver the keys to the Engineer; (5) complete start-up testing of systems; (6) train the owner's operation and maintenance personnel; (7) discontinue or change over and remove temporary facilities from the Project Site, along with construction tools, mock-ups, and similar elements; (8) complete final cleaning requirements, including touch-up painting; (9) touch-up and otherwise repair and restore marred exposed finishes to eliminate visual defects; (10) submit a certified copy of the Engineer's "Punch List" of items to be completed or corrected, stating that each item has been completed or otherwise resolved for acceptance, and the list has been endorsed and dated by the Engineer; (11) submit final meter readings for utilities, a measured record of stored fuel, and similar data as of the date of Final Inspection, or when the Engineer took possession of and responsibility for corresponding elements of the Project work; and (12) install permanent electrical service. The Contractor shall install permanent electrical service prior to Semi-Final Inspection if requested by the Engineer, or if necessary for the Engineer or Contractor to perform testing of building and other related systems and equipment to certify acceptance and completion of Project work. The Contractor shall submit all outstanding items or unacceptable submissions from the Semi-Final Inspection, or other outstanding items required for submittal, prior to the Final Inspection.

On receipt of a Contractor request for inspection, the Engineer will proceed with inspection and notify the Contractor of unfulfilled requirements."

**1.20-1.08.13—Termination of the Contractor's Responsibility:**

*Add subsection 3 as follows:*

**"3. Insurance Coverage:** The Contractor shall have in place all insurance coverage identified in Article 1.03.07 for the performance of any warranty work."

**1.20-1.08.14—Acceptance of Project:**

*Add the following to subsection 2 under the heading “Equipment and Systems Maintenance Manual:”*

“(j) Copies of maintenance agreements with service agent name and telephone number.”

*Add the following paragraph in subsection 3 after the second paragraph:*

“The Contractor shall provide a syllabus prior to the training to ensure that the appropriate owner’s operation and maintenance personnel are in attendance.”

*Delete the last paragraph and replace with the following:*

“ The Contractor shall submit to the Engineer for approval, a qualified commercial videographer to videotape the training sessions. The videographer shall be a firm or an individual of established reputation that has been regularly engaged as a professional videographer for not less than 3 years.

The Contractor shall video record each training session and provide said video in DVD format to the Engineer for the owner’s future use.”

*Add the following section:*

**“1.20-1.09.06—Partial Payments:**

With each payment request under the MLSI, the Contractor shall submit AIA Form G702 (Application and Certificate of Payment) and Form G703 (Continuation Sheet). The Contractor is not required to obtain the Architect’s signature on Form G702. Once approved by the Engineer, the Forms G702 and G703 become the basis of payment under the MLSI.”

*Add the following section:*

**“1.20-9.75.04—Method of Measurement:**

Mobilization as defined in Article 1.20-1.03.01 will be paid in the manner described hereinafter; however, the determination of the total contract price earned shall not include the amount of mobilization earned during the period covered by the current monthly estimate – but shall include amounts previously earned and certified for payment:

1. When the first payment estimate is made, 25 percent of the “Mobilization” line item will be certified for payment.

2. When the Baseline Schedule, as specified under Section 1.05.08, is accepted, 50 percent of the "Mobilization" line item, minus any previous payments, will be certified for payment.

3. When 10 percent of the total original contract price is earned and the Baseline Schedule, as specified under Section 1.05.08, is accepted, 75 percent of the "Mobilization" line item, minus any previous payments, will be certified for payment.

4. When 30 percent of the total original contract price is earned and the Baseline Schedule, as specified under Section 1.05.08, is accepted, 100 percent of the "Mobilization" line item, minus any previous payments, will be certified for payment.

Project Closeout as defined in Article 1.20-1.03.01 shall include demobilization of plant and equipment, completion of all physical work, and administrative closeout items necessary to satisfy all Contract requirements. Project Closeout will be paid in the manner described hereinafter:

1. When the non-administrative project completion requirements (as specified under Article 1.08.13) and the administrative completion requirements (as specified under Article 1.08.14) have been satisfied, 100 percent of the "Project Closeout" line item will be certified for payment."

**CONNECTICUT  
SUPPLEMENTAL SPECIFICATION  
SECTION 2.02  
ROADWAY EXCAVATION, FORMATION OF  
EMBANKMENT AND DISPOSAL OF  
SURPLUS MATERIAL**

**2.02.01 – Description:**

*In the first sentence, insert “, swales” between “channels” and “and other miscellaneous construction to the ...”*

**2.02.04 – Method of Measurement:**

*In the second to last Paragraph, replace the last sentence with the following:*  
“Bituminous parking areas are considered as bituminous concrete pavement.”

**CONNECTICUT  
SUPPLEMENTAL SPECIFICATION  
SECTION 2.05  
TRENCH EXCAVATION**

**2.05.01--Description:**

*In Paragraph 2, delete the only sentence and replace with the following:*

- 2) The removal of stormwater drainage structures, stormwater pipes and appurtenances beyond the limits of the roadway and structure excavation.

*In Sub article 2, Rock in Trench, delete the only sentence and replace with the following:*

- (2) Rock, insofar as it applies to trench excavation, shall be defined as rock in definite ledge formation, boulders, or portions of boulders, cement masonry structures, concrete structures, reinforced concrete pipe, Portland cement concrete pavement or base, of 1/2 cubic yard (0.5 cubic meters) or more in volume, removed as indicated or directed from within the payment lines for trench excavation.

**2.05.05 -Basis of Payment**

*In Paragraph 13, delete the entire sentence "There will be no direct payment for the plugging of existing pipes....." and replace with the following:*

" There will be no direct Payment for the plugging of existing pipes, removal and disposal of metal or plastic pipes or for the breaking up of floors in drainage structures being abandoned. The cost shall be included in the contract unit prices of the drainage and excavation items."

**CONNECTICUT  
SUPPLEMENTAL SPECIFICATION  
SECTION 2.12  
SUBBASE**

**2.12.02 – Materials:**

*Delete the second sentence:*

“Grading ‘B’ shall be used.”

**CONNECTICUT  
SUPPLEMENTAL SPECIFICATION  
SECTION 2.16  
PERVIOUS STRUCTURE BACKFILL**

**2.16.01 - Description:**

*Add the following sentence after the only sentence:*

“This item shall also consist of furnishing and placing crushed stone or gravel in permeable material bags at the inlet ends of weep holes in structures to the dimensions indicated on the plans or as ordered by the Engineer.”

**2.16.02 – Materials:**

*Add the following paragraph after the only sentence:*

“ The materials for bagged stone shall conform to the following requirements:

1. The crushed stone or gravel shall conform to the grading requirements of Article M.01.01 for No. 3 or No. 4 coarse aggregate or a mixture of both.
2. The bag shall be of permeable material sized to contain 1 c.f. (0.03 cu.m) of loosely packed granular material.”

**2.16.03 - Construction Methods:**

*Add the following paragraph at the end of the section:*

“ Where weep holes are installed, bagged stone shall be placed around the inlet end of each weep hole, to prevent movement of the pervious material into the weep hole. Approximately 1 c.f. (0.03 cu.m) of crushed stone or gravel shall be enclosed in each of the permeable material bags. All bags shall then be securely tied at the neck with cord or wire so that the enclosed material is contained loosely. The filled bags shall be stacked at the weep holes to the dimensions shown on the plans or as directed by the Engineer. The bags shall be unbroken at the time pervious material is placed around them, and bags which are broken or burst prior to or during the placing of the pervious material shall be replaced at the Contractor’s expense.”

**2.16.04 - Method of Measurement:**

*Add the following paragraph after the only paragraph:*

“ There will be no direct payment for bagged stone, but the cost thereof shall be included in the cost of the work for “Pervious Structure Backfill.””

**CONNECTICUT  
SUPPLEMENTAL SPECIFICATION  
SECTION 3.04  
PROCESSED AGGREGATE BASE**

*Delete the entire Section and replace with the following:*

**3.04.01--Description:** The base shall consist of a foundation constructed on the prepared subbase or subgrade in accordance with these specifications and in conformity with the lines, grades, compacted thickness and typical cross-section as shown on the plans.

**3.04.02--Materials:** All materials for this work shall conform to the requirements of Article M.05.01.

**3.04.03--Construction Methods:** Only one type of coarse aggregate shall be used on a project unless otherwise permitted by the Engineer.

Prior to placing the processed aggregate base, the prepared subbase or subgrade shall be maintained true to line and grade, for a minimum distance of 200 feet (60 meters) in advance of the work. None of the aggregate courses shall be placed more than 500 feet (150 meters) ahead of the compaction and binding operation on that particular course.

The processed aggregate base shall be spread uniformly by a method approved by the Engineer. The thickness of each course shall not be more than 4 inches (100 millimeters) after compaction, unless otherwise ordered.

After the aggregate is spread, it shall be thoroughly compacted and bound by use of equipment specifically manufactured for that purpose. Rollers shall deliver a ground pressure of not less than 300 pounds per lineal inch (52.5 newtons/millimeter) of contact width and shall have a weight (mass) not less than 10 tons (9100 kilograms). Vibratory units shall have a static weight (mass) of not less than 4 tons (3650 kilograms). Water may be used during the compaction and binding operation and shall be applied from an approved watering device. The compacting and binding operation shall begin at the outside edges, overlapping the shoulders for a distance of not less than 6 inches (150 millimeters) and progress towards the middle, parallel with the centerline of the pavement. The work shall cover the entire surface of the course with uniform overlapping of each preceding track or pass. Areas of super-elevation and special cross slope shall be compacted by beginning at the lowest edge and proceeding towards the higher edge, unless otherwise directed by the Engineer. The compacting and binding operation shall be continued until the voids in the aggregates have been reduced to provide a firm and uniform surface satisfactory to the Engineer. The amount of compactive effort shall in no case shall be less than four (4) complete passes of the compacting and binding operations. All aggregate shall be completely compacted and bound at the end of each day's work or when traffic is to be permitted to operate on the



road. The dry density of each layer of processed aggregate base after compaction shall not be less than 95 percent of the dry density for that material when tested in accordance with AASHTO T180, Method D.

Should the subbase or subgrade material become churned up or mixed with the processed aggregate base at any time, the Contractor shall, without additional compensation remove the mixture. The Contractor shall add new subbase material, if required, and reshape and recompact the subbase in accordance with the requirements of Article 2.12.03. New aggregate material shall be added, compacted and bound, as hereinbefore specified, to match the surrounding surface.

Any surface irregularities which develop during, or after work on each course, shall be corrected by loosening material already in place and removing or adding aggregate as required. The entire area, including the surrounding surface, shall be re-compacted and rebound until it is brought to a firm and uniform surface satisfactory to the Engineer.

**3.04.04--Method of Measurement:** Processed Aggregate Base will be measured horizontally in-place after final grading and compaction. Materials placed beyond the horizontal limits indicated on the plans will not be measured for payment.

The total thickness shall be as indicated on the plans, or as ordered by the Engineer and within a tolerance of minus three-fourths of an inch ( $-\frac{3}{4}$ " ) to plus one-half inch ( $+\frac{1}{2}$ " ) (-19 millimeters to +13 millimeters).

Measurements to determine the thickness will be taken by the Engineer at intervals of 500 feet (150 meters) or less, along lanes, and shall be considered representative of the lane. For the purpose of these measurements, a shoulder will be considered a lane.

If a thickness measurement is taken and found deficient, the Engineer will take such additional measurements as he considers necessary to determine the longitudinal limits of the deficiency. Areas not within allowable tolerances shall be corrected, as ordered by the Engineer, without additional compensation to the Contractor.

**3.04.05--Basis of Payment:** This work will be paid for at the contract unit price per cubic yard for "Processed Aggregate Base", complete in place, which price shall include all materials, tools, equipment and work incidental thereto.

Pay Item	Pay Unit
Processed Aggregate Base	c.y. (cu. m)

**CONNECTICUT  
SUPPLEMENTAL SPECIFICATION  
SECTION 4.01  
CONCRETE PAVEMENT**

**4.01.03-A. Composition:**

*Change the beginning of the first sentence as follows:*

“The composition of the concrete shall be in accordance with the requirements of Section M.03 - Portland Cement Concrete, as well as the applicable ...”

*Add the following new paragraph before the last paragraph:*

“The temperature of the concrete at the time of placement shall not be less than 60° F (15.5° C) or greater than 90° F (32° C). For pumped concrete, the temperature shall be determined at the placement end of the pump line. The temperature of the concrete shall be determined in accordance with ASTM C1064.”

**4.01.03-E. Hauling Units:**

**1. Truck mixers and truck agitators:**

*Change the end of the only sentence as follows:*

“... the requirements of Subarticle 6.01.03-3, ‘Transportation and Delivery of Concrete.’”

**4.01.03-F. Placing Concrete:**

**6. Joints:**

**(e) Load Transfer Devices:**

*Change the only sentence as follows:*

“Load transfer devices shall conform to the requirements of Article M.03.08.”

**7. Curing:**

**(a) Liquid Membrane-Forming Cure:**

*Change the first sentence as follows:*

“The liquid curing compound shall conform to Subarticle M.03.04-3.”

**(b) Moist Curing:**

*Change the end of the first sentence as follows:*

“... moist mats of the size and quality specified in Subarticle M.03.04-2.”

**(c) Cover Sheet Curing:**

*Change the end of the first sentence as follows:*

“... paper or polyethylene cover sheets conforming to Subarticle M.03.04-4.”

**CONNECTICUT  
SUPPLEMENTAL SPECIFICATION  
SECTION 5.14  
PRESTRESSED CONCRETE MEMBERS**

**5.14.03 – Construction Methods:**

**2. Prestressing:**

*Change the outline level of “Final Stressing of Straight Strands:” and “Final Stressing of Draped Strands:” and their subsections as follows:*

**“ A. Final Stressing of Straight Strands:**

**(1) Single-strand tensioning:**

**(2) Multiple-strand tensioning:**

**B. Final Stressing of Draped Strands:**

**(1) Partial stressing and subsequent strains:**

**(2) Final stressing in draped position:”**

**5. Finishing: Deck Units:**

*Change the first sentence as follows:*

“Deck units in structures that will have a bituminous concrete wearing surface shall be given a float finish on the top surface as specified in Subarticle 6.01.03-10.”

**9. Joining Deck Units:**

*Change the end of the last sentence of the first paragraph as follows:*

“... shall be filled with non-shrink grout conforming to the requirements of Article M.03.05.”

**12. Inspection:**

*Change the beginning of the first sentence as follows:*

“The provisions of Subarticle 6.03.03-3 (Shop Fabrication), (a) Notification shall apply to the steel items, ...”

**16: Methods and Equipment:**

*Change the last sentence as follows:*

“The results of this investigation, including computations, shall be submitted to the Engineer.”

**CONNECTICUT  
SUPPLEMENTAL SPECIFICATION  
SECTION 6.01  
CONCRETE FOR STRUCTURES**

*Delete the entire Section and replace it with the following:*

**SECTION 6.01  
CONCRETE FOR STRUCTURES**

- 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 bridges and culverts, walls, catch basins, drop inlets and other incidental construction as required. 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 conform to the requirements of Section M.03.

**6.01.03—Construction Methods:**

**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 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. Falsework and forms shall be mortar tight and 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 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 (mass) of the falsework and all construction material to be supported. The combined unit weight (density) of concrete, reinforcing and pre-stressing steel and forms that is supported shall be assumed to be not less than:

1. Normal-weight (normal-density) concrete: 0.16 kip/ft<sup>3</sup> (2560 kg/m<sup>3</sup>)
2. Lightweight (low-density) concrete: 0.13 kip/ft<sup>3</sup> (2080 kg/m<sup>3</sup>)

Live loads shall consist of the actual weight (mass) 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/ft<sup>2</sup> (0.001 MPa) applied over the area supported, plus 0.075 kip/ft (1.10 N/mm) 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 two percent (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 6.01.03-12, "Application of Loads."

- (c) **Working Drawings:** The working drawings for falsework and formwork shall be prepared in accordance with Article 1.05.02 whenever the falsework or formwork exceeds 14.0 feet (4300 mm) in height 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 6.01.03-10, "Finishing Concrete Surfaces," and 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 (6 mm) when checked with a 4 foot (1200 mm) 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 (13 mm) when checked with a 4 foot (1200 mm) 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 (50 mm) 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 conform to the 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) **Date of Completion:** The year in which the superstructure is completed in its entirety shall be cast in at least two (2) places as shown on the plans unless otherwise ordered by the Engineer. The date shall be placed in diagonally opposite ends of the bridge parapets or as designated by the Engineer. The reverse molds for the date shall be furnished by the Contractor.
- (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 seven (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 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 Article 1.05.02, Working Drawings. 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 (mass) of concrete [considered to be equivalent to the weight (mass) imposed by an additional concrete thickness equal to three percent (3%) of the proposed deck thickness, but not to exceed 0.3 inches (8 mm)] due to the deflection of the metal forms, plus 50 pounds per square foot (2.40 kilopascals) 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 (250 megapascals). The span for design and deflection shall be the clear distance between edges of the beams or girders less 2 inches (50 mm) and shall be measured parallel to the form flutes. The maximum deflection under the weight (mass) of plastic concrete, reinforcement, and forms shall not exceed 1/180 of the form span or 0.5 inches (13 mm), whichever is less. In no case shall the loading



used to estimate this deflection be less than 120 pounds per square foot (586 kilograms per square meter). 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 with horizontal leg not more than 3 inches (75 mm).

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 over a salt-laden body of water with a clearance of less than 15 feet (4.5 m) 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 pre-stressed 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 (100 mm) 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 two (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 (50 mm). 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 Section 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 (25 mm) 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 (450 mm). The ends of the form sheets shall be securely attached to the support angles with fasteners at a maximum spacing of 18 inches (450 mm), or two (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 (25 mm) 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 documents. 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.

For mechanical joint systems, the concrete shall be placed in such a manner that does not interfere with the movement of the joint.

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 conform to the requirements of the plans and of these specifications.

- (j) **Pipes, Conduits and Utility Installations:** The Contractor shall coordinate the installation of pipes, conduits and utilities as shown on the plans and in conformance with the Contract documents 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) **Anchorage:** Anchor bolts and systems shall be set to the requirements of the plans and Contract documents. 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 per the Contract Special Provisions.

- (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 two (2) or more spans, the sequence of falsework release shall be as specified in the Contract documents or as approved by the Engineer.

Removal shall be controlled by field-cured cylinder tests. The removal shall not begin until the concrete has achieved seventy-five percent (75%) of the design compressive strength. To facilitate finishing, side forms carrying no load may be removed after twenty-four (24) hours with the permission of the Engineer, but the curing process must be continued for seven (7) days.

When the results of field-cured cylinder tests are unavailable, the following periods, exclusive of days when the temperature drops below 40°F (5°C), may govern the removal of forms:

<b>Form Removal Requirements</b>	
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 alternate methods to determine the in-place strength of the concrete for removal of forms and falsework, for review and approval by the Engineer.

**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 (32°C), the forms, which will come in contact with the mix shall be cooled to below 90°F (32°C) for a minimum of one (1) hour prior to and one (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 (5°C) 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 (5°C), by methods satisfactory to the Engineer, for a minimum of one (1) hour prior to, and maintained throughout, concrete placement.

2. Curing: For the first six (6) days, considered the initial cure period, the concrete shall be maintained at a temperature of not less than 45°F (7°C) and the air temperature surrounding the structure shall be maintained at a temperature of not less than 60°F (16°C). When the concrete mix includes pozzolans or slag, the initial cure period shall be increased to ten (10) days. After the initial cure period, the air surrounding the structure shall be maintained above 40° F (5°C) for an additional eight (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 (32°C) or caused to change temperature by more than 20°F (11°C) in eight (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 (40 kph) or more, or ambient air temperatures greater than 80°F (25°C) 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 cooler times of days or nights, or a 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 Section 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 (cubic meters) 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 (masses) and any admixtures shall be printed on plant tickets
9. Water/cement ratio, and
10. Additional water allowance in gallons (liters) based on water/cement ratio for mix

A State inspector may be present to monitor batching and 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 one (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 Section 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 (liters) added to the concrete cannot exceed the allowance shown on the delivery ticket.

The concrete shall be completely discharged into the forms within one and one-half (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 (32°C). This time may also be reduced if the temperature of the concrete is over 90°F (32°C).

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.

### English Units

Standard Mix Class	Air Content	Slump	Concrete Temperature
A (3300 psi)	6.0 +/- 1.5%	4" +/- 1"	60°-90°F
C (3300 psi)			
F (4400 psi)			
Modified Standards <sup>1</sup>	6.0 +/- 1.5% <sup>2</sup>	4" +/- 1" <sup>2</sup>	
Special Provision Mix <sup>3</sup>	As specified	As specified	
<sup>1</sup> 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.			
<sup>2</sup> If the <u>only</u> modification is the addition of HRWR, the maximum allowable slump shall be 7 inches.			
<sup>3</sup> 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.			

### Metric Units

Standard Mix Class	Air Content	Slump	Concrete Temperature
A (23MPa)	6.0 +/- 1.5%	100 mm +/- 25mm	15.5°-32°C
C (23 MPa)			
F (30 MPa)			
Modified Standards <sup>1</sup>	6.0 +/- 1.5% <sup>2</sup>	100mm +/- 25mm <sup>2</sup>	
Special Provision Mix <sup>3</sup>	As specified	As specified	
<sup>1</sup> 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.			
<sup>2</sup> If the <u>only</u> modification is the addition of HRWR, the maximum allowable slump shall be 175 mm.			
<sup>3</sup> 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.			

- (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.

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 (30 m) 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 documents.

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 required specifications 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 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 6.01.03-6(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 one (1) or more of the same truck loads that an Acceptance sample is taken from.



A minimum of two (2) 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 Article 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 twenty-four (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 (16°C) and 90°F (32°C). 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 documents 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 6.01.03-1(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 twenty-four (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 (1500 mm), 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 (1000 mm) 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 fifteen (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 twenty-four (24) hours prior to actual placement of the concrete to verify deck survey and equipment operations to the satisfaction of the Engineer.

Concrete shall be deposited in a uniform manner across the entire width being placed, and only two (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 final finishing of the surface will occur before initial set of the concrete takes place.

At construction joints, concrete shall not be placed against the previously placed concrete for at least twelve (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 documents or otherwise 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 ten percent (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 one (1) tremie or pump shall be used to ensure compliance with this requirement.

Mass concrete placement requirements, outlined in 6.01.03-6(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 working drawing submitted to the Engineer 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 (1500 mm) or greater in each of three (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 (1800 mm) or greater and a height of 5 feet (1500 mm) or greater. For all mass concrete placements, the mix temperature shall not exceed 85°F (30°C) 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 documents, 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 6.01.03-10, "Finishing Concrete Surfaces."

After completion of the placing and finishing operation and for at least twelve (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 (1.5 mm) and 3/16 inch (5 mm) wide and between 1/8 inch (3 mm) and 3/16 inch (5 mm) deep, spaced 1/2 inch (12.5 mm) to 3/4 inch (20 mm) on centers. Tining shall be discontinued 12 inches (300 mm) 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 (5 mm) 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 two (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 (3 meter) straightedge.

1. The surface shall not vary more than +/- 1/8 inch (3 mm) in 10 feet (3 m) for decks which will not be covered with an overlay.
2. The surface shall not vary more than +/- 1/4 inch (6 mm) in 10 feet (3 m) for decks which will be covered with an overlay.

Variances 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 inches (1.5 mm). 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 seven (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 (150 mm) 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:**

1. Curing Plan: The Contractor shall submit to the Engineer, at least fourteen (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, and
  - C. proposed primary and secondary water and heat sources

2. 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 Section 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.

3. 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.

4. Temperature Monitoring: The internal temperature of the concrete shall be monitored with a calibrated continuous recording thermometer for a minimum of seven (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 one (1) recording thermometer.

The number and placement of the thermometers will be determined by the Engineer. A minimum of two (2) thermometers per concrete placement shall be provided by the Contractor.

The following types of thermometers shall be used to monitor curing temperatures:

- A. Continuously Recording Thermometer: The thermometer shall be capable of continuously recording temperatures within a range of -4 °F to 122 °F (-20°C to 50°C) for a minimum of twenty-four (24) hours.
- B. 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 (-20°C to 50°C).

**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 one (1) hour of mixing. The concrete shall be finished as defined below if required and the cure continued as previously specified in "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 6.01.03-8, "Bearing Surfaces."
- (b) Rubbed Finish:** The initial rubbing shall only be allowed within three (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 three (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 one (1) work shift.

All finished surfaces shall be cured for a minimum of twenty-four (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 forty-eight (48) hours prior to the planned use, a copy of the installation instructions and MSDS sheet(s) 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 6.01.03-9(a)-2 "Curing Concrete – Water Method," for a period of not less than three (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 (3 mm) 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, size and type specified and installed as shown on the plans and shall be in accordance with Section M.03.

**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 eighty percent (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 twenty-four (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) **Loading of Completed Elements:** Precast concrete or steel girders shall not be placed on substructure elements until the substructure concrete has attained eighty-five percent (85%) of its specified strength.

No load shall be allowed on mortar or grout that has been in place less than seventy-two (72) hours.

- (d) **Traffic Loads:** The concrete deck will not be opened to traffic until at least fourteen (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 cubic yards (60 cubic meters).

- (a) **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.

- (b) **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.

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

**1. Concrete:** The quantity of concrete will be the actual volume in cubic yards (cubic meters) of the specified class or classes, with the exception of underwater concrete, completed and accepted within the neat lines as shown on the plans or as ordered by the Engineer.

When concrete is placed against bedrock, a maximum of 6 additional inches (150 additional millimeters) 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 square feet (1 square meter) 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, joint seal, paraffin coating and closed cell elastomer 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.

**2. Underwater Concrete:** When underwater concrete is used, it will be measured by the volume in cubic yards (cubic meters) within the actual horizontal limits of the cofferdam and between the elevations established by the Engineer.

**3. Joint Filler:** This material will be measured by the area in square feet (square meters) of the joint filler, of the type and thickness specified, actually 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 will be a maximum of 75 cubic yards (60 cubic meters). Payment for each lot of concrete will be adjusted based on the results of the Acceptance testing performed by the Engineer.

The following pay factors apply for Standard and Modified Standard Mix classes with regard to entrained air content:

#### Air Pay Factors

Measured air (%)		Pay factor (%)
4.5 to 7.5		1.00 (100)
4.3 and 4.4	7.6 and 7.7	0.98 (98)
4.1 and 4.2	7.8 and 7.9	0.96 (96)
3.9 and 4.0	8.0 and 8.1	0.94 (94)
3.7 and 3.8	8.2 and 8.3	0.92 (92)
3.5 and 3.6	8.4 and 8.5	0.90 (90)
Concrete lots with less than 3.5% or greater than 8.5% entrained air will be rejected.		

The following pay factors apply for Standard and Modified Standard Mix classes with regard to compressive strength:

#### 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)
Concrete lots with less than 85% specified strength will be rejected.	

The payment adjustment value for entrained air and 28-day strength for any lot of concrete that is allowed to remain in-place is determined using the formulas below. An index price of \$400.00 per c.y. (cu.m) 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 payment for the appropriate item.

English Units:	Metric Units:
Adjustment (air) = (1 - air pay factor) x \$400/c.y. x lot size (c.y.)	Adjustment (air) = (1 - air pay factor) x \$400/cu.m x lot size (cu.m)
Adjustment (strength) = (1 - strength pay factor) x \$400/c.y. x lot size (c.y.)	Adjustment (strength) = (1 - strength pay factor) x \$400/cu.m x lot size (cu.m)
Total Adjustment = Adjustment (air) + Adjustment (strength)	

The Contractor shall request permission from the Engineer to remove and replace a lot(s) of concrete to avoid a negatively adjusted payment. 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 will be paid for at the Contract unit price per cubic yard (cubic meter) less any adjustments, for the specified class or classes, complete in place, which price shall include all materials, equipment, tools, labor and work incidental thereto, including heating, all admixtures, joint sealer, roofing felt and closed cell elastomer, 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 (cubic meter) for "Underwater Concrete," complete in place, which price shall include all materials, equipment, tools, labor and work incidental thereto.

**3. Joint Filler:** Expansion joint filler will be paid for at the Contract unit price per square foot (square meter) 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.

<u>Pay Item</u>	<u>Pay Unit</u>
Concrete (Class A, C, F)	c.y. (cu.m)
Underwater Concrete	c.y. (cu.m)
Joint Filler for Bridges (Thickness and Type)	s.f. (s.m.)

**CONNECTICUT  
SUPPLEMENTAL SPECIFICATION  
SECTION 6.03  
STRUCTURAL STEEL**

*Delete the entire section and replace it with the following:*

**SECTION 6.03  
STRUCTURAL STEEL**

**Description:** Work under this item shall consist of furnishing, fabricating, transporting, storing, handling and erecting of structural steel of the type and size designated, as shown on the plans, as directed by the Engineer and in accordance with these specifications.

All work except as stated in the following paragraph shall conform to the requirements of the AASHTO LRFD Bridge Construction Specifications and the ANSI/AASHTO/AWS D1.5 – Bridge Welding Code.

All work subject to railroad loading shall conform to AREMA and the ANSI/AASHTO/AWS D1.5 – Bridge Welding Code.

**Materials:** The materials for this work shall conform to the requirements of Section M.06.

Materials for this work shall be stored off the ground before, during, and after fabrication. It shall be kept free from dirt, grease and other contaminants and shall be reasonably protected from corrosion. In addition, weathering steel shall be stored as to allow free drainage and promote the development of the oxide coating and a uniform appearance.

**Construction Methods:**

1. Pre-qualification:

(a) Fabricators producing material for Department projects under this item are required to have as a minimum, an active AISC Certification for Simple Steel Bridges. For fabrication of material for use on bridges other than un-spliced rolled beam bridges, AISC Major Steel Bridge Certification is required. If so noted on the plans, additional AISC endorsement for fabrication of fracture critical members is also required.

(b) Field Welders: Prior to working on material for Department projects under this specification, all field welders, field welding operators, and field tackers must possess a valid welder certification card issued by the Department's Division of Materials Testing. If such person has not been engaged in welding operations on a Department project or

project acceptable to the Department within a period of six months, or if he cannot produce an approved welding certificate dated within the previous twelve months from a welding agency acceptable to the Engineer, he shall be required to re-qualify through examination. The Engineer may require re-qualification of anyone whose quality of work he questions.

## 2. Submittals:

(a) Shop Drawings: Prior to any fabrication, the Contractor shall submit shop drawings in accordance with Article 1.05.02-3 to the Engineer for review and approval. Shop drawings shall include a cambering procedure and diagram. In the case of trusses, the Contractor is responsible for calculation of the camber (lengthening and shortening) of all truss members.

(b) Shop Schedule: The Contractor shall submit a detailed shop fabrication schedule to the Engineer for review within 30 days of the notice to proceed unless otherwise agreed to by the Engineer. At a minimum the schedule shall include the start date, milestone dates, and completion date. Any significant changes shall be brought to the attention of the Engineer immediately.

(c) Welding Procedures: Prior to start of fabrication, all weld procedures shall be submitted to the Engineer for review and approval.

(d) Working Drawings for Falsework and Erection of Structural Steel: Prior to erecting any steel fabricated under this specification, the Contractor shall submit drawings and supporting calculations, including erection stresses, in accordance with Article 1.05.02-2 to the Engineer. The design of temporary supports and falsework shall conform to the *AASHTO Specifications*, the *AASHTO Guide Design Specifications for Bridge Temporary Works* or any other standard acceptable to the Engineer. 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. The submittal shall include at a minimum:

- Title block with contract number, project identification number (PIN), town, and structure number and name.
- Plan of the work area showing support structures, roads, railroad tracks, Federal and State regulated areas as depicted on the plans, utilities or any other information relative to erection.
- A detailed narrative describing the erection sequence for main members and secondary members (cross frames, diaphragms, lateral bracing, portals, etc.), noting use of holding cranes or temporary supports, falsework, or bents.
- Delivery location of each girder.
- Location of each crane for each pick.
- Capacity chart for each crane and boom length used in the work.
- The capacity of the crane and of all lifting and connecting devices shall be adequate for the total pick load including spreaders and other materials. In the area of railroads and navigable waterways, the capacity shall be as required by Amtrak, Metro North, U.S. Coast Guard or other regulatory authorities. No picks shall be



allowed over vehicular or pedestrian traffic unless otherwise noted on the plans or permitted by the Engineer.

- Pick point location(s) on each member.
- Lifting weight of each member (including clamps, spreader beams, etc.)
- Lift and setting radius for each pick (or maximum lift radius).
- Description of lifting devices or other connecting equipment.
- Girder tie-down details or other method of stabilizing erected girders.
- Bolting requirements, including the minimum number of bolts and erection pins required to stabilize members during the erection sequence.
- Blocking details for stabilizing members supported on expansion bearings and on bearings that do not limit movement in the transverse direction.
- The method and location for temporary supports for field spliced or curved girders, including shoring, false work, holding cranes, guys, etc. The Engineer will review, but not approve details of temporary supports. The design, erection, and stability of these supports shall be the sole responsibility of the Contractor.
- Offsets necessary to adjust expansion bearings during erection to provide for temperature variance and dead load rotation.

The following notes shall be placed on the Erection Drawings:

- Cranes shall be operated in accordance with the Connecticut Department of Public Safety regulations.
- The Contractor shall be responsible for verifying the weight of each lift and for insuring the stability of each member during all phases of erection.
- Members shall be subject to only light drifting to align holes. Any drifting that results in distortion of the member or damage to the holes will be cause for rejection of the member.
- Field reaming of holes shall not be performed unless required by the Contract Drawing or approved by the Engineer.

The Contractor shall submit these documents to the Engineer at least 60 calendar days in advance of their proposed use. If the proposed method of erection requires additional members or modifications to the existing members of the structure, such additions and modifications shall be made by the Contractor at no expense to the State.

3. Shop Fabrication: Unless otherwise shown on the plans or indicated in the Special Provisions, Structural Steel shall be fabricated in accordance with the AASHTO LRFD Bridge Construction Specifications, amended as follows:

(a) Notification: The Contractor shall submit written notification to both the Engineer and the Director of Research and Materials Testing not less than 30 calendar days prior to start of fabrication. No material shall be manufactured or worked in the shop before the Engineer has been so notified. The notification shall include 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 a Department Quality Assurance inspector.

(b) Camber: All members shall be cambered prior to heat curving and painting. Rolled beams shall be heat cambered by methods approved by the Engineer. Plate girders shall be cambered by cutting the web to the prescribed shape with allowances for shrinkage due to cutting, welding, and heat curving. The fabricator is responsible to determine what allowances should be made. Rolled, plate-rolled, or fabricated sections shall be cambered to the total amount shown on the plans and within the camber deviation tolerances permitted for welded beams and girders, as indicated in the ANSI/AASHTO/AWS D1.5 Bridge Welding Code. The Contractor must submit to the Engineer for approval, a plan for corrective action if the actual camber is not within tolerance.

(c) Welding: Unless otherwise indicated on the plans or specifications, all work shall be performed in accordance with ANSI/AASHTO/AWS D1.5 – Bridge Welding Code.

(d) Preassembly of Field Connections: Field connections of main members of continuous beams, plate girders, bents, towers, rigid frames, trusses and arches shall be preassembled prior to erection as necessary to verify the geometry of the completed structure or unit and to verify or prepare field splices. The Contractor shall propose an appropriate method of preassembly for review and comment by the Engineer. The method and details of preassembly shall be consistent with the erection procedures shown on the working drawings and camber diagrams. As a minimum, the preassembly procedure shall consist of assembling three contiguous panels accurately adjusted for line and camber. Successive assemblies shall consist of at least one section or panel of the previous assembly plus two or more sections or panels added at the advancing end. In the case of structures longer than 150 feet (45 meters), each assembly shall not be less than 150 feet (45 meters) long regardless of the length of individual continuous panels or section. All falsework, tools, machinery and appliances, including drift pins and bolts necessary for the expeditious handling of the work shall be provided by the Contractor at no cost to the State.

(e) Inspection: The Contractor shall furnish facilities for the inspection of material and workmanship in the shop by the Engineer. The Engineer and his representative shall be allowed free access to the necessary parts of the premises.

The Engineer will provide Quality Assurance (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 structural steel shall be stamped or 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 stamp or 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 structural steel for re-inspection by the Department's QA inspector. Should non-conforming pieces be identified, all similar pieces must be re-inspected by the fabricator and repair procedure(s) submitted to the Engineer for approval. Repairs will be made at the Contractor's expense.

The pieces selected for re-inspection and found to be in conformance, or adequately repaired pieces, may be stamped or 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.

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.

(f) Nondestructive Testing: All nondestructive testing of structural steel and welding shall be performed as designated on the plans and in the project specifications. Such testing shall be performed by personnel approved by the Engineer.

Personnel performing Radiographic, Ultrasonic or Magnetic Particle 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.

Nondestructive testing shall be performed in accordance with the procedures and standards set forth in the AASHTO/AWS D1.5, Bridge Welding Code. The Department reserves the right to perform additional testing as determined by the Engineer.

All nondestructive testing shall be witnessed by an authorized representative of the Department. Certified reports of all tests shall be submitted to the Materials Testing Division 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.

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 is defective. If the testing indicates the weld to be satisfactory, the actual cost of such inspection will be paid by the Department.

(g) Marking: Each member shall be identified with an erection mark corresponding with the member identification mark on the approved shop drawings. Identification marks shall be impressed into the member with a low stress stamp in a location in accordance with standard industry practice.

(h) Shipping, Handling, Storage and Receiving: The Contractor shall make all arrangements necessary to properly load, transport, unload, handle and store all material. The Contractor shall furnish to the Engineer copies of all shipping statements. The weight (mass) of the individual members shall be shown on the statements. Members having a weight (mass) of more than 3 tons (2700 kilograms) shall have the weight (mass) marked thereon. All material shall be unloaded promptly upon delivery. The Contractor shall be responsible for any demurrage charges. 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. Top lateral bracing should be installed in tub girders prior to shipping and erection of the field pieces. All costs associated with any corrective action will be borne by the Contractor.

4. Field Erection: A meeting shall be held on site prior to any erection of structural steel. The Contractor shall name the person responsible for the steel erection work and provide copies of all crane operator licenses. Proposed equipment, rigging, timetable and methods shall be proposed at this meeting.

(a) Falsework: Any temporary work shall be constructed in conformance with the working drawings. The Contractor shall verify that the quality of materials and work employed are consistent with their design.

All girders shall be stabilized with falsework, temporary braces, or holding cranes until a sufficient number of adjacent girders are erected with all diaphragms and cross frames connected to provide necessary lateral support as shown in the erecting diagrams.

Adjustment shall be provided in the falsework and other temporary supports so that the temporary elevation of the structural steel provided by the falsework is consistent with the deflections that will occur as the structure is completed. The elevation of falsework shall be such as to support the girders at the cambered no-load elevation. Unloading of temporary supports should be performed such that all temporary supports at each cross section are unloaded uniformly. Unless specifically permitted by the Engineer, welding of falsework support brackets to structural steel is not allowed.

Unless erected by the cantilever method, truss spans shall be erected on blocking. The blocking shall be left in place until the tension chord splices are fully bolted and all other truss connections pinned and bolted and the proper geometric shape is achieved.

(b) Anchorages: Anchor bolts and similar materials which are to be placed during the erection of the structural steel shall be carefully and accurately set to the requirements of Article 6.01.03.

(c) Bearings: Bearing plates shall have a full and uniform bearing upon the substructure masonry. Bearing plates shall be placed upon bearing areas which are finished according to the requirements of Article 6.01.03.

Prefabricated pads conforming to the requirements of Article M.12.01 shall be installed unless specifically noted otherwise on the contract plans.

Each piece shall be the same size as the bearing plate it is to support and the holes to accommodate the anchor bolts shall be clearly and accurately punched before setting the pad in place.

In placing expansion bearings, due consideration shall be given to the temperature at the time of erection and stage construction requirements. The nuts of anchor bolts at expansion bearings shall be adjusted to permit the free movement of the span.

(d) Field Assembly: Members and components shall be accurately assembled as shown on the plans and any match marks shall be followed. The material shall be carefully handled so that no components will be bent, broken or otherwise damaged.

Hammering which will injure or distort the members is not permitted. Bearing surfaces and surfaces to be in permanent contact shall be cleaned before the members are assembled.

Cylindrical erection pins shall be 1/32 inch (0.8 mm) larger than the nominal diameter of the holes.

Splices and field connections of main stress carrying members shall be made with a minimum of 50% of the holes filled and tightened with high strength bolts before the lifting system is released. The bolts shall be installed uniformly throughout the connection. Lateral stability must be maintained until the deck is placed.

The Contractor shall ensure that girders are stable throughout the erection process. The stage of completeness of the bolted connections shall be considered when evaluating the strength and stability of the steel during erection. For Closed Box and Tub Girders the Contractor shall ensure that the cross- section shape of each box is maintained during erection. Top lateral bracing should be installed in tub girders prior to shipping and erection of the field pieces.

(e) Welded Connections:

Unless otherwise shown on the plans or indicated by the special provisions, welding of structural steel shall be done in accordance with "ANSI/AASHTO/AWS D1.5 Bridge Welding Code."

The Contractor's welding and inspection procedures for each type of field weld and field tacking must be submitted to the Engineer on the form designated by the Department. All procedures must be approved by the Materials Testing Division prior to any work and must be adhered to at all times.

Quality control is the responsibility of the Contractor. The Contractor must provide an AWS Certified Welding Inspector (CWI) in accordance with AWS D1.5. The CWI must be qualified and certified in accordance with the provisions of AWS QC1, *Standard for Qualification and Certification of Welding Inspectors*.

The CWI shall make visual inspection of all welds. The Contractor will perform magnetic particle inspection, ultrasonic testing inspection, or radiographic testing inspection of field welds when required on the plans or special provisions. Each test may be witnessed by an authorized representative of the Engineer.

Welds or sections of welds containing imperfections determined to be unacceptable by either the CWI or the Engineer shall be removed and re-welded by the Contractor at their expense. Welds so removed and replaced shall be re-inspected by the CWI. All costs for re-inspection or testing of such welds shall be borne by the Contractor.

(f) High Strength Bolted Connections:

The assembly of structural connections using ASTM A 325/ A 325M or ASTM A 490/A 490M 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.

Bolts, nuts and washers from each rotational-capacity lot shall be shipped in the same container. If there is only one production lot number for each size of nut and washer, the nuts and washers may be shipped in separate containers. Each container shall be permanently marked with the rotational-capacity lot number such that identification will be possible at any stage prior to installation. Assemblies of bolts, nuts and washers shall be installed from the same rotational-capacity lot. Pins, small parts and packages of bolts, washers, and nuts shall be shipped in boxes, crates, kegs, or barrels. A list and description of the contained materials shall be plainly marked on the outside of each shipping container.

**Bolted Parts:** All material within the grip of the bolt shall be steel; there shall be no compressible material, such as gaskets or insulation, within the grip. Bolted steel shall fit solidly together after the bolts are tensioned. The length of the bolts shall be such that the end of the bolt will be flush with or outside of the face of the nut when properly installed.

**Surface Conditions:** At the time of assembly, all connection surfaces, including surfaces adjacent to the bolt head and nut, shall be free of scale, except tight mill scale, and shall be free of dirt or other foreign material. Burrs that would prevent solid seating of the connected parts in the snug tight condition shall be removed.

Paint is permitted on the faying surface, including slip critical connections, only when shown on the plans. The faying surfaces of slip-critical connections shall meet the requirements of the following paragraphs, as applicable:

- Connections specified to have un-coated faying surfaces: any paint, including any inadvertent over spray, shall be excluded from areas closer than one bolt diameter, but not less than 1.0 in. (25 mm), from the edge of any hole and all areas within the bolt pattern.
- Connections specified to have painted faying surfaces: shall be blast cleaned and coated in accordance with Section 6.04, and shall not be assembled until the coating system has been properly cured.

- Connections specified to have galvanized faying surfaces: shall be hot-dip galvanized in accordance with ASTM A 123/A 123M, and shall subsequently be roughened by means of hand wire brushing. Power wire brushing is not permitted.

Installation: At the pre-erection meeting, the Contractor shall inform the Engineer of their planned method of tensioning high strength bolts. Acceptable methods are: Turn-of-Nut, Calibrated Wrench or Direct Tension Indicator.

#### Fastener Assemblies:

A "fastener assembly" is defined as a bolt, a nut, and a washer. Only complete fastener assemblies of appropriately assigned lot numbers shall be installed.

Fastener assemblies shall be stored in an area protected from dirt and moisture. Only as many fastener assemblies as are anticipated to be installed and tensioned during a work shift shall be taken from protected storage. Fastener assemblies not used shall be returned to protected storage at the end of the shift. Prior to installation, fastener assemblies shall not be cleaned of lubricant. Fastener assemblies which accumulate rust or dirt resulting from site conditions shall be cleaned, relubricated and tested for rotational-capacity prior to installation. All galvanized nuts shall be lubricated with a lubricant containing a visible dye. Plain bolts must be oily to the touch when delivered and installed. Lubricant shall be removed prior to painting.

All bolts shall have a hardened washer under the turned element (nut or bolt head). All hardened washers shall conform to the requirements of ASTM F 436/F 436M.

Where necessary, washers may be clipped on one side to a point not closer than  $7/8$  of the bolt diameter from the center of the washer. Circular and beveled washers, when used adjacent to direct tension indicator washers shall not be clipped. Direct tension indicator washers shall not be clipped.

**Bolt Tension Measuring Device:** The Contractor shall provide a calibrated bolt tension measuring device (a Skidmore-Wilhelm calibrator (Skidmore) or other acceptable bolt tension indicating device) at all times when, and at all locations where high-strength fasteners are being installed and tensioned. The tension measuring device (Skidmore) shall be calibrated by an approved testing agency at least annually. The Skidmore shall be used to perform the rotational-capacity test of the fastener assemblies. The Skidmore will also be used to substantiate (1) the suitability of the fastener assembly to satisfy the requirements of Table A, including lubrication as required, (2) calibration of the installation wrenches, if applicable, and (3) the understanding and proper use by the contractor of the selected method of tensioning to be used.

Complete fastener assemblies shall be installed in properly aligned holes and then tensioned by the Turn-of-Nut, Calibrated Wrench or Direct Tension Indicator method to the minimum tension specified in Table A. Tensioning may be done by turning the bolt while the nut is prevented from rotating when it is impractical to turn the nut. Impact wrenches, if

used, shall be of adequate capacity and sufficiently supplied with air to perform the required tensioning of each bolt in approximately 10 seconds.

Bolts shall be installed in all holes of the connection and the connection brought to a snug condition. Snug is defined as having all the plies of the connection in firm contact. Snugging shall progress systematically from the most rigid part of the connection to the free edges. The bolts of the connection shall then be tightened in a similar manner as necessary until the connection is properly tensioned.

Nuts shall be located, whenever practical, on the side of the connection which will not be visible from the traveled way.

Unless otherwise approved by the Engineer fastener assemblies shall be brought to full tension immediately following snugging.

Fully tensioned fastener assemblies shall not be reused. Retightening previously tensioned bolts which may have been loosened by the tensioning of adjacent bolts shall not be considered as reuse.

Rotational-Capacity Tests: In addition to the certified test reports, on site Rotational-capacity tests may be required by the Engineer. This test shall be performed by the Contractor at the location where the fasteners are installed and tensioned. When performed in the field, the procedure shall conform to the requirements of ASTM A 325/ A 325M Appendix A-1.

#### Turn-of-Nut Installation Method:

At the start of the work, the Contractor shall demonstrate that the procedure used by the bolting crew to develop a snug condition and to control the turns from a snug condition develops the tension required in Table A. To verify their procedure, the Contractor shall test a representative sample of not less than three complete fastener assemblies of each diameter, length and grade to be used in the work. This shall be performed at the start of work using a Skidmore. Periodic retesting shall be performed when ordered by the Engineer.

After snugging the connection, the applicable amount of rotation specified in Table B shall be achieved. During the tensioning operation there shall be no rotation of the part not turned by the wrench. Tensioning shall progress systematically from the most rigid part of the connection to its free edges.

#### Calibrated Wrench Installation Method:

Calibrated wrench method may be used only when the installation wrenches are properly calibrated daily, or as determined by the Engineer. Standard torques determined from tables or from formulas which are assumed to relate torque to tension **shall not** be acceptable.



The Contractor shall demonstrate to the Engineer periodically that all equipment and wrenches are providing a torque which has been calibrated to produce the minimum tension specified in Table A. The installation procedures shall be verified periodically, as determined by the Engineer, for each bolt diameter, length and grade using the fastener assemblies that are being installed in the work. This verification testing shall be accomplished in a Skidmore by tensioning three complete fastener assemblies of each diameter, length and grade from those being installed with a hardened washer under the element turned.

When significant difference is noted in the surface condition of the bolts, threads, nuts or washers, as determined by the Engineer, wrenches shall be recalibrated. The Contractor shall verify during the installation of the assembled steel work that the wrench adjustment selected by the calibration does not produce a nut or bolt head rotation from snug greater than that permitted in Table B. If manual torque wrenches are used, nuts shall be turned in the tensioning direction when torque is measured.

When calibrated wrenches are used to install and tension bolts in a connection, bolts shall be installed with hardened washers under the element turned to tension the bolts. Once the connection has been snugged, the bolts shall be tensioned using the calibrated wrench. Tensioning shall progress systematically from the most rigid part of the connection to its free edges. A calibrated torque wrench shall be used to "touch up" previously tensioned bolts which may have been relaxed as a result of the subsequent tensioning of adjacent bolts until all bolts are tensioned to the prescribed amount.

#### Direct Tension Indicator Installation Method:

When Direct Tension Indicators (DTIs) meeting the requirements of Section M.06 are used with high-strength bolts to indicate bolt tension, they shall be subjected to the verification testing described below and installed in accordance with the method specified below. Unless otherwise approved by the Engineer, the DTIs shall be installed under the head of the bolt and the nut turned to tension the bolt. The Manufacturer's recommendations shall be followed for the proper orientation of the DTI and additional washers, if any, required for the correct use of the DTI. Installation of a DTI under the turned element may be permitted if a washer is used to separate the turned element from the DTI.

Verification: Verification testing shall be performed in a Skidmore. A special flat insert shall be used in place of the normal bolt head holding insert. Three verification tests shall be required for each combination of fastener assembly rotational-capacity lot, DTI lot, and DTI position relative to the turned element (bolt head or nut) to be used on the project. The fastener assembly shall be installed in the tension-measuring device with the DTI located in the same position as in the work. The element intended to be stationary (bolt or nut) shall be restrained from rotation.

The verification tests shall be conducted in two stages. The bolt nut and DTI assembly shall be installed in a manner so that at least three and preferably not more than five threads are located between the bearing face of the nut and the bolt head. The bolt shall be tensioned first to the load equal to that listed in Table C

under Verification Tension for the grade and diameter of the bolt. If an impact wrench is used, the tension developed using the impact wrench shall be no more than two-thirds of the required tension. Subsequently, a manual wrench shall be used to attain the required tension. The number of refusals of the 0.005-in. (0.125-mm) tapered feeler gage in the spaces between the protrusions shall be recorded. The number of refusals for uncoated DTIs under the stationary or turned element, or coated DTIs under the stationary element, shall not exceed the number listed under Maximum Verification Refusals in Table C for the grade and diameter of bolt used. The maximum number of verification refusals for coated DTIs (galvanized, painted, or epoxy-coated), when used under the turned element, shall be no more than the number of spaces on the DTI less one. The DTI lot shall be rejected if the number of refusals exceeds the values in the table or, for coated DTIs if the gage is refused in all spaces.

After the number of refusals is recorded at the verification load, the bolt shall be further tensioned until the 0.005-in (0.125-mm) feeler gage is refused at all the spaces and a visible gap exists in at least one space. The load at this condition shall be recorded and the bolt removed from the tension-measuring device. The nut shall be able to be run down by hand for the complete thread length of the bolt excluding thread run-out. If the nut cannot be run down for this thread length, the DTI lot shall be rejected unless the load recorded is less than 95 percent of the average load measured in the rotational capacity test of the fastener lot as specified previously in "Rotational-Capacity Tests."

If the bolt is too short to be tested in the calibration device, the DTI lot shall be verified on a long bolt in a calibrator to determine the number of refusals at the verification tension listed in Table C. The number of refusals shall not exceed the values listed under maximum verification refusals in Table C. Another DTI from the same lot shall then be verified with the short bolt in a convenient hole in the work. The bolt shall be tensioned until the 0.005-in. (0.125-mm) feeler gage is refused in all spaces and a visible gap exists in at least one space. The bolt shall then be removed from the tension-measuring device and the nut shall be able to be run down by hand for the complete thread length of the bolt excluding thread run-out. The DTI lot shall be rejected if the nut cannot be run down this thread length.

Installation: Installation of fastener assemblies using DTIs shall be performed in two stages. The stationary element shall be held against rotation during each stage of the installation. The connection shall be first snugged with bolts installed in all holes of the connection and tensioned sufficiently to bring all the plies of the connection into firm contact. The number of spaces in which a 0.005-in. (0.125-mm) feeler gage is refused in the DTI after snugging shall not exceed those listed under maximum verification refusals in Table C. If the number exceeds the values in the table, the fastener assembly shall be removed and another DTI installed and snugged.

For uncoated DTIs used under a stationary or turned element and for coated DTIs used under a stationary element, the bolts shall be further tensioned until the number of refusals of the 0.005-in. (0.125-mm) feeler gage shall be equal or greater than the number listed under Minimum Installation Refusals in Table C. If the bolt is

tensioned so that no visible gap in any space remains, the bolt and DTI shall be removed and replaced by a new properly tensioned bolt and DTI.

When coated DTIs (galvanized, painted or epoxy coated) are used under a turned element, the 0.005-in (0.125-mm) feeler gage shall be refused in all spaces.

#### Inspection:

The Contractor shall provide all the material, equipment, tools and labor necessary for the inspection of the bolted connections. Access to the bolted parts and fastener assemblies, both before and after the fasteners are installed and tensioned, shall be provided.

The Contractor is responsible for Quality Control (QC). The Contractor shall review this specification with its project personnel prior to performing the work. The Contractor shall verify the proper markings, surface conditions and storage of fastener assemblies. The Contractor shall inspect the faying surfaces of connections for compliance with the plans and specifications. The Contractor shall provide to the Engineer a copy of their written QC report for each shift of the calibration or verification testing specified. This report shall confirm that the selected procedure is properly used and that the fastener assemblies installed meet the tensions specified in Table A. The Contractor shall monitor the installation of fasteners in the work to assure that the selected procedure, as demonstrated in the initial testing to provide the specified tension, is routinely and properly applied.

The Contractor, in the presence of the Engineer, shall inspect the tensioned bolts using an inspection torque wrench, as defined below. If direct tension indicator devices are used, the appropriate feeler gauge will be used. Inspection tests shall be performed within 24 hours of bolt tensioning to prevent possible loss of lubrication or corrosion influence on tensioning torque.

The inspection torque wrench shall be calibrated as follows. Three bolts of the same grade, size, and condition as those under inspection shall be placed individually in a device calibrated to measure bolt tension. This calibration operation shall be done at least once each inspection day. There shall be a washer under the part turned in torquing each bolt. In the calibrated device, each bolt shall be tightened by any convenient means to the specified tension. The inspection wrench shall then be applied to the tensioned bolt to determine the torque required to turn the nut or head five degrees in the tightening direction. The average of the torque required for all three bolts shall be defined as the job-inspection torque.

Twenty-five percent, but a minimum of two, of the tensioned bolts shall be selected by the Engineer for inspection in each connection. (The Engineer may reduce the number of bolts tested at a connection to 10% based on the Contractor's past performance and splice location.) The job-inspection torque shall then be applied to each selected assembly with the inspection torque wrench turned in the tightening direction. If all inspected bolt heads or nuts do not turn, the bolts in the connection shall be considered to be properly tensioned. If the torque turns one or more bolt heads or nuts, the job-inspection torque shall then be applied to **all** bolts in the connection or to the satisfaction of the Engineer. Any bolt whose head or nut turns shall be re-tensioned and re-inspected. The Contractor

may, however, re-tension all the bolts in the connection with the inspection torque wrench and resubmit it for inspection, so long as the bolts are not over-tensioned or damaged by this action.

(g) Field Corrections and Misfits: Reaming of bolt holes during erection shall be permitted only with approval of the Engineer. No excessive forces shall be applied to any member to provide for proper alignment of the bolt holes.

The correction of minor misfits involving minor amounts of reaming, cutting, grinding and chipping shall be considered a legitimate part of the erection. However, any error in the shop fabrication or deformation resulting from handling and transportation may be cause for rejection. The Contractor shall be responsible for all misfits, errors and damage and shall make the necessary corrections and replacements.

**TABLE A (Metric)**  
**Minimum Bolt Tension in Kilonewtons\***

<b>Bolt Size</b>	<b>ASTM A 325M</b>	<b>ASTM A 490M</b>
M16	91	114
M20	142	179
M22	176	221
M24	205	257
M27	267	334
M30	326	408
M36	475	595

\*Equal to 70% of specified minimum tensile strength of bolts (as specified in ASTM Specifications for tests of full-size A 325M and A 490M bolts with metric coarse threads series ANSI B1.13M, loaded in axial tension) rounded to the nearest kilonewton.

**Table A (English)**  
**Minimum Bolt Tension in kips\***

<b>Bolt Size (Inches)</b>	<b>ASTM A 325</b>	<b>ASTM A 490</b>
5/8	19	24
3/4	28	35
7/8	39	49
1	51	64
1 1/8	56	80
1 1/4	71	102
1 3/8	85	121
1 1/2	103	148

\*Equal to 70% of specified minimum tensile strength of bolts (as specified in ASTM Specifications for tests of full-size A 325 and A 490 bolts with UNC threads, loaded in axial tension) rounded to the nearest kip.

**TABLE B (English and Metric)  
Nut Rotation from the Snug Condition  
Geometry<sup>a,b,c</sup> of Outer Faces of Bolted Parts**

<b>Bolt Length (measured from underside of head to end of bolt)</b>	<b>Both Faces Normal to Bolt Axis</b>	<b>One Face Normal to Bolt Axis and Other Face Sloped Not More Than 1:20, Bevel Washer Not Used</b>	<b>Both Faces Sloped Not More Than 1:20 From Normal to Bolt Axis, Bevel Washer Not Used</b>
Up to and including 4 diameters	1/3 turn	1/2 turn	2/3 turn
Over 4 diameters but not exceeding 8 diameters	1/2 turn	2/3 turn	5/6 turn
Over 8 diameters but not exceeding 12 diameters	2/3 turn	5/6 turn	1 turn

(a) Nut rotation, as used in Table B, shall be taken as relative to the bolt, regardless of the element (nut or bolt) being turned. For bolts installed by 1/2 turn and less, the tolerance should be plus or minus 30 degrees; for bolts installed by 2/3 turn and more, the tolerance should be plus or minus 45 degrees.

To determine the nut rotation for installation and inspection of the fasteners, the nut and the end of the bolt or the head of the bolt and the adjacent steel shall be match marked.

(b) The values, given in Table B, shall be applicable only to connections in which all material within grip of the bolt is steel.

(c) No research work has been performed by the Research Council Riveted and Bolted Structural Joints to establish the turn-of-nut procedure when bolt lengths exceed 12 diameters. For situations in which the bolt length, measured from the underside of the head to the end of the bolt, exceeds 12 diameters, the required rotation shall be determined by actual tests in a suitable tension device simulating the actual conditions.

**TABLE C (Metric)**

Bolt Dia. (in.)	Verification Tension		Maximum Verification Refusals		DTI Spaces		Minimum Installation Refusals	
	A325	A490	Type 8.8	Type 10.9	Type 8.8	Type 10.9	Type 8.8	Type 10.9
M16	96	120	1	1	4	4	2	2
M20	149	188	2	2	5	6	3	3
M22	185	232	2	2	5	6	3	3
M24	215	270	2	2	5	6	3	3
M27	280	351	2	3	6	7	3	4
M30	342	428	3	3	7	8	4	4
M36	499	625	3	4	8	9	4	5

**TABLE C (English)**

Bolt Dia. (in.)	Verification Tension		Maximum Verification Refusals		DTI Spaces		Minimum Installation Refusals	
	A325	A490	325	490	325	490	325	490
5/8	20	25	1	2	4	5	2	3
¾	29	37	2	2	5	6	3	3
7/8	41	51	2	2	5	6	3	3
1	54	67	2	3	6	7	3	4
1 1/8	59	84	2	3	6	7	3	4
1¼	75	107	3	3	7	8	4	4
1 3/8	89	127	3	3	7	8	4	4
1½	108	155	3	4	8	9	4	5

**Method of Measurement:** Payment under this item will be at the contract lump sum price per each complete bridge structure or shall be based on the net weight (mass) of metal in the fabricated structure, whichever method appears on the proposal form.

When payment is based on a lump sum basis, the work, including anchor bolts, steel bearings and plates will not be measured for payment. Bearing plates welded to the girder are included in the price of the structural steel and bearing plates bonded to the bearings are included in the price of the bearing.

When payment is based on the net weight (mass) of metal in the fabricated structure, it shall be computed as described below.

The weight (mass) of the metal works to be paid for under the item of structural steel shall be computed on the basis of the net finished dimensions of the parts as shown on the shop drawings, deducting for copes, cuts, clips and all open holes, except bolt holes, and on the following basis:

1. The weights (masses) of rolled shapes shall be computed on the basis of their nominal weights (masses) per foot (meter), as shown in the shop drawings or listed in handbooks.

The weight (mass) of plates shall be computed on the basis of the nominal weight (mass) for their width and thickness as shown on the shop drawings.

2. The weight (mass) of temporary erection bolts, shop and field paint, galvanization, boxes, crates and other containers used for shipping, and materials used for supporting members during transportation and erection, shall not be included.

3. The weight (mass) of all high strength bolts, nuts, and washers shall be included on the basis of the following weights (masses):

Weight per 100			
Nominal diameter of H.S. bolt (inch)	Bolthead, nut, 1 washer and stickthrough (lbs)	Nominal diameter of H.S. bolt (mm)	Bolthead, nut, 1 washer and stickthrough (kg)
1/2	22	16	17
5/8	33	20	26
3/4	55	22	39
7/8	84	24	50
1	120	27	60
1 1/8	169	30	73
1 1/4	216	36	122



4. The weight (mass) of weld metal shall be computed on the basis of the theoretical volume from plan dimensions of the welds.

Size of fillet in Inches (mm)		Weight of weld in pounds per foot (kg per meter)	
3/16	(5)	0.08	(0.119)
1/4	(6)	0.14	(0.208)
5/16	(8)	0.22	(0.327)
3/8	(9.5)	0.30	(0.446)
1/2	(13)	0.55	(0.818)
5/8	(16)	0.80	(1.190)
3/4	(19)	1.10	(1.636)
7/8	(22)	1.50	(2.231)
1	(25)	2.00	(2.974)

5. The weight (mass) of steel shims, filler plates and anchor bolts shall be measured for payment.

When the pay item "Materials for Structural Steel (Site No. )" is included in the Contract, payment for furnishing of the raw steel material for the plates and shape material only, excluding any markup, based on the net weight (mass) required, and the payment will be made under the estimated item "Materials for Structural Steel (Site No.)". The overruns or wastage shall not exceed ten per cent for straight girders and fifteen per cent for curved girders. All other work specified in this section for the bridge will be deemed paid for under the lump sum price. In the absence of the pay item "Materials for Structural Steel (Site No. )", the cost of the raw material is included in the Lump Sum payment for this item, "Structural Steel (Site No. )".

**Basis of Payment:** The structural steel, incorporated in the completed and accepted structure, will be paid for at the contract lump sum price for "Structural Steel (Site No. )," or at the contract unit price per hundred weight (kilogram) for "Structural Steel," whichever is indicated in the contract documents.

Payment for either method shall be for structural steel, complete in place, which price shall include quality control, furnishing, fabricating, transporting, storing, erecting, welding, surface preparation and all materials including fastener assemblies, steel bearing assemblies and anchor bolts, equipment, tools and labor incidental thereto.

When the pay item "Materials for Structural Steel (Site No. )" is included in the Contract, payment for furnishing of the raw steel material for the plates and shape material only,

excluding any markup, based on the net weight (mass) required, and the payment will be made under the estimated item "Materials for Structural Steel (Site No.)". All remaining work including, but not limited to, preparation of shop drawings, fabricating, transporting, storage and handling, erecting, surface preparation and all materials, equipment, tools and labor incidental thereto, will be paid for under "Structural Steel (Site No. )".

In the absence of the pay item "Materials for Structural Steel (Site No. )", the cost of the raw material is included in the Lump Sum payment for this item, "Structural Steel (Site No. )". All remaining work including, but not limited to, preparation of shop drawings, fabricating, transporting, storage and handling, erecting, surface preparation and all materials, equipment, tools and labor incidental thereto, will be paid for under "Structural Steel (Site No. )".

No direct payment will be made for setting anchor bolts, preparing bearing areas, furnishing and placing materials under bearings. No direct payment will be made for non destructive testing as shown on the plans.

<u>Pay Item</u>	<u>Pay Unit</u>
Structural Steel (Site No. )	l.s. (l.s.)
Structural Steel	cwt. (kg)

**CONNECTICUT  
SUPPLEMENTAL SPECIFICATION  
SECTION 6.12  
CONCRETE CYLINDER CURING BOX**

*Delete the entire section and replace with it the following:*

**6.12.01 –Description:** This item shall consist of furnishing a box for curing concrete test cylinders. The box shall be commercially available and manufactured specifically for curing concrete test cylinders. The box will remain the property of the Contractor at the conclusion of the project. The box shall be delivered to a location on the project as directed by the Engineer.

**6.12.02 – Materials:** A catalog cut listing detailed specifications of the box and operating instructions from the manufacturer must be submitted to the Engineer. The box and its components shall be constructed of non-corroding materials and shall be capable of storing a minimum of 18 test cylinders, 6" X 12" (152 mm X 305 mm) stored vertically with the lid closed. The lid must be watertight when closed and hinged in the back with security latches on the front that can be padlocked. The box must be capable of holding water to a maximum level of one inch above test cylinders placed in the box vertically. A drain hole must be provided in a wall of the box to allow manual drainage of the water that exceeds this level. A drain hole must also be provided at the bottom of the box so that it can be manually emptied. The temperature of the water must be controlled by heating and cooling device capable of maintaining the temperature of the water within a range of 60 to 80° F, +/- 2 °F (15.5 to 26.7 °C, +/- 1 °C) within an outside ambient air temperature range of -10 to 120 ° F (-23.3 to 49 °C). The heating and cooling device must be positioned to allow free circulation of air and water around the cylinders and be rated at 120 volts and 15 amps. A rack must be provided within the box to support the cylinders above the pool of temperature controlled water. The device must be thermostatically controlled with a digital readout that is capable of displaying the high/low water temperature within the box since the last reading was taken.

**6.12.03 - Construction Methods:** The Contractor shall maintain the curing box in working order and shall provide all necessary electrical service and water so that the curing box can be used properly during the entire course of the project. Any curing box that is not operating properly, as determined by the Engineer, shall be replaced within 24 hours by the Contractor at no expense to the State. The Engineer reserves the right to prohibit placement of fresh concrete on the project until a curing box acceptable to the Engineer is operational on the project site.

**6.12.04 - Method of Measurement:** The furnishing of the concrete test cylinder curing box will be measured for payment by the number of boxes delivered by the Contractor and accepted by the Engineer.

**6.12.05 – Basis of Payment:** This item will be paid for at the contract unit price each for “Concrete Cylinder Curing Box” ordered and accepted on the project, which price shall include all submittals, material, tools, equipment, and labor incidental thereto. The price shall also include all maintenance and operating costs related to the curing box for the duration of the project.

Pay Item	Pay Unit
Concrete Cylinder Curing Box	ea. (ea.)

**CONNECTICUT  
SUPPLEMENTAL SPECIFICATION  
SECTION 6.51  
CULVERTS**

**6.51.02 – Materials:**

*Delete the 2nd paragraph, “Pipes of the type indicated ... of Article M.02.01.” and insert the following paragraph:*

“Pipes of the type indicated on the plans and joint sealant shall conform to the requirements of Article M.08.01. Bedding material shall conform to the requirements of Article M.08.03. Granular fill shall conform to the requirements of Article M.02.01.”

**6.51.03 – Construction Methods:**

*In the 8th paragraph replace “gravel fill” with “granular fill”.*

*Delete the 13th paragraph, “Bituminous fiber and ... as the pipe.”*

**6.51.04 – Methods of Measurement:**

*In the 7th paragraph, replace “Gravel Fill” with “Granular Fill”.*

**6.51.05 – Basis of Payment:**

*In the 8th paragraph, replace “Gravel Fill” with “Granular Fill”.*

**CONNECTICUT  
SUPPLEMENTAL SPECIFICATION  
SECTION 7.01  
DRILLED SHAFTS**

*Add the following section:*

**SECTION 7.01  
DRILLED SHAFTS**

- 7.01.01 – Description**
- 7.01.02 – Materials**
- 7.01.03 – Construction Methods**
- 7.01.04 – Method of Measurement**
- 7.01.05 – Basis of Payment**

**7.01.01 - Description:** This work shall consist of all labor, materials, equipment and services necessary to complete the Drilled Shaft installation in accordance with the Contract. Drilled shafts shall be made primarily of reinforced or unreinforced concrete.

**7.01.02 - Materials:** Drilled Shafts shall be made of the following materials:

- 1. Portland Cement Concrete:** Concrete used in the construction of the shaft shall conform to the plans, Section M.03, and to the following:
  - (a)** The concrete shall have a minimum initial slump of 8 in (200 mm).
  - (b)** The concrete mix shall maintain a slump of no less than 4 in (100 mm) for a minimum of three (3) hours beyond the expected time for placement of concrete and removal of temporary casing (if used), as indicated by trial mixes and physical tests of slump loss. The trial mix and physical tests (slump loss tests) shall be conducted using concrete mix and ambient air temperatures anticipated during concrete placement.
  - (c)** All admixtures, if approved for use, shall be adjusted for the conditions encountered on the job so as to conform to the slump loss requirements within this specification and must not adversely affect the timing of, taking of or interpretation of any Nondestructive Testing that may be called for in the Contract.
  - (d)** Coarse aggregate shall conform to Article M.01.01, No. 8 Gradation.
- 2. Reinforcing Steel:** Reinforcing steel used in construction of the shaft shall conform to Article M.06.01.
- 3. Access Tubes:** Access tubes for cross-hole acoustic logging shall be made of Schedule 40 steel pipe conforming to ASTM A 53, Grade A or B, Type E, F, or S. The tubes' inside diameter shall be at least 1.5 in (38 mm). All access tubes, including all pipe joints, shall

have a round, regular inside surface free of defects and obstructions, in order to permit the free, unobstructed passage of probes to the bottoms of the tubes. The access tubes shall be watertight, free from corrosion and free of deleterious material on the outside that could prevent bonding with the concrete. All access tubes shall be fitted with watertight caps on the bottom and top.

- 4. **Grout:** Grout used for filling Access Tubes shall meet the requirements of Article M.03.05. The grout shall have strength properties equivalent to or better than those of the drilled shaft concrete.
- 5. **Permanent Casing:** Steel casing shall conform to the requirements of ASTM A36 or A252 Grade 2 unless otherwise specified on the plans. Casings shall be smooth, clean, watertight, and of ample strength to withstand handling, installation, and the pressure from surrounding concrete and earth materials. The outside diameter of any casing shall not be less than the specified diameter of the shaft.

**7.01.03 - Construction Methods:**

- 1. **Qualifications of Drilled Shaft Contractor and Submittals:** The Contractor performing the work described in this specification shall have been installing drilled shafts of both diameter and length similar to those shown on the plans for a minimum of three (3) years prior to the bid date for this Project. The Contractor shall submit a list of projects that it has performed in said three (3) years that met these criteria. The list of projects shall contain names and phone numbers of owner's representatives who can verify the Contractors' participation on those projects, and that they met said criteria.

As early as possible, and no later than thirty (30) days prior to constructing drilled shafts, the Contractor shall submit to the Engineer an Installation Plan for the shafts. This Plan shall provide the following information:

- (a) A list identifying the intended on-Site supervisor(s) and drill operator(s), for approval by the Engineer. The on-Site supervisor(s) shall have a minimum of two (2) years' experience supervising the construction of drilled shafts of a diameter and length similar to those shown on the plans. The drill operator(s) shall have a minimum of one (1) years' experience drilling for the construction of drilled shafts of a diameter and length similar to those shown on the plans. The list shall contain a summary of each individual's experience.

Should the Contractor elect to change any of these intended personnel during construction of the shafts, this same approval process will need to be completed for the new personnel prior to their starting work on the Project. The Contractor shall not be compensated for any delays resulting from such changing of personnel.

- (b) List of proposed equipment to be used, including cranes, drills, augers, bailing buckets, final cleaning equipment, desanding equipment, slurry pumps, core sampling equipment, tremies or concrete pumps, casing and any other equipment required for construction of the shafts.

- (c) Details of overall construction operation sequence and the sequence of shaft

construction in bents or groups.

- (d) Details of the Contractor's intended shaft excavation methods.
- (e) When the use of slurry is anticipated, details of the mix design and its suitability for the subsurface conditions at the Site, mixing and storage methods, maintenance methods, and disposal procedures.
- (f) Details of methods for cleaning the shaft excavation.
- (g) Details of reinforcement placement, including support and centralization methods.
- (h) Details of concrete mix design and test results of both a trial mix and a slump loss test. The tests shall be conducted by an approved testing laboratory, using approved methods to demonstrate that the concrete meets slump loss requirements.
- (i) Details of concrete placement, including proposed operational procedures for free fall, tremie or pumping methods, proposed concreting log form and computations for time duration of shaft pour estimates.
- (j) Details of casing installation and removal methods. If welding of casing is proposed, submit the welding procedure. All welding shall be done in accordance with the current AWS Structural Welding Code.
- (k) Details of methods for removal of obstructions. Obstructions for which the Contractor shall provide details of methods for removal include, but are not necessarily limited to, removal of boulders, concrete, riprap, steel, timber or miscellaneous debris.
- (l) Details for any monitoring plan as called for in the Contract.

The Engineer will evaluate the drilled shaft Installation Plan for conformance with the Contract and will then notify the Contractor of any additional information required or changes necessary in order to meet 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 Project work as detailed in the plans and specifications. The Contractor shall not commence construction of drilled shafts until the Engineer has approved the Installation Plan.

If integrity or load testing of the drilled shafts is called for by the Contract or the Site conditions, this submittal shall be developed in coordination with and submitted concurrently with working drawing submittals, as required in the testing specifications.

All submittals shall comply with the working drawing submittal requirements outlined in Article 1.05.02.

- 2. Trial Drilled Shaft Installation and Load Testing:** When called for in the Contract, the Contractor shall demonstrate the adequacy of the proposed methods, techniques and equipment by successfully constructing a trial drilled shaft in accordance with these



specifications. This trial drilled shaft shall be positioned away from production shafts, in the location shown on the plans or as directed by the Engineer. The trial shaft shall be drilled to the maximum depth shown in the plans. Failure by the Contractor to demonstrate to the Engineer the adequacy of methods and equipment shall be reason for the Engineer to require alterations of the Contractor's equipment or methods in order to prevent results unacceptable under the Contract or to the Engineer. Any additional trial drilled shaft required to demonstrate the adequacy of altered methods or construction equipment shall be at the Contractor's expense. Once the Engineer approves construction of production shafts, no changes will be permitted in the personnel, materials, methods or equipment used by the Contractor in constructing the satisfactory trial drilled shaft, unless the Contractor obtains the Engineer's written approval to do so.

Unless otherwise shown in the Contract, the trial drilled shaft shall have reinforcing bars, access tubes and concrete placed using the same materials and methods of construction to be used during construction of the production drilled shafts. The trial drilled shaft shall be cut off 2 ft (0.6 m) below finished grade and left in place. The disturbed area(s) at the site(s) of the trial drilled shaft(s) shall be restored as nearly as practical to original conditions.

Should the plans call for load testing of the trial drilled shaft, all necessary loading apparatus, instrumentation and other equipment required for performing the load test will be specified and paid for under a separate item.

All trial drilled shaft(s) and load test(s) must be completed and accepted by the Engineer prior to construction of any production drilled shafts. In the event that there is more than one trial drilled shaft and load test, the Contractor may begin construction of some of the production drilled shafts, in whatever way that the Engineer requires or approves.

- 3. Protection of Existing Structures:** The Contractor shall control drilled shaft operations in a way that will prevent damage to existing structures or utilities, in accordance with Articles 1.07.09 and 1.07.13. Preventive measures shall include, but are not limited to: selecting construction methods and procedures to prevent caving of the shaft excavation, and that will include monitoring and controlling the vibrations from construction activities such as the driving of casing or sheeting, drilling of the shaft, or from any blasting that the Contract or the Engineer may have permitted.

If monitoring is called for in the Contract, a preconstruction survey of existing facilities shall be performed to establish baseline data, including ambient vibration levels and existing structural defects. In general, monumented survey points shall be established on structures which are located within a distance of either ten (10) shaft diameters or the estimated shaft depth, whichever is greater. These points shall be monitored by the Contractor for vertical and lateral movement in an approved manner to the accuracy required by the Engineer.

When deformations exceed the predetermined amount included in the plans, the Contractor shall immediately stop work and, if directed by the Engineer to do so, backfill the excavated hole. The Contractor shall be responsible for selecting and using equipment and procedures that keep deformations of existing structures within levels specified by the Contract or Engineer.

When vibrations are to be monitored, the Contractor must engage the services of a professional vibrations consultant to monitor and record vibration levels during drilled shaft construction. Unless the Engineer states otherwise, vibration monitoring equipment must be capable of detecting velocities of 0.1 in/sec (2.5 mm/sec) or less. When vibration levels exceed tolerable levels established by the Contract or Engineer, the Contractor shall immediately stop the work causing the vibrations and take whatever measures are necessary to reduce vibration levels to below tolerable levels. All costs related to vibration monitoring required in the Contract shall be included in the bid price for the Drilled Shaft item.

- 4. Construction Sequence:** Excavation to footing elevation shall be completed before shaft construction begins unless otherwise noted in the Contract or approved by the Engineer. Any disturbance at or below the footing area caused by shaft installation shall be repaired by the Contractor prior to the footing construction.

When drilled shafts are to be installed in conjunction with embankment placement, the Contractor shall construct drilled shafts after the placement of fills, unless shown otherwise in the Contract or approved by the Engineer.

Drilled shafts, constructed prior to the completion of the fills, shall not be capped until the fills have been placed as near to final grade as possible, leaving only the workroom necessary for construction of the caps.

- 5. Exploration Test Borings:** As soon as possible, the Contractor shall take soil samples or rock cores, where shown on the plans or as directed by the Engineer, in order to determine the character of the material directly below the completed shaft excavation. The soil samples shall be extracted with a split spoon sampler or undisturbed sample tube. The rock cores shall be cut with an approved triple tube core barrel to a minimum of 10 ft (3 m) below the bottom of the drilled shaft excavation before the excavation is made. The Engineer may require the depth of coring be extended up to a total depth of 20 ft (6 m). Rock core and standard penetration test samples shall be measured, visually identified and described in the Contractor's log. The samples shall be placed in suitable containers, identified by shaft location, elevation, and Project number and shall be delivered with the Contractor's field log to the Engineer within twenty-four (24) hours after each boring exploration is completed. The Engineer will inspect the samples and log in order to determine the final depth of required excavation based on evaluation of the material's suitability. The Contractor shall not start shaft drilling or construction of the shafts until the Engineer has determined the final depth of required excavation. Two (2) copies of the Contractor's final typed log shall be furnished to the Engineer within seven (7) calendar days after completion of the borings. The logs shall contain specific information about the drilling equipment and tools used and the rate of hole advancement, as well as descriptions of soil, rock, obstructions, and water encountered. The Contractor shall supply a suitable, secure location on the Site for storage of all soil and rock samples. At no time shall the soil or rock core samples be taken off the Site without the Engineer's permission to do so.
- 6. General Methods and Equipment:** The Contractor shall perform the excavations required for shafts through whatever materials are encountered, to the dimensions and elevations shown in the plans or otherwise required by the Contract. The Contractor's methods and equipment shall be suitable for the intended purpose and materials encountered. The

permanent casing method shall be used only at locations shown on the plans or authorized by the Engineer in writing. Blasting shall be permitted only if specifically authorized on the plans or in writing by the Engineer.

- 7. Uncased Construction Method:** This method consists of using water or slurry (mineral or polymer) to maintain stability of the borehole perimeter while advancing the excavation to final depth, placing the reinforcing cage, and concreting the shaft. Where drilled shafts are located in open water areas, exterior casings shall be extended from above the anticipated high water elevation into the ground in order to protect the shaft concrete from water action during placement and curing of the concrete. The exterior casing shall be installed in a manner that will produce a positive seal at the bottom of the casing, so that no piping of water or other materials occurs into or from the shaft excavation.
- 8. Casing Construction Method:** The casing method may be used either where shown on the plans or at sites where uncased construction methods are inadequate to prevent hole caving or excessive deformation of the hole. In using this method, the casing may either be placed in a predrilled hole or advanced through the ground by twisting, driving or vibration before being cleaned out.
- 9. Excavation and Drilling Equipment:** The Contractor's excavation and drilling equipment shall have adequate capacity, including power, torque and down-thrust to make it possible to excavate a hole of the maximum diameter and to a depth of twenty percent (20%) beyond the depths shown on the plans.

The excavation and overreaming tools shall be of adequate design, size and strength to perform the work shown in the plans or described herein. When the material encountered cannot be drilled using conventional earth augers with soil or rock teeth, drill buckets, grooving tools, or underreaming tools, the Contractor shall provide special drilling equipment, including but not limited to: rock core barrels, rock tools, air tools, blasting materials, or other equipment as necessary to enable construction of the shaft excavation to the size and depth required. Excavation by blasting may not be performed without the prior written approval of same by the Engineer.

- 10. Excavation:** Shaft excavations shall be made at locations and to the top of shaft elevations, estimated bottom of shaft elevations, shaft geometry and dimensions shown in the Contract. If material encountered during excavation is unsuitable for these purposes or differs from that anticipated in the design of the drilled shaft, the Contractor shall extend drilled shaft tip (base) elevations as and when the Engineer directs it to do so.

The Contractor shall maintain a construction method log during shaft excavation. The log shall contain information such as the description and approximate top and bottom elevation of each soil or rock material encountered, of seepage or ground water, and any other relevant information or observations, including a description of the tools and drill rigs used and any changes necessitated by changing ground conditions.

The Contractor shall dispose of any excavated materials removed from shaft excavations in accordance with the applicable Contract requirements for disposal of excavated materials, including those in Section 1.10.

The Contractor shall not permit workers to enter the shaft excavation for any reason unless (1) a suitable casing has been installed and the water level has been lowered and stabilized below the level to be occupied, and (2) adequate safety equipment and procedures have been provided to workers entering the excavation. Any placement of workers within the shaft excavation shall be in conformance with OSHA regulations and industry standards.

- 11. Drilled Shaft Earth Excavation:** Drilled shaft earth excavation is (1) excavation accomplished with conventional tools such as augers and drilling buckets attached to drilling equipment of the size, power, torque, and down-thrust (crowd) proposed by the Contractor in a construction procedure approved by the Engineer, or (2) successful construction of a trial drilled shaft. Earth excavation may include, but will not necessarily be limited to, excavation of clay, silt, sand, gravel, cobbles, boulders, weathered rock, and miscellaneous fill.
- 12. Drilled Shaft Rock Excavation:** Drilled shaft rock excavation is (1) excavation of competent rock, accomplished with conventional rock drilling tools, such as core barrels attached to drilling equipment of the size, power, torque, and down-thrust (crowd) as proposed by the Contractor in a construction procedure approved by the Engineer or (2) successful construction of a trial drilled shaft. Top of competent rock is as shown on the Contract drawings.
- 13. Obstructions:** When obstructions are encountered, the Contractor shall notify the Engineer of them immediately. Obstructions are defined as impenetrable objects that
  - (a)** cannot be removed or excavated using conventional augers fitted with soil or rock teeth, underreaming tools, or drilling buckets; or
  - (b)** cause a significant decrease in the rate of excavation advancement, relative to the rate of advancement for the rest of the shaft excavation within the particular strata where the obstruction is located that had been achieved using the techniques and equipment that had previously been used successfully to excavate the shaft.

The Engineer will be the sole judge of the significance of any reduced rate of shaft advancement and of the classification of obstruction excavation. The Engineer will be present at the site of the obstruction in order to evaluate obstructions, to authorize measures for dealing with them, and to approve the designation each obstruction. Sloping bedrock or bedrock that is higher than anticipated by the plans shall not be considered as requiring obstruction excavation. Shallow obstructions are obstructions located within 5 ft (1.5 m) of the top level of the shaft. Shallow obstructions at shaft locations shall be removed at the Contractor's expense.

The Contractor shall remove all subsurface obstructions at drilled shaft locations. Such obstructions may include man-made materials, such as concrete foundations, and natural materials, such as boulders. Subsurface obstruction removal special procedures/tools may include, but are not limited to, chisels, boulder breakers, core barrels, down-the-hole hammers, air tools, hand excavation, temporary casing, and increases of the hole diameter. Blasting shall not be permitted unless specifically approved in advance in writing by the Engineer.

**14. Lost Tools:** Drilling tools lost in the excavation shall not be considered obstructions and shall be promptly removed by the Contractor without compensation. All costs due to lost tool removal shall be borne by the Contractor including, but not limited to, costs associated with the repair of hole degradation due to removal operations or due to the hole's remaining open for an excessively long time.

**15. Casing:** Casings shall be steel, smooth, clean, watertight, and of ample strength to withstand both handling and installation and the pressure of both concrete and the surrounding earth materials. The outside diameter of casings shall not be less than the specified diameter of the shaft, and the outside diameter of any excavation made below the casing shall not be less than the specified diameter of the shaft. No extra compensation will be paid for concrete required to fill an oversized casing or oversized excavation. All casings, except permanent casings, shall be removed from shaft excavations. Any length of permanent casing installed below the shaft cutoff elevation shall remain in place.

When the shaft extends above ground or through a body of water, the portion exposed above ground or through the water may be formed with removable casing, except when permanent casing is specified. Removable casing shall be stripped from the shaft in a manner that will not damage the concrete. Casings may be removed when the concrete has attained sufficient strength, provided: curing of the concrete is continued for a seventy-two (72) hour period; the shaft concrete is not exposed to salt water or moving water for seven (7) days; and the concrete reaches a compressive strength of at least 2500 psi (17,235 kPa) as determined from concrete cylinder breaks.

**16. Temporary Casing:** All subsurface casing shall be considered temporary unless specifically shown as permanent casing in the Contract. The Contractor shall be required to remove temporary casing before or immediately after completion of concreting the drilled shaft. Casing shall never be pulled after the concrete begins to set, due to probable entrapment of drilling fluid in the shaft concrete and probable separation of the concrete within the shaft.

If the Contractor elects to remove a casing and substitute a longer or larger-diameter casing through caving soils, the excavation shall either be stabilized with slurry or backfilled before the new casing is installed. Other methods approved by the Engineer may be used to control the stability of the excavation and protect the integrity of foundation materials.

Before the casing is withdrawn, the level of fresh concrete in the casing shall be a minimum of 5 ft (1.5 m) above either the hydrostatic water level in the formation or the level of drilling fluid in the annular space behind the casing, whichever is higher. As the casing is withdrawn, care shall be exercised to maintain an adequate level of concrete within the casing, so that fluid trapped behind the casing is displaced upward and discharged at the ground surface without contaminating or displacing the shaft concrete.

Temporary casings that become bound or fouled during shaft construction and cannot practicably be removed shall constitute a defect in the drilled shaft. The Contractor shall be responsible to improve such defective shafts to the satisfaction of the Engineer. Improvement may consist of, but not be limited to, removing the shaft concrete and extending the shaft deeper, in order to compensate for loss of frictional capacity in the cased zone; providing straddle shafts to compensate for capacity loss; grouting around the

exterior of the shaft; or providing a replacement shaft. All corrective measures, including redesign of footings caused by defective shafts, shall be done to the satisfaction of the Engineer by the Contractor without either compensation or an extension of Contract time of the Project. In addition, no compensation will be paid for casing remaining in place.

- 17. Permanent Casing:** Permanent casing shall be used where specified by the Contract. The casing shall be continuous between top and bottom elevations as shown in the plans. After installation is complete, the permanent casing shall be cut off at the prescribed elevation.

In cases in which special temporary casings are shown on the plans or authorized in writing by the Engineer to be used in conjunction with permanent casing, the Contractor shall maintain both alignment of the temporary casing with the permanent casing and a positive, watertight seal between the two casings during excavation and concreting operations.

Permanent casing shall maintain close contact with the surrounding earth after installation. Use of an oversized hole or temporary casing outside the permanent casing beneath the ground surface will not be allowed without the advance written permission of the Engineer to do so. Should an oversized hole or temporary casing outside the permanent casing beneath the ground surface be allowed by the Engineer, grouting of the exterior annular space shall be provided by the Contractor in order to create close contact between the casing and the surrounding ground. The grouting shall extend from the bottom of the annular space to an elevation determined by the Engineer. No compensation will be paid to the Contractor for grouting of the exterior annular space.

- 18. Slurry:** Mineral or polymer slurries shall be employed when slurry is used in the drilling process, unless other drilling fluids are approved in writing by the Engineer. Mineral slurry shall have both a mineral grain size that will remain in suspension and sufficient viscosity and gel characteristics to allow it to transport excavated material to a suitable screening system. The percentage and specific gravity of the material used to make the mineral suspension shall be sufficient to maintain the stability of the excavation and to allow proper concrete placement.

During construction, the level of the slurry shall be maintained at a height sufficient to prevent caving of the hole. The slurry head shall remain above the piezometric head of the groundwater. This includes initial drilling of the borehole down to the piezometric level. Slurry shall be introduced when the depth of the borehole is still above the piezometric level, not after the inflow of water can be detected and sloughing has begun. In the event of a sudden significant loss of slurry to the hole, the construction of that foundation shall be stopped until either a method to stop slurry loss or an alternate construction procedure has been approved by the Engineer.

Mineral slurry shall be premixed thoroughly with clean fresh water and adequate time (as prescribed by the mineral manufacturer) shall be allotted for hydration prior to introduction into the shaft excavation. Slurry tanks of adequate capacity shall be required for slurry circulation, storage, and treatment. No excavated slurry pits will be allowed in lieu of slurry tanks without the written consent of the Engineer to the substitution. Desanding equipment shall be provided by the Contractor as necessary to keep slurry sand content at less than

four percent (4%) by volume at any point in the borehole at the time the slurry is introduced, including situations in which temporary casing will be used. The Contractor shall take all steps necessary to prevent the slurry from "setting up" in the shaft. Such methods may include, but are not limited to: agitation, circulation and adjusting the properties of the slurry. The Contractor shall dispose of all slurry in suitable off-Site areas. Disposal of the slurry shall also comply with Section 1.10.

Control tests using suitable apparatus shall be carried out on the mineral slurry by the Contractor in order to determine density, viscosity and pH. An acceptable range of values for mineral slurry physical properties is shown in Table 7.01-1:

**TABLE 7.01-1, MINERAL SLURRY PROPERTIES**  
(Sodium Bentonite or Attapulgite in Fresh Water)

Property	Acceptable Range of Values		
	At Time of Slurry Introduction	In Hole at Time of Concreting	Test Method
Density - pcf (kN/m <sup>2</sup> )	64.3* - 69.1* (10.1* - 10.8*)	64.3* - 75.0* (10.1* - 11.8*)	Density Balance
Viscosity - sec./quart (sec./liter)	28 - 45 (26 - 43)	28 - 45 (26 - 43)	Marsh Funnel
pH	8 - 11	8 - 11	pH paper, pH meter
<p align="center">* Increase by 2 pcf (0.3 kN/m<sup>2</sup>) in salt water</p> <p>Notes:            (a) Tests shall be performed when the slurry temperature is above 40° F (4.5° C).            (b) If desanding is required, sand content shall not exceed 4% (by volume) at any point in the borehole, as determined by the American Petroleum Institute sand content test when the slurry is introduced.</p>			

Tests to determine density, viscosity and pH value shall be performed during the shaft excavation to establish a consistent working pattern. A minimum of four (4) sets of tests shall be made during the first eight (8) hours of slurry use. When the tests show consistent results, the testing frequency may be decreased to one (1) set every four (4) hours of slurry use.

If the Contractor proposes to use polymer slurry, either natural or synthetic, use of the product must be approved in advance by the Engineer. Slurry properties at the time of mixing and at the time of concreting must comply with the manufacturer's written recommendations. Whatever product is used, the sand content at the base of the drilled shaft excavation shall not exceed one percent (1%) when measured by Method API 13B-1, Section 5, immediately prior to concreting.

If the Contractor proposes to use blended mineral-polymer slurry, the Contractor shall submit to the Engineer a detailed report specific to the Project, prepared and signed by a qualified slurry consultant, describing the proposed slurry materials, the mix proportions, mixing methods and quality control methods.

If polymer slurry, or blended mineral-polymer slurry, is proposed, the Contractor's slurry management plan shall include detailed provisions for controlling the quality of the slurry, including tests to be performed, the frequency of those tests, the test methods, and any maximum or minimum property requirements that must be met in order to ensure that the slurry meets its intended functions in the subsurface conditions at the Project site and with the construction methods to be used. The slurry management plan shall include a set of the slurry manufacturer's written recommendations and shall include the following tests, as a minimum: Density test (API 13B-1, Section 1), viscosity test (Marsh funnel and cup, API 13B-1, Section 2.2, or approved viscometer), pH test (pH meter, pH paper), and sand content test (API sand content kit, API 13B-1, Section 5).

If such a proposal is approved by the Engineer, the Contractor may use water as a drilling fluid. In that case, all of the provisions in Table 7.01-1 for mineral slurries must be met, except that the maximum density shall not exceed 70 pcf (11 kN/m<sup>2</sup>).

The Contractor shall ensure that a heavily-contaminated slurry suspension, which could impair the free flow of concrete, has not accumulated in the bottom of the shaft. Prior to placing concrete in any shaft excavation, the Contractor shall take slurry samples using a sampling tool approved by the Engineer. Slurry samples shall be extracted from the base of the shaft and at intervals not exceeding 10 ft (3 m) up the slurry column in the shaft, until two (2) consecutive samples produce acceptable values for density, viscosity, and pH.

When any slurry samples are found to be unacceptable, the Contractor shall take whatever action is necessary to bring the slurry within specification requirements. Concrete shall not be placed until the slurry in the hole is re-sampled and test results produce acceptable values.

Reports of all tests specified above, signed by an authorized representative of the Contractor, shall be furnished to the Engineer on completion of each drilled shaft.

During construction, the level of mineral or blended mineral-polymer slurry in the shaft excavation shall be maintained at a level not less than 4 ft (1.2 m) above the highest expected piezometric pressure head along the depth of the shaft, and the level of polymer slurry shall be maintained at a level not less than 6 ft (1.8 m) above the highest expected piezometric pressure head along the shaft. If at any time, in the opinion of the Engineer, the slurry construction method fails to produce the desired final results, the Contractor shall discontinue this method and propose an alternate method for approval by the Engineer.

Drilling tools shall contain vents to stabilize hydrostatic pressure above and below the tool during insertion and extraction. The rate of tool extraction shall not cause any noticeable turbulence in the slurry column in the borehole.

The Contractor shall arrange for the slurry manufacturer's technical representative to be present at the Site during Project startup, or throughout the entire Project if continual difficulty is expected, in order to ensure that the slurry is mixed and managed properly.

- 19. Excavation Inspection:** The Contractor shall check the dimensions and alignment of each shaft excavation. Final shaft depths shall be measured with a suitable weighted tape or other approved method after final cleaning. The Contractor shall provide equipment and



access to the Engineer for confirming dimension, alignment, and bottom cleanliness. Acceptable shaft cleanliness will be determined by the Engineer.

**20. Construction Tolerances:** The following construction tolerances apply to drilled shafts, unless otherwise stated in the Contract:

- (a) The center of the drilled shaft shall be within 3 in (76 mm) of plan position in the horizontal plane at the plan elevation for the top of the shaft.
- (b) The vertical alignment of a vertical shaft excavation shall not vary from the plan alignment by more than 1/4 in/ft (21 mm/m) of depth.
- (c) After the concrete is placed, the top of the reinforcing steel cage shall be no more than 6 in (150 mm) above and no more than 3 in (76 mm) below plan position.
- (d) All casing diameters shown on the plans refer to outside diameter ("OD") dimensions. The dimensions of casings are subject to American Petroleum Institute tolerances applicable to regular steel pipe. The Contractor may elect to provide a casing larger in diameter than shown in the plans, if the Engineer approves its doing so.
- (e) The top elevation of the shaft shall have a tolerance of plus 1 in (25 mm) or minus 3 in (76 mm) from the plan top-of-shaft elevation.
- (f) Excavation equipment and methods shall be designed so that the completed shaft excavation will have a planar bottom. The cutting edges of excavation equipment shall be normal to the vertical axis of the equipment within a tolerance of +/- 3/8 in/ft (+/- 3 mm/m) of diameter.

Drilled shaft excavations and completed shafts not constructed within the required tolerances are unacceptable. The Contractor shall be responsible for correcting all unacceptable shaft excavations and completed shafts to the satisfaction of the Engineer. Materials and work necessary, including engineering analysis and redesign, in order to complete corrections for out-of-tolerance drilled shaft excavations, shall be furnished without cost to the State or extension of Contract time.

**21. Reinforcing Steel Cage Construction and Placement:** The reinforcing steel cage, consisting of longitudinal bars, ties, cage stiffener bars, spacers, centralizers, and other necessary appurtenances, shall be completely assembled and placed as a unit immediately after the shaft excavation is inspected and accepted, and prior to concrete placement. Internal stiffeners shall be removed as the cage is placed in the borehole, so as not to interfere with the placement of concrete.

The reinforcing steel in the shaft shall be tied and supported so that the reinforcing steel will remain within allowable tolerances. Concrete spacers or other approved noncorrosive spacing devices shall be used at sufficient intervals near the bottom and at intervals not exceeding 10 ft (3 m) up the shaft, in order to ensure concentric spacing for the entire cage length. Spacers shall be constructed of approved material, equal in quality and durability to the concrete specified for the shaft. The spacers shall be of adequate dimension to ensure

a minimum 3 in (76 mm) annular space between the outside of the reinforcing cage and the side of the excavated hole. Approved cylindrical concrete feet (bottom supports) shall be provided to ensure that the bottom of the cage is maintained the proper distance above the base.

The elevation of the top of the steel cage shall be checked before and after the concrete is placed. If the upward displacement of the rebar cage exceeds 2 in (51 mm) or if the downward displacement exceeds 6 in per 20 ft (152 mm per 6 m) of shaft length, the drilled shaft will be considered defective. In such a case, corrections shall be made by the Contractor to the satisfaction of the Engineer. No additional shafts shall be constructed until the Contractor has modified the rebar cage support in a manner satisfactory to the Engineer.

- 22. Concrete Placement:** Concrete placement shall be performed in accordance with the applicable portions of Section 6.01 and with the requirements herein dealing with concrete materials.

Concrete shall be placed as soon as possible after reinforcing steel placement and after the Engineer has accepted the cleanliness of the shaft. The Engineer may re-inspect the shaft for cleanliness should there be any delays between initial acceptance of shaft cleanliness and commencement of the concrete placement. If during such a delay the Engineer has determined that shaft cleanliness has deteriorated, the Engineer may require the Contractor to re-clean the shaft. The Contractor may be required to remove the rebar cage should it be necessary in order to achieve the required shaft cleanliness. The Contractor will not be compensated for any cost or loss of time due to the need to re-clean the shaft.

Concrete placement shall be continuous from the bottom to the top elevation of the shaft. Concrete placement shall continue after the shaft excavation is filled and good quality concrete is evident at the top of shaft. Concrete shall be placed by free fall, or through a tremie or concrete pump. Free fall placement will be permitted only in dry holes. Concrete placed by free fall shall fall directly to the base without contacting the rebar cage or hole sidewall. Drop chutes may be used to direct concrete to the base during free fall placement.

The Contractor shall maintain Concreting Logs during all concrete placement. The log shall include, but not be limited to, concreting curves plotting Depth-to-Top of Concrete vs. Volume of Concrete Placed (for both theoretical and actual volumes of concrete placed). The Contractor shall provide a copy of each log to the Engineer upon completion of each drilled shaft concrete placement. A sample of the proposed log to be used by the Contractor shall be submitted as part of the Installation Plan working drawing submittal.

- 23. Tremies:** Tremies may be used for concrete placement in either wet or dry holes. Tremies used to place concrete shall consist of a tube of sufficient length, weight, and diameter to discharge concrete at the shaft base elevation. The tremie shall not contain aluminum parts that may come in contact with the concrete. The tremie's inside diameter shall be at least six (6) times the maximum size of aggregate used in the concrete mix, but shall not be less than 10 in (254 mm). The inside and outside surfaces of the tremie shall be clean and

smooth in order to permit flow of concrete and unimpeded withdrawal during concreting. The wall thickness of the tremie shall be adequate to prevent crimping or sharp bends, which would restrict concrete placement.

The tremie used for wet excavation concrete placement shall be watertight. Underwater or under-slurry placement shall not begin until the tremie is placed to the shaft base elevation, and the concrete shall be kept completely separated from the water or slurry prior to the time that it is discharged. Valves, bottom plates or plugs may be used for this purpose only if concrete discharge can begin within 1 tremie diameter of the base of the drilled shaft. Plugs shall either be removed from the excavation or be of a material approved by the Engineer that will not cause a defect in the shaft if not removed. The discharge end of the tremie shall be constructed to permit the free radial flow of concrete during placement operations. The tremie discharge end shall be immersed at least 5 ft (1.5 m) in concrete at all times after starting the flow of concrete. The flow of the concrete shall be continuous. The level of the concrete in the tremie shall be maintained above the level of slurry or water in the borehole at all times, in order to prevent water or slurry intrusion into the shaft concrete.

If at any time during the concrete placement, the tremie line orifice is removed from the fluid concrete column and it discharges concrete above the rising concrete level, the shaft will be considered defective. All costs of repair or replacement of defective shafts shall be the responsibility of the Contractor.

- 24. Pumped Concrete:** Concrete pumps and lines may be used for concrete placement in either wet or dry excavations. All pump lines shall have a minimum 4 in (102 mm) diameter and be constructed with watertight joints. Concrete placement shall not begin until the pump line discharge orifice is at the shaft base elevation.

For wet excavations, a plug or similar device shall be used to separate the concrete from the fluid in the hole until pumping begins. The plug shall either be removed from the excavation or be of a material approved by the Engineer that will not cause a defect in the shaft if not removed.

The discharge orifice shall remain at least 5 ft (1.5 m) below the surface of the fluid concrete. When lifting the pump line during concreting, the Contractor shall temporarily reduce the line pressure until the orifice has been repositioned at a higher level in the excavation.

If at any time during the concrete placement the pump line orifice is removed from the fluid concrete column and it discharges concrete above the rising concrete level, the shaft will be considered defective. All costs of repair or replacement of defective shafts shall be the responsibility of the Contractor.

- 25. Drop Chutes:** Drop chutes may be used to direct placement of free-fall concrete in excavations where the maximum depth of water does not exceed 3 in (76 mm). Free fall placement is not permitted in wet excavations. Drop chutes shall consist of a smooth tube of either one-piece construction or sections that can be added and removed. A drop chute can also be a hopper with a short tube to direct the flow of concrete. Concrete may be placed through either the hopper at the top of the tube or side openings as the drop chute

is retrieved during concrete placement. If concrete placement causes the shaft excavation to cave or slough, or if the concrete strikes the rebar cage or sidewall, the Contractor shall reduce the height of free fall or reduce the rate of concrete flow into the excavation, or both. If caving or sloughing of the borehole walls occurs during free-fall placement of concrete, the shaft will be considered defective. All costs of repair or replacement of defective shafts shall be the responsibility of the Contractor. If concrete placement cannot be satisfactorily accomplished by free fall, in the opinion of the Engineer, the Contractor shall use either tremie or pumping techniques to accomplish the concrete placement.

- 26. Access Tubes for Crosshole Acoustic Logging:** Access tubes for crosshole acoustic logging shall be placed on each reinforcing cage designated in the Contract in the position and at the frequency shown on the plans. Access tubes must be firmly secured to the cage. Normally, the tubes shall extend from 6 in (150 mm) above the bottom of the shaft to at least 3 ft (0.9 m) above the top of the shaft, or 2 ft (0.6 m) above the ground surface if the shaft is cut off below the ground surface. If cross-hole acoustic tests are to be performed, the access tubes shall be filled with clean water no later than four (4) hours after placement of the concrete and the tubes capped during concrete placement to keep out concrete and debris. In all cases, the access tubes shall be as nearly parallel as possible and be placed as far from the longitudinal steel bars as possible.

Prior to the beginning of downhole logging, the Contractor shall assure that the Cross-Hole Acoustic Logging test probes can pass through every tube to the bottom. If a tube is obstructed, the entire length of the obstructed access tube will not be measured for payment. The Engineer may also require the Contractor to core a hole within the drilled shaft near and to the full depth of the obstructed tube. The cored hole shall be large enough to accommodate the test probe for the full length of the hole. The coring equipment, coring procedure and location of the core hole shall be approved by the Engineer before the coring process may begin. The coring method shall provide for complete core recovery and shall minimize abrasion and erosion of the core. The core hole shall be placed at a position in the shaft that will not produce damage to the reinforcing steel in the shaft. The core hole shall be logged, voids or defects indicated on the log, and the log submitted to the Engineer. Cores shall be preserved and made available for inspection by the Engineer. The core hole will be treated as an access tube for downhole testing. Core holes that are drilled to substitute for a blocked access tube shall be measured and paid for at the Contract unit price for Access Tubes.

Upon completion of all tests involving access tubes and after acceptance of the drilled shaft, the access tubes and core holes shall be filled with grout.

- 27. Evaluation and Acceptance or Rejection of Drilled Shafts:** Upon completion and integrity testing (if called for) of a drilled shaft, the Engineer will review all available drilling logs, drilled shaft construction logs, concreting logs, inspection reports, load test results, and integrity test results in order to determine the acceptability of the drilled shaft. If the Engineer determines that available data is inconclusive, the Engineer may call for additional integrity testing, coring, or other appropriate actions necessary for evaluating the drilled shaft. Should the additional integrity testing or coring confirm the presence of anomalies, the Contractor will not be compensated for the cost of the additional integrity testing or coring (even if the anomalies are determined to be non-critical and the shaft is found to be acceptable). Should additional integrity testing or coring demonstrate that anomalies are

not present (prior to any remedial work), the additional integrity testing or coring will be paid for by the Department. The Contractor may continue to construct drilled shafts before receipt of notice of acceptance of the tested shaft or shafts by the Engineer. If the Engineer finds previously-constructed shaft(s) to be unacceptable, the Contractor shall be required to repair, at its expense, the unacceptable shaft(s) to the satisfaction of the Engineer. The Contractor shall prove to the satisfaction of the Engineer, at no expense to the State, the acceptability of all shafts constructed since the time that the unacceptable shaft was constructed and to prove the acceptability of the procedure to be used in constructing future shafts. If the Engineer deems the construction procedure to be unacceptable, the Contractor shall cease all drilled shaft construction until submittal of a new construction procedure to the Engineer and the Engineer has accepted it.

The Contractor shall submit repair procedures to the Engineer for review and approval. If these plans involve change of or impact on the structural design of the shafts or shaft caps, or the geometry of the shafts, any proposed redesign of the Contractor's plan shall be performed at the Contractor's expense by a qualified Professional Engineer registered in the State of Connecticut.

The Engineer may require that additional shafts be tested. If the testing of the additional shaft(s) indicates the presence of a defect in any additional shaft, the testing cost for that shaft shall be borne by the Contractor, and the Contractor shall repair the shaft at its own expense, as above. Any additional testing required by the Engineer on repaired drilled shafts shall be considered part of the Contractor's remediation plan, to be paid for by the Contractor.

#### **7.01.04 - Method of Measurement:**

- 1. Furnishing Drilled Shaft Drilling Equipment:** There will be no measurement of the work performed under this Lump Sum item.
- 2. Drilled Shaft** will be measured for payment by the length in linear feet (meters) of the completed and accepted concrete drilled shaft, of the diameter and containing the reinforcement shown on the plans. The length will be determined as the difference between the plan top-of-shaft elevation and the final bottom-of-shaft elevation.
- 3. Drilled Shaft Earth Excavation** will be measured for payment by the length in linear feet (meters) of completed earth excavation of the diameter shown on the plans (measured along the centerline of the shaft), either from the top of existing grade elevation prior to drilling or from the bottom of the drilled shaft cap elevation (whichever is lower), to either the top of competent rock elevation (if the drilled shaft extends onto or into competent rock) or to the bottom of the shaft elevation (if the shaft does not extend onto or into competent rock).
- 4. Drilled Shaft Rock Excavation** will be measured for payment by the length in linear feet (meters) of completed rock excavation of the diameter shown on the plans, measured along the centerline of the shaft from the top-of-competent-rock elevation to the bottom-of-the-shaft elevation
- 5. Obstructions** will be measured for payment, after designation as an obstruction by the

Engineer, by the number of hours of work, or fraction thereof per obstruction, required to remove the obstruction.

6. **Trial Drilled Shaft** will be measured for payment by the authorized linear feet (meters) of trial shaft holes drilled to the diameter shown on the plans, completed (including backfill and restoration of area, when required) and accepted. The length of trial shaft holes will be determined as the difference between the existing ground surface elevation at the center of the trial shaft hole prior to drilling and the authorized bottom elevation of the hole.
7. **Exploration Test Borings** will be measured for payment by the length in linear feet (meters), measured from the existing grade elevation to the bottom elevation of the exploration hole, for each authorized exploration boring drilled.
8. **Permanent Casing** will be measured for payment by the length in linear feet (meters) of each diameter casing installed and accepted. The length to be paid will be measured along the casing from the top-of-the-shaft elevation or the top of the casing, whichever is lower, to the bottom of the casing at each shaft location where permanent casing is used.
9. **Access Tubes** will be measured for payment by the length in linear feet (meters) of unobstructed access tube, installed and accepted in the drilled shafts, to the depths shown on the plans

#### 7.01.05 - Basis of Payment:

1. **Furnishing Drilled Shaft Drilling Equipment:** Payment for this item will be at the Contract lump sum price for "Furnishing Drilled Shaft Drilling Equipment" which will be considered full and complete payment for furnishing and moving the drilling equipment to the Site, setting up the equipment at the required locations, and removing the equipment from the Site.

Payment of sixty percent (60%) of the lump sum amount bid for this item will be made when all drilling equipment is on the Site, assembled and ready to drill foundation shafts. Payment of the remaining forty percent (40%) of the lump sum amount will be made when all shafts have been drilled, all shaft concrete has been placed to the top of the shaft, all defects are repaired, and all drilled shafts have been accepted by the State.

2. **Drilled Shaft:** Drilled shafts will be paid for at the Contract unit price per linear foot (meter) for "Drilled Shaft (Diameter)" complete and accepted in place, including submittals, concrete and reinforcing steel, all labor, equipment, materials, temporary casings, slurry, slurry technical representative, blasting (if allowed), protection of existing facilities or utilities, vibration monitoring and incidentals necessary to complete the drilled shaft.
3. **Drilled Shaft Earth Excavation:** This work will be paid for at the Contract unit price per linear foot (meter) for "Drilled Shaft Earth Excavation (Diameter)" complete, including all labor, equipment, materials, water control, and disposal of excavated material necessary.
4. **Drilled Shaft Rock Excavation:** Drilled shaft rock excavation will be paid for at the Contract unit price per linear foot (meter) for "Drilled Shaft Rock Excavation (Diameter)" complete, including all labor, equipment, materials, water control, and disposal of excavated

material necessary. No payment will be made for additional rock excavation or placement of additional shaft concrete resulting from blasting overbreak (if blasting is allowed).

- 5. **Obstructions:** Removal of obstructions will be paid for at the Contract unit price per hour for “Obstructions” complete, including all labor, equipment, materials, excavation of obstructions, water control, disposal of excavated material necessary. If the Contractor chooses to use a larger shaft diameter for obstruction excavation, no additional compensation will be paid for performing such oversized obstruction excavation.
- 6. **Trial Drilled Shaft:** Trial drilled shafts will be paid for at the Contract unit price per linear foot (meter) for “Trial Drilled Shaft (Diameter)” complete and accepted, including all labor, equipment, materials, excavation of the trial drilled shaft through whatever materials are encountered, to the bottom of shaft elevation shown on the plans or as authorized by the Engineer (using slurry approved by the Engineer as necessary), providing inspection facilities, backfilling the hole, restoring the Site as required, and all other expenses to complete the trial shaft.
- 7. **Exploration Test Borings:** Soil samples, rock cores or both, of the diameter and length required and authorized by the Engineer will be paid for at the Contract unit price per linear foot (meter) for “Exploration Test Boring” complete, including drilling, extracting, packaging and classifying samples or cores, delivery of same to the Engineer, furnishing concrete or grout to fill the core hole, providing a written log of the hole, and all other expenses necessary.
- 8. **Permanent Casing:** Permanent casings will be paid for at the Contract price per linear foot (meter) for “Permanent Casing (Diameter)” complete, including furnishing and placing the permanent casing in the shaft excavation.
- 9. **Access Tubes:** Access tubes will be paid for at the Contract unit price per linear foot (meter) of unobstructed “Access Tubes” complete and accepted, installed in the drilled shafts to the depths shown on the plans, including the post-test grouting of the access tubes.

Pay Item	Pay Unit
Furnishing Drilled Shaft Drilling Equipment	l.s. (l.s.)
Drilled Shaft (Diameter)	l.f. (m)
Drilled Shaft Earth Excavation (Diameter)	l.f. (m)
Drilled Shaft Rock Excavation (Diameter)	l.f. (m)
Obstructions	hr. (hr.)
Trial Drilled Shaft (Diameter)	l.f. (m)
Exploration Test Boring	l.f. (m)
Permanent Casing (Diameter)	l.f. (m)
Access Tubes	l.f. (m)

**CONNECTICUT  
SUPPLEMENTAL SPECIFICATION  
SECTION 7.02  
PILES**

*Delete the entire section and replace it with the following:*

**SECTION 7.02  
PILES**

**7.02.01—Description****7.02.02—Materials****7.02.03—Construction Methods****7.02.04—Method of Measurement****7.02.05—Basis of Payment**

**7.02.01—Description:** This item shall consist of furnishing and driving foundation piles of the type and dimensions designated. Piles shall conform to and be installed in accordance with these specifications, and at the location, and to the elevation, penetration and/or capacity shown on the plans, or as directed by the Engineer. If specified in the plans or directed by the Engineer, piles shall be tipped, shaped, reinforced or otherwise pointed and strengthened

Test piles shall be piles of the type specified, driven in advance of placing orders for the piles, for the purpose of determining length or bearing capacity of piles. The Contractor shall furnish the piles in accordance with an itemized order list which will be furnished by the Engineer, showing the number and length of all piles. When test piles are specified, the pile lengths shown on the plans are for estimating purposes only. The actual lengths to be furnished for production piles will be determined by the Engineer after the test piles have been driven.

**7.02.02—Materials:** Piles of the type indicated on the plans shall conform to the requirements of Articles M.09.02 and M.14.01.

**7.02.03—Construction Methods****1. Pile Types:**

**(a) Timber Piles:** The method of storing and handling timber piles shall be such as to avoid damage to the piles. Special care shall be taken to avoid breaking the surface of treated piles. Cant dogs, hooks, or pike-poles shall not be used. Cuts or breaks in the surface of treated piling shall be given three brush coats of hot creosote oil of approved quality, and hot creosote oil shall be poured into all bolt holes.

**(b) Steel Piles:** The methods of storing and handling steel piles shall be such as to prevent damage to the piles and to protect them from corrosion.

**(c) Cast-In-Place Concrete Piles:** Cast-in-place concrete piles shall be constructed by driving steel shells and filling them with concrete. Shells shall be continuously or incrementally tapered, or cylindrical, or a combination of continuously or incrementally



tapered lower sections, which are extended with cylindrical upper sections, unless otherwise provided in the plans or special provisions. The tapered portion of piles shall have a minimum tip diameter of 8 inches (200 millimeters) and shall change in diameter not less than 1 inch in every 12 feet (7 millimeters/meter). Cylindrical piles and the cylindrical extension portions of tapered piles shall have a minimum diameter of 12 inches (300 millimeters). Shells for cast-in-place concrete piles shall be formed by joining sections of the same manufacture, unless otherwise permitted by the Engineer. Composite shell piles, which are piles composed of different thicknesses or of different manufacture, shall not be used unless shown on the plans or approved by the Engineer. Prefabricated driving points or other type tip enclosures shall be subject to the approval of the Engineer.

The Contractor shall furnish shells of a type and gage which can be driven without distortion. Shells which fail, fracture or otherwise distort during driving or after driving shall be withdrawn or replaced at the Contractor's expense. The metal of shells which are to be driven without a mandrel shall be of sufficient thickness to withstand the driving without failure, fracture or distortion, but in no case shall the thickness be less than No. 7 gage. Shells driven with a mandrel shall have a thickness not less than No. 18 gage. Piles having a shell thickness less than No. 9 gage shall be reinforced as shown on the plans.

Composite shell piles formed by extending lower sections of No. 7 or heavier gage, with upper sections of lighter than No. 7 gage, shall be driven with an internal mandrel in such a manner so as to insure shell alignment and maximum hammer energy transmission throughout the pile shell length. All details concerning compatibility of shell and mandrel construction shall be subject to the approval of the Engineer.

After driving has been completed, the shell shall be inspected and approved before any concrete is placed. The Contractor shall provide suitable lights and other equipment necessary to inspect each shell throughout its length.

All seams, joints and splices in shells shall develop the full strength of the shell and shall be watertight. Damaged shells that are unacceptable to the Engineer shall be filled with sand and a replacement shell or shells shall be driven adjacent thereto.

Reinforcement shall be placed in accordance with the requirements of the plans or special provisions.

No concrete shall be placed in a pile until all driving within a radius of 15 feet (4.5 meters) from the pile has been completed, or until all the shells for any one bent have been completely driven. If this is not practical, all driving within the above limits shall be discontinued until the concrete in the last pile cast has set at least 7 days.

Concrete shall be placed continuously in each pile, care being used to fill every part of the shell, and to work concrete around the reinforcement without displacing it. No concrete shall be placed in shells containing an accumulation of water or any foreign material.

Extensions, or "build-ups" on concrete piles, shall be avoided; but when necessary, they shall be made as specified in Subarticle 7.02.03-7.

**(d) Prestressed Concrete Piles (Pretensioned):** The piles shall be manufactured in accordance with the provision of Article 5.14.03, except as follows:

**(1) Forms:** The forms for the piles shall be of substantial construction and shall produce a uniformly smooth surface on all formed sides. A minimum concrete cover of 2 inches (50 millimeters) shall be maintained for prestressing elements by the use of spreaders or by bundling in areas adjacent to openings or inserts. Ties shall also have a minimum cover of 2 inches (50 millimeters) at these locations. Side forms carrying no load may be removed after 24 hours with the permission of the Engineer or after the concrete has reached the minimum transfer strength as required by Subarticle M.09.02-6.

**(2) Finishing:** The topside surface of the piles shall be given a uniformly smooth steel trowel finish to match the surface of the formed sides. The prestressing elements shall be cut flush or recessed 1/8 inch (3 millimeters) to the top of the pile. Projecting fins and surface imperfections shall be removed in a workmanlike manner. Exposed jet pipe connections, inserts or other devices shall be removed or recessed to a depth as directed, and the hole or opening patched with non-shrink grout in a workmanlike manner. The patching material shall have a degree of finish comparable to the adjacent surfaces. Additional finishing of piles, if required, shall be as shown on the plans or as otherwise directed.

**(3) Handling and Storage:** Care shall be taken during storage, transporting, hoisting and handling of the prestressed piles to prevent cracking or damage. Damaged piles shall be replaced by the Contractor at his expense. Lifting and support points shall be marked on the piles as required.

**(4) Pile Extensions:** Pile extensions shall normally be fabricated for this purpose in accordance with the specifications. However, sound sections of pile cutoffs or sound portions of rejected piles may be used, subject to the approval of the Engineer. Short pile extensions may, with the permission of the Engineer, be cast-in-place monolithically with the footing or cap.

## **2. Pile Driving Equipment:**

**(a) Hammers:** Piles shall be driven with approved air, steam, diesel, or hydraulic hammers or a combination of acceptable hammer and water jet. The plant and equipment furnished for air/steam hammers shall have sufficient capacity to maintain at the hammer, under working conditions, the volume and pressure specified by the manufacturer. The plant and equipment shall be equipped with accurate pressure gauges which are easily accessible to the Engineer. The valve mechanism and other parts of the hammer shall be properly maintained so that the length of stroke for a single-acting hammer and the number of blows per minute for a double-acting hammer will be obtained. The power plant for hydraulic hammers shall have sufficient capacity to maintain at the hammer, under working conditions, the volume and pressure specified by the manufacturer. The power plant and equipment shall be equipped with accurate pressure gauges which are easily accessible to the Engineer.

The size of hammer shall be adapted to the type and size of piles and the driving conditions. Unless otherwise specified, the minimum rated striking energy per blow for

hammers used shall be 7,000-foot pounds (9,500 joules) for driving timber piles; 15,000-foot pounds (20,000 joules) for driving steel piles and for driving shells for cast-in-place concrete piles; and 19,000-foot pounds (25,000 joules) for driving precast concrete piles and for driving prestressed concrete piles. The hammer model used for the driving of test piles shall be used for the driving of service or production piles, unless a change is authorized by the Engineer in writing. Hammers delivering an energy which the Engineer considers detrimental to the piles shall not be used.

Non-impact hammers, such as vibratory hammers, or driving aids such as jets, followers, pre-augered and prebored holes shall not be used unless either specifically permitted in writing by the Engineer or stated in the contract documents.

**(b) Pile Hammer Approval:** All pile driving equipment furnished by the Contractor shall be subject to the approval of the Engineer. All pile driving equipment shall be sized in such a way that the piles can be driven with reasonable effort to the ordered lengths without damage. Approval of pile driving equipment by the Engineer will be based on wave equation analysis and/or other judgments. In no case shall the driving equipment be used without written approval of the Engineer. Prerequisite to such approval, the Contractor shall submit to the Engineer the necessary pile driving equipment information and wave equation analysis at least 30 days prior to driving piles. The wave equation analysis shall be signed, sealed and dated by a Connecticut licensed Professional Engineer.

The criteria that the Engineer will use to evaluate the driving equipment consists of both the required number of hammer blows per foot (per 0.25 meters) as well as the pile stresses at the required ultimate pile capacity. The required number of hammer blows indicated by the wave equation at the ultimate pile capacity shall be between 36 and 180 blows per foot (29 and 147 blows per 0.25 meters) for the driving equipment to be acceptable. In addition, for the driving equipment to be acceptable the pile stresses which are indicated by the wave equation to be generated by the driving equipment shall not exceed the maximum driving stresses allowed by the governing design code stated in the contract documents.

During pile driving operations, the Contractor shall use the approved system. No variations in the driving system will be permitted without the Engineer's written approval. Any change in the driving system will only be considered after the Contractor has submitted the necessary information for a revised wave equation analysis.

If the Engineer determines the Contractor's hammer is unable to transfer sufficient energy to the pile, the hammer shall be removed from service until repaired to the satisfaction of the Engineer.

**(c) Drive System Components and Accessories:**

**(1) Hammer Cushion:** Impact pile driving equipment designed to be used with a hammer cushion shall be equipped with a suitable thickness of hammer cushion material to prevent damage to the hammer or pile and to insure uniform driving behavior. Hammer cushions shall be made of durable manufactured materials, provided in accordance with the hammer manufacturer's guidelines. Wood, wire rope, and asbestos hammer cushions are specifically disallowed and shall not be

used. A striker plate as recommended by the hammer manufacturer shall be placed on the hammer cushion to insure uniform compression of the cushion material. The hammer cushion shall be removed from the helmet and inspected prior to beginning pile driving at each structure or after each 100 hours of pile driving, whichever is less. The Contractor shall replace any hammer cushion whose thickness is less than 75% of the original thickness.

**(2) Helmet:** Piles driven with impact hammers require an adequate helmet or drive head to distribute the hammer blow to the pile head. The helmet shall be axially aligned with the hammer and the pile. The helmet shall be guided by the leads and not be free-swinging. The helmet shall fit around the pile head in such a manner as to prevent transfer of torsional forces during driving, while maintaining proper alignment of hammer and pile. For steel and timber piling, the pile heads shall be cut squarely and a helmet, as recommended by the hammer manufacturer, shall be provided to hold the axis of the pile in line with the axis of the hammer. For precast concrete and prestressed concrete piles, the pile head shall be plane and perpendicular to the longitudinal axis of the pile to prevent eccentric impacts from the helmet. For special types of piles, appropriate helmets, mandrels or other devices shall be provided in accordance with the manufacturer's recommendations so that the piles may be driven without damage.

**(3) Pile Cushion:** The heads of concrete piles shall be protected by a pile cushion. Pile cushions shall be made of plywood, hardwood, or composite plywood and hardwood materials. The minimum pile cushion thickness placed on the pile head prior to driving shall be at least 4 inches (100 millimeters). A new pile cushion shall be provided for each pile. In addition the pile cushion shall be replaced if, during the driving of any pile, the cushion is compressed more than one-half the original thickness or it begins to burn. The pile cushion dimensions shall match the cross sectional area of the pile top. The use of manufactured pile cushion materials in lieu of a wood pile cushion shall be evaluated on a case by case basis.

**(4) Leads:** Piles shall be supported in line and position with leads while being driven. Pile driver leads shall be constructed in a manner that affords freedom of movement of the hammer while maintaining alignment of the hammer and the pile to insure concentric impact for each blow. Leads may be either fixed or swinging type. Swinging leads, when used, shall be fitted with a pile gate at the bottom of the leads and, in the case of batter piles, a horizontal brace may be required between the crane and the leads. The pile section being driven shall not extend above the leads. The leads shall be adequately embedded in the ground or the pile constrained in a structural frame such as a template to maintain alignment. The leads shall be of sufficient length to make the use of a follower unnecessary, and shall be so designed as to permit proper alignment of batter piles.

**(5) Followers:** Followers shall only be used when approved in writing by the Engineer, or when specifically stated in the contract documents. In cases where a follower is permitted, the first pile in each bent and every tenth pile driven thereafter shall be driven full length without a follower, to determine that adequate pile penetration is being attained to develop the ultimate pile capacity. The follower and pile shall be held and maintained in equal and proper alignment during driving. The follower shall be of such material and dimensions to permit the piles to be driven to the penetration depth

determined necessary from the driving of the full length piles. The final position and alignment of the first two piles installed with followers in each substructure unit shall be verified to be within the required location tolerances before additional piles are installed.

**(6) Jets:** Jetting shall only be permitted if approved in writing by the Engineer or when specifically stated in the contract documents. When jetting is not required in the contract documents, but approved after the Contractor's request, the Contractor shall determine the number of jets and the volume and pressure of water at the jet nozzles necessary to freely erode the material adjacent to the pile without affecting the lateral stability of the in place pile. When jetting is specifically required in the contract documents, the plant shall have sufficient capacity to deliver at all times at least 100 psi (700 kilopascals) pressure at two 3/4-inch (19 millimeter) jet nozzles. In either case, unless otherwise indicated by the Engineer, jet pipes shall be removed when the pile toe is a minimum of 5 feet (1.5 meters) above prescribed toe elevation and the pile shall be driven to the required ultimate pile capacity with an impact hammer. Also, the Contractor shall control, treat if necessary, and dispose of all jet water in a manner satisfactory to the Engineer and in accordance with the provisions of Article 1.10.

**(7) Pre-Augering:** When stated in the contract documents, the Contractor shall pre-auger holes at pile locations to the depths shown on the plans. Pre-augered holes shall be of a size smaller than the diameter or diagonal of the pile cross section; however, large enough to allow penetration of the pile to the specified depth. If subsurface obstructions, such as boulders or rock layers, are encountered, the hole diameter may be increased to the least dimension which is adequate for pile installation. Any void space remaining around the pile after completion of driving shall be filled with sand or other approved material. The use of spuds shall not be permitted in lieu of pre-augering. Augering, wet-rotary drilling, or other methods of pre-augering shall be used only when approved by the Engineer. When permitted, such procedures shall be carried out in a manner which will not impair the capacity of the piles already in place or the safety of existing adjacent structures. If the Engineer determines that pre-augering has disturbed the capacities of previously installed piles, those piles that have been disturbed shall be restored to conditions meeting the requirements of this specification by re-driving or by other methods acceptable to the Engineer. Redriving or other remedial measures shall be instituted after the pre-augering operations in the area have been completed.

### **3. Pile Capacity**

**(a) Ultimate Pile Capacity:** Piles shall be driven by the Contractor to the penetration depth shown on the plans or to a greater depth if necessary to obtain the ultimate pile capacity. The ultimate pile capacity shall be as defined in the contract documents.

Jetting or other methods shall not be used to facilitate pile penetration unless specifically permitted in the contract documents or in writing by the Engineer. The ultimate pile capacity of jetted piles shall be based on driving resistances recorded during impact driving after the jet pipes have been removed. Jetted piles not attaining the ultimate pile capacity at the ordered length shall be spliced, as

required, at the Contractor's cost, and driven with an impact hammer until the ultimate pile capacity is achieved.

The ultimate pile capacity of piles driven with followers shall only be considered acceptable when the follower driven piles attain the same pile toe elevation or top of bedrock elevation as required for the full length piles driven without followers that attained the required ultimate pile capacity.

**(b) Wave Equation:** The ultimate pile capacity shall be determined by the Engineer. Piles shall be driven with the approved driving equipment to the ordered length or other lengths necessary to obtain the required ultimate pile capacity. Jetting or other methods to facilitate pile penetration shall not be used unless specifically permitted either in the contract documents or approved by the Engineer after a revised driving resistance is established from the wave equation analysis. Adequate pile penetration shall be considered to be obtained when the specified wave equation resistance criteria is achieved within 5 feet (1.5 meters) of the pile toe elevation, based on ordered length. Piles not achieving the specified resistance within these limits shall be driven to penetrations established by the Engineer.

**(c) Static Load Tests:** Compression load tests shall be performed by procedures set forth in ASTM D-1143 using the quick load test method, except that the test shall be taken to plunging failure or the capacity of the loading system. Testing equipment and measuring systems shall conform to ASTM D-1143, except that the loading system shall be capable of applying 150% of the ultimate pile capacity as stated in the contract documents, and that a load cell and spherical bearing plate shall be used. The apparatus shall be constructed to allow the various increments of the load to be placed gradually, without causing vibration to the test pile. The Contractor shall submit to the Engineer for approval working drawings of the loading apparatus in accordance with Article 1.05.02. When the approved method requires the use of tension (reaction) piles, the tension piles, when feasible, shall be of the same type and diameter as the production piles, and shall be driven in the location of permanent piles except that timber or tapered piles installed in permanent locations shall not be used as tension piles.

The top elevation of the test pile shall be determined immediately after driving and again just before load testing to check for heave. Any pile which heaves more than 1/4 inch (6 millimeters) shall be redriven or jacked to the original elevation prior to testing. Unless otherwise specified in the contract, a minimum 3-day waiting period shall be observed between the driving of any anchor piles or the load test pile and the commencement of the load test.

On completion of the load testing, any test or anchor piling not a part of the finished structure shall be removed or cut off at least 1 foot (300 millimeters) below either the bottom of footing or the finished ground elevation, if not located within the footing area.

**(d) Dynamic Pile Driving Analysis (PDA) Test:** Dynamic measurements following procedures set forth in ASTM D-4945 will be taken during the driving of piles designated as dynamic monitoring test piles. The Contractor shall employ a qualified specialty Consultant, which has successfully completed no less than ten

dynamic pile driving tests, to perform the testing and report preparation for all Dynamic Pile Driving Analysis (PDA) Tests to be performed.

At least thirty days prior to driving the test piles the Contractor shall submit to the Engineer for review and approval the qualified specialty consultant, as well as the complete installation, and testing procedures. The submittal shall include all necessary pile driving equipment and support facilities to drive the piles to capacities and depths shown on the plans within allowable stress limits. As part of the submittal the Contractor's Consultant shall perform a wave equation analyses, and a summary report confirming that the pile driving system proposed by the Contractor can meet the capacity, driving resistance and allowable stress limits.

All equipment necessary for the dynamic monitoring of the piles such as gages, cables, etc., shall be furnished by the Contractor's Consultant. The equipment shall conform to the requirements of ASTM D-4945, Standard Test Method for High Strain Dynamic Testing of Piles, and be capable of testing the pile to one and one-half times the ultimate pile capacity. An experienced engineer, who has successfully completed no less than ten dynamic pile driving tests, shall operate the Pile Driving Analyzer in the field. The Contractor shall furnish a shelter within 100 feet (30 meters) of test location(s) to protect the dynamic test equipment from the elements. The shelter shall be a minimum floor size of 400 square feet (40 square meters), with a minimum ceiling height of 7 feet (2 meters), and an inside temperature maintained between 50° and 85°F (10° and 29°C).

The Contractor shall provide power to the test pile locations for the duration of the dynamic testing. The power supply shall consist of a power source providing 115-Volt alternating current with a frequency of 60 Hz and a minimum of 2 kilowatts. If field generators are used as the power source, provide functioning meters to monitor power voltage and frequency. Direct current welders or non-constant power sources are unacceptable.

Prior to lifting the pile to be dynamically tested, the Contractor shall provide as a minimum 3 feet (1 meter) of clear access to 180 degree opposite faces of the pile for pile preparation. The Contractor or its Consultant shall then drill and prepare holes in the pile for gage attachment.

The Contractor or its Consultant shall attach the gages to the pile before driving the piles. Pile driving shall be performed using routine pile installation procedures. When the level of the gages is within 1 foot (300 millimeters) of the ground surface, or obstruction, driving shall be halted to remove the gages from the pile. If additional driving is required, the pile shall be spliced and gages shall be reattached to the head of the next pile segment.

With the dynamic testing equipment attached, the Contractor shall drive the pile to the design penetration depth or to a depth determined by the Engineer. The Engineer will use the ultimate pile capacity estimates at the time of driving and/or restriking from dynamic test methods to determine the required pile penetration depth for the ultimate pile capacity. The stresses in the piles will be monitored during driving with the dynamic test equipment to ensure that the actual driving stresses do not exceed the maximum allowed values. If necessary, the Contractor

shall reduce the driving energy transmitted to the pile by using additional cushions or reducing the energy output of the hammer in order to maintain driving stresses below the maximum values. If non-axial driving is indicated by dynamic test equipment measurements, the Contractor shall immediately realign the driving system.

After the initial drive of the pile, the Contractor shall wait 24 hours, or the time specified in the contract documents, and restrike the dynamic monitoring test pile with the dynamic testing instruments attached. A cold hammer shall not be used for the restrike. The hammer shall be warmed up before restrike begins by applying at least 20 blows to another pile. The maximum amount of penetration required during restrike shall be 6 inches (150 millimeters), or 50 hammer blows, whichever occurs first.

The Contractor's Consultant shall provide preliminary estimates of pile capacity of the test pile to the Engineer within 24 hours of the restrike of each tested pile. The Contractor's Consultant shall also prepare and submit a written report within 5 calendar days of the completion of the testing. This report shall contain a discussion of the pile capacity obtained from the dynamic testing. CAPWAP analyses of the dynamic testing data shall be performed on data obtained at the end of initial driving and the beginning of restrike. The Engineer may request additional analyses at selected pile penetration depths. The report shall also discuss hammer and driving system performance, driving stress levels, and pile integrity. The report is to be prepared, signed, sealed and dated by a Connecticut licensed Professional Engineer. No production piles can be driven until the report has been submitted and approved by the Engineer.

**4. Test Piles and Order Lists:** Test piles shall be driven at the locations shown on the plans and to the penetration depths specified by the Engineer. Test piles shall be driven to a driving resistance established by the Engineer at the estimated pile toe elevation. The Contractor shall excavate the ground at each test pile to the elevation of the bottom of the footing before the pile is driven. All test piles shall be driven with impact hammers unless specifically stated otherwise in the plans. In general, the specified length of test piles will be greater than the estimated length of production piles in order to provide for variation in soil conditions. The driving equipment used for driving test piles shall be identical to the equipment proposed for driving the production piling. Approval of driving equipment shall conform to the requirements of these Specifications.

Test piles that do not attain the specified driving resistance at a depth of 6 inches (150 millimeters) above the estimated pile tip elevation, or are specified as a dynamic monitoring pile, shall be redriven after being allowed to set up. The minimum time period before restrike shall be 24 hours, or as specified in the contract documents. A cold hammer shall not be used for the restrike. The hammer used shall be warmed up by applying at least 20 blows to another pile.

Unless otherwise specified in the contract documents, the Contractor shall not order piling to be used in the permanent structure until test pile data has been reviewed and pile order lengths are authorized by the Engineer. The Engineer will provide the pile order list after completion of the test pile(s) and dynamic pile driving analysis (PDA) tests and/or pile loading tests specified in the contract documents.



When no test piles are specified for a substructure, the estimated pile lengths in the contract documents are taken as the pile order length.

The lengths given in the order list will be based on the lengths which are assumed after cutoff to remain in the completed structure. The Contractor shall, without added compensation, increase the lengths to provide for fresh heading and for such additional length as may be necessary to suit the Contractor's method of operation.

**5. Pile Preparation and Driving:** The heads of all piles shall be plane and perpendicular to the longitudinal axis of the pile before the helmet is attached. Approval of a pile hammer relative to driving stress damage shall not relieve the Contractor of responsibility for piles damaged because of misalignment of the leads, failure of cushion materials, failure of splices, malfunctioning of the pile hammer, or other improper construction methods. Piles damaged for such reasons shall be rejected and replaced at the Contractor's expense when the Engineer determines that the damage impairs the strength of the pile.

If it becomes necessary and is authorized by the Engineer to resort to jetting, spudding or pre-holing — and further, if no contract bid price is asked for in the proposal for jetting, spudding, or pre-holing — such work will be paid for as "extra work" in accordance with Articles 1.04.05 and 1.09.04.

The use of a hammer with a greater mass, or the use of piles manufactured or designed with pile tips of a nature to provide for better penetration such as but not limited to composite shells, tapered sections or H-pile sections, shall not be considered as extra work. Authorized point reinforcement for piles shall be a separate item.

Piles for exposed pile bents shall be driven with pile driver leads and templates. They shall be of rigid design and construction and shall maintain the required position and alignment of the piles within the tolerances hereinafter specified. Templates shall be anchored or spudded into position, shall be capable of guiding all piles required for the bent and shall remain in place until all the piles in the bent are driven.

**(a) Location and Alignment Tolerance:** Piles shall be driven with a variation of not more than 1/4 inch per foot (20 millimeters/meter) from the vertical or from the batter line indicated, except that piles for trestle bents shall be so driven that the cap may be placed in its proper location without inducing excessive stresses in the piles. Upon completion of driving and released from leads, exposed piles such as in bents shall not have a variation of more than 2 inches (50 millimeters) at the cut-off elevation from the position shown on the plans. Unless otherwise permitted in writing by the Engineer, failure to meet this tolerance shall be cause for rejection. Other foundation piles shall not be out of the position shown on the plans more than 6 inches (150 millimeters) after driving. The Engineer may require that driving be stopped in order to check the pile alignment. Pulling laterally on piles to correct misalignment, or splicing a properly aligned section on a misaligned section shall not be permitted.

If the location and/or alignment tolerances specified are exceeded, the extent of overloading shall be evaluated by the Engineer. If in the judgment of the Engineer, corrective measures are necessary, suitable measures shall be designed and constructed by the Contractor.

**(b) Heaved Piles:** Level readings to measure pile heave after driving shall be made by the Contractor at the start of pile driving operations and shall continue until the Engineer determines that such checking is no longer required. Level readings shall be taken immediately after the pile has been driven and again after piles within a radius of 15 feet (4.5 meters) have been driven. If pile heave is observed, the Contractor shall take accurate level readings referenced to a fixed datum on all piles immediately after installation and periodically thereafter as adjacent piles are driven to determine the pile heave range. All piles that have been heaved more than ¼ inch (6 millimeters) shall be redriven at the Contractor's cost, to the required resistance or penetration. Concrete shall not be placed in pile casings until pile driving has progressed beyond a radius of 15 feet (4.5 meters) from the pile to be concreted. If pile heave is detected for pipe or shell piles which have been filled with concrete, the piles shall be redriven to original position after the concrete has obtained sufficient strength and a proper hammer-pile cushion system, satisfactory to the Engineer, is used.

**(c) Installation Sequence:** The order of placing individual piles in pile groups shall be either starting from the center of the group and proceeding outwards in both directions or starting at the outside row and proceeding progressively across the group.

**6. Unsatisfactory Piles:** The method used in driving piles shall not subject the piles to excessive or undue abuse producing crushing and spalling of concrete, injurious splitting, splintering, and brooming of the wood, or deformation of the steel. Misaligned piles shall not be forced into proper position. Any pile damaged during driving by reason of internal defects, or by improper driving, or driven out of its proper location, or driven below the designated cutoff elevation, shall be corrected by the Contractor by a method approved by the Engineer.

Piles which have been bent during installation shall be considered unsatisfactory unless the ultimate capacity is proven by load tests performed at the Contractor's expense. If such tests indicate inadequate capacity, corrective measures as determined by the Engineer shall be taken, such as use of bent piles at reduced capacity, installation of additional piles, strengthening of bent piles, or replacement of bent piles.

A concrete pile will be considered defective if a visible crack, or cracks, appears around the entire periphery of the pile, or if any defect is observed which, as determined by the Engineer, affects the strength or life of the pile.

**7. Splicing Piles and Extensions:** Full length piles shall be used when practicable; but if splices cannot be avoided, piles or shells for cast-in-place piles may be spliced in accordance with the requirements of the plans. Piles shall not be spliced except with the approval of the Engineer. Splices in excess of two per pile for timber, steel and cast-in-place concrete piles will not be permitted except with special permission of the Engineer. Only one splice per pile will be permitted in precast concrete or prestressed concrete piles. In the absence of splice details in the plans, piles or shells for cast-in-place concrete piles shall be spliced in accordance with the pile or shell manufacturer's recommendations, subject to the approval of the Engineer. Working Drawings for prefabricated splicing devices and their method of installation shall be submitted to the Engineer for review. All seams, joints and splices shall develop the full strength of the pile.

**8. Point Reinforcement:** When directed by the Engineer, the contractor shall point-reinforce piles. Such point-reinforcement shall be in accordance with the plans or as directed.

**9. Cutoff Lengths:** The pile head of all permanent piles and pile casings shall be cutoff at the elevation shown on the plans or as ordered by the Engineer. All cutoff lengths shall become the property of the Contractor, and shall be removed by the Contractor from the site of the work.

**10. Painting Steel Piles and Steel Pile Shells:** When steel piles or steel pile shells extend above the ground surface or water surface, they shall be painted as specified elsewhere in the contract documents or as ordered by the Engineer. This protection shall extend from an elevation 2 feet (600 millimeters) below the ground or water surface to the top of the exposed steel.

**11. Welding on Piles:** When required or permitted, all welding on piles shall be done in accordance with the requirements of the current AWS Structural Welding Code.

#### **7.02.04—Method of Measurement**

**1. Steel Piles-Timber Piles-Precast Concrete Piles:** The length of (type) piles which will be the basis for the pay computation to be included under the item of furnishing (type) piles, shall be number of linear feet (meters) of (type) piles authorized by the Engineer or actually furnished by the Contractor, whichever is the lesser amount.

Length of pile cutoffs previously paid for under authorized lengths of piles and subsequently incorporated into the work will not be measured for payment.

The work, materials, tools, equipment and labor incidental to the disposal of pile cutoffs will not be measured for payment.

The amounts to be included under the item for driving (type) piles will be the number of linear feet (meters) of piles actually driven and accepted in the completed structure.

**2. Cast-in-Place Concrete Piles:** The amount to be included under the item of cast-in-place concrete piles shall be the number of linear feet (meters) of piles actually driven and accepted in place in the completed structure.

Cut-off materials from shells shall remain the property of the Contractor. They will be paid for in accordance with the unit cost applying in the Contractor's bill or bills for such shells, except that no payment will be made of material cut off from shells furnished by the Contractor in excess of the ordered length. The unit of measurement will be the unit applying in the Contractor's bill or bills for such shells. Material cut off from shells furnished by the Contractor in lengths in excess of those ordered by the Engineer will not be measured for payment hereunder. The work, materials, tools, equipment and labor incidental to the disposal of cutoffs will not be measured for payment.

Reinforcement, if required in cast-in-place concrete piles, will not be measured for payment.

**3. Prestressed Concrete Piles (Pretensioned):** The length of the prestressed concrete piles, which will be the basis for the pay computation, shall be the number of linear feet (meters) of piles authorized by the Engineer or actually furnished by the Contractor, whichever is the lesser amount. The length of any specified pile tip protruding from the concrete will be included in the length measured for payment.

Also included in the length measured for payment will be the length of precast pile extensions ordered by the Engineer. Not to be included, however, is the length of pile extension furnished in excess of the ordered length. The length of projection dowels shall not be included in the length measured for payment.

Extensions to prestressed concrete piles which are poured monolithically with the footing or pier cap will be paid for at the Contract unit prices for the several items involved, which prices shall be full compensation for all materials, tools, equipment and labor necessary to the completion of the work.

Cut-offs shall not be used for pile extension. The work, material, tools equipment and labor incidental to the disposal of cutoffs will not be measured for payment.

The amounts to be included under the item for driving prestressed concrete piles shall be the number of linear feet (meters) of piles actually driven and accepted in the completed structure.

**4. Test Piles:** The amounts to be included under the respective items for test piles, of the type and length specified, shall be the number of test piles actually driven and accepted. Lengths of test piles ordered by the Engineer in excess of the length or lengths specified in the contract will be measured for payment by the actual number of linear feet (meters) ordered, furnished and accepted by the Engineer. Driving of such pile extensions will be measured for payment by the actual length driven and left in place.

Authorized splices performed on test piles will be measured for payment by the number of authorized splices actually completed and accepted. Splicing of test piles shall not be considered as authorized splices when such splicing is done to complete piles to the test pile length specified in the contract.

**5. Static Load Tests:** The amount to be included under the item of static loading tests shall be the actual number of static load tests completed and accepted.

**6. Dynamic Pile Driving Analysis (PDA) Test:** The amount to be included under this item shall be the actual number of piles which are driven and restruck with dynamic monitoring equipment attached, completed and accepted

**7. Splices:** The amount to be included under the items for splicing timber, steel, cast-in-place concrete, precast concrete and prestressed concrete piles (pretensioned) shall be the number of authorized pile splices actually completed and accepted. The splicing of timber and steel piles, steel shells for cast-in-place concrete piles, precast concrete piles and prestressed concrete piles (pretensioned) shall not be considered as authorized splices when such splicing is performed to complete piles to the order lengths, as defined in Subarticle 7.02.03-7, or when the furnished lengths of such piles are less than the order lengths approved by the Engineer.

**8. Point Reinforcement for Piles:** The amount to be included under the item of "Point Reinforcement for Piles" for the type of piles specified shall be the number of authorized reinforced points actually completed and accepted.

**9. Pre-Augering of Piles:** The amount to be included under the item "Pre-Augering of Piles" shall be the number of linear feet (meters) of pre-augering completed and accepted by the Engineer.

**7.02.05--Basis of Payment:** This work will be paid for as follows:

**1. Steel Piles:** Payment for furnishing steel piles of the lengths authorized will be at the Contract unit price per pound (kilogram) for "Furnishing Steel Piles," which price shall include furnishing, delivery, storage and handling, and all materials, equipment, tools and labor incidental thereto. The weight (mass) of steel pile caps will be included with and paid for under this item.

Payment for driving steel piles will be at the contract unit price per linear foot (meter) for "Driving Steel Piles," complete in place, which price shall include all materials, equipment, tools and labor incidental thereto.

**2. Timber Piles:** Payment for furnishing timber piles or treated timber piles, up to a length 10 feet (3 meters) greater than that specified on the plans or in the proposal form, will be at the Contract unit price per foot (meter) for "Furnishing Timber Piles (' Length)" and "Furnishing Treated Timber Piles (' Length)," respectively, which price shall include furnishing, delivery, peeling, storage and handling, and all materials, equipment, tools and labor incidental thereto.

In case the length of any piles finally ordered is more than 10 feet (3 meters), but less than 20 feet (6 meters), greater than the length specified on the plans or proposal form, payment for furnishing such piles shall be at a price per linear foot (meter) equal to the original contract price, plus 20 percent thereof.

In case the length of any piles finally ordered is 20 feet (6 meters) or more greater than the length specified on the plans or proposal form, payment for furnishing such piles shall be at a price per linear foot (meter) equal to the original contract price plus 40 percent thereof.

Payment for driving timber piles or treated timber piles will be at the contract unit price per linear foot (meter) for "Driving Timber Piles" and "Driving Treated Timber Piles," respectively, complete in place and regardless of length, which price shall include all materials, equipment, tools and labor incidental thereto.

**3. Cast-in-Place Concrete Piles:** Payment for cast-in-place concrete piles will be at the contract unit price per linear foot (meter) for "Cast-in-Place Concrete Piles," complete in place, including all materials, equipment, tools and labor incidental thereto.

Cut-off materials from shells shall remain the property of the Contractor. They will be paid for in accordance with the unit cost applying in the Contractor's bill or bills for such shells, except that no payment will be made for material cut off from shells furnished by the Contractor in excess of the ordered length.

**4. Prestressed Concrete Piles:** Payment for furnishing prestressed concrete piles, of the lengths required, will be at the contract unit price per linear foot (meter) for "Furnishing Prestressed Concrete Piles" of the type and size as shown on the plans, which price shall include furnishing, delivery, storage and handling, and all materials, equipment, tools and labor incidental thereto.

Payment for driving prestressed concrete piles will be at the contract unit price per linear foot (meter) for "Driving Prestressed Concrete Piles," complete in place, which price shall include all material, equipment, tools and labor incidental thereto. Also included shall be all work involved in cutting piles to the direct cut-off elevation.

**5. Test Piles:** Test piles will be paid for at the contract unit price each for "Test Pile," of the type and length specified, which price shall constitute the complete compensation for furnishing and driving test piles and shall include all materials, equipment, tools and labor incidental thereto. Authorized splices to test piles will be paid for at 200 percent of the contract unit price bid for Splicing Timber Piles, Splicing Steel Piles, Splicing Cast-in-Place Piles or Splicing Prestressed Concrete Piles, whichever type of test pile the splice has been performed on; and such payment shall be for all costs including materials, equipment, tools and labor incidental thereto.

Extension to test piles in excess of the specified length will be paid for on the following basis, which shall include all equipment, tools, splices, labor and work incidental thereto.

**(a) Timber Test Piles:** Extensions will be paid for at 125 percent of the contract unit price per linear foot (meter) for "Furnishing Timber Piles," of the shortest length specified in the proposal, and at 125 percent of the contract unit price per linear foot (meter) for "Driving Timber Piles."

**(b) Steel Test Piles:** Extensions will be paid for at 125 percent of the contract unit price per pound (kilogram) for "Furnishing Steel Piles" and at 125 percent of the contract unit price per linear foot (meter) for "Driving Steel Piles."

**(c) Cast-in-Place Concrete Test Piles:** Extensions will be paid for at 125 percent of the contract unit price per linear foot (meter) for "Cast-in-Place Concrete Piles." Cut-off materials from shells will be paid for as provided in Subarticle 7.02.05-3.

**(d) Prestressed Concrete Test Piles:** Extensions will be paid for at 125 percent of the contract unit price per linear foot (meter) for "Furnishing Prestressed Concrete Piles," and at 125 percent of the contract unit price per linear foot (meter) for "Driving Prestressed Concrete Piles."

**6. Static Load Tests:** Loading tests will be paid for at the contract unit price each for "Pile Loading Test," which price shall include all expenses incidental to loading the pile or group of piles and removing the load, platform, etc., upon completion of the test.

**7. Dynamic Pile Driving Analysis (PDA) Test:** Dynamic monitoring will be paid for at the contract unit price each for "Dynamic Pile Driving Analysis (PDA) Test" which price shall include complete compensation for each pile tested using a pile driving analyzer during driving and restrike, including all materials, equipment, tools and labor incidental thereto, as well as providing preliminary and summary report(s).

**8. Splices:** Authorized splices in timber, steel, cast-in-place piles, precast concrete and prestressed concrete piles will be paid for at the contract unit price each for "Splicing Timber Piles," "Splicing Steel Piles," "Splicing Cast-in-Place Concrete Piles," "Splicing Precast Concrete Piles," "Splicing Prestressed Concrete Piles," respectively, which price shall include all materials, except as otherwise noted, and all equipment, tools and labor incidental thereto. In the absence of such prices, authorized splices will be paid for as extra work.

**9. Trimming and Cutting:** There shall be no direct compensation for cutting off timber, steel, precast concrete or prestressed concrete piles and shells for cast-in-place concrete piles as ordered; but the cost thereof shall be considered as included in the cost of the pile items.

**10. Point Reinforcement for Piles:** Authorized points for pointing and reinforcing piles will be paid for at the contract unit price each for "Point Reinforcement for Timber Piles," or "Point Reinforcement for Steel Piles," respectively, whichever applies, which price shall include all materials, equipment, tools and labor incidental thereto. In the absence of such prices, authorized points will be paid for as extra work.

**11. Pre-Augering of Piles:** Payment for "Pre-Augering of Piles" will be at the contract unit price per linear foot (meter) for "Pre-Augering of Piles," which price shall include which price shall include all materials, and all equipment, tools and labor incidental thereto.

**12. Underground Obstructions:** If the required pile penetration is not reached due to the presence of underground obstructions which are not the result of the Contractor's operations but are due to the presence of earlier construction at the site, then the cost of removing these obstructions and back-filling the area will be paid for as extra work unless otherwise specified in the contract documents.

**13. Painting:** There will be no additional payment for painting steel piles and steel pile shells, but the cost thereof shall be considered as included in the cost of furnishing and driving the piles.

**14. Disposal of Pile Cutoffs:** All costs incidental to the disposal of cutoff material will be included in the price of furnishing of the type of pile specified.

Pay Item	Pay Unit
Furnishing (Type) Piles (Lengths)	lb. (kg)
Driving (Type) Piles	l.f. (m)
Test Pile (Type-Length)	ea. (ea.)
Splicing (Type) Piles	ea. (ea.)
Point Reinforcement for (Type) Piles	ea. (ea.)
Pile Loading Test	ea. (ea.)
Dynamic Pile Driving Analysis (PDA) Test	ea. (ea.)
Pre-Augering of Piles	l.f. (m)

**CONNECTICUT  
SUPPLEMENTAL SPECIFICATION  
SECTION 7.06  
MICROPILES**

*Add the following section:*

**SECTION 7.06  
MICROPILES**

**7.06.01 – Description**

**7.06.02 – Materials**

**7.06.03 – Construction Methods**

**7.06.04 – Method of Measurement**

**7.06.05 – Basis of Payment**

**7.06.01 - Description:** This work shall consist of constructing micropiles in accordance with the Contract. The Contractor is responsible for furnishing all design, materials, products, accessories, tools, equipment, services, transportation, labor and supervision required for design, installation and testing of micropiles and micropile top attachments for this Project.

The Contractor shall select the micropile type, size, pile-top attachment, installation means and methods, and shall estimate the grout-to-ground bond value(s) and determine the required grout bond length and final micropile diameter.

The Contractor shall design and install micropiles that will develop the load capacities indicated on the plans. The micropile load capacities shall be confirmed by verification and proof-load testing as required and must meet the test acceptance criteria specified herein. The Contractor's micropile design shall conform to requirements set forth in this specification and to micropile design minimums/maximums shown on the Contract drawings.

**7.06.02 - Materials:** Furnish new materials without defects. Materials for micropiles shall comply with the following:

- 1. Admixtures for Grout:** Admixtures shall comply with Article M.03.01 hereof. Accelerators are not permitted. Expansive admixtures and admixtures containing chlorides are not permitted.
- 2. Cement:** Cement shall conform to ASTM C 150/AASHTO M85, Types II, III or V.
- 3. Centralizers and Spacers:** Centralizers and spacers shall be fabricated from Schedule 40 PVC pipe.
- 4. Grout:** Grout shall consist of neat cement or fine aggregate/cement mixture meeting the three (3) and twenty-eight-(28-)day required compressive strengths specified in the Contract. The grout shall conform to AASHTO T106/ASTM C109 and to any minimum and



maximum properties shown on the plans or in Article M.03.05.

- 5. Permanent Casing Pipe:** Permanent steel casing or steel pipe shall conform to required minimum and maximum properties shown on the plans. The steel casing or steel pipe shall comply with one or more of the following specifications: ASTM A252 or A106, or API N-80.
- 6. Reinforcing Bars:** Reinforcing steel shall be deformed bars in accordance with ASTM A615/AASHTO M31. Continuous spiral deformations (*i.e.*, continuous thread bars) shall be used for same. Bar tendon couplers, if required, shall develop the ultimate tensile strength of the bars without evidence of any failure.
- 7. Encapsulation:** Encapsulation (double corrosion protection) shall be shop-fabricated using high-density, corrugated polyethylene tubing complying with the requirements of ASTM D3350/AASHTO M252 with a nominal wall thickness of 0.03 in (0.8 mm). The inside annulus between the reinforcing bar(s) and the encapsulation tube shall measure a minimum 0.2 in (5 mm) and be fully grouted with non-shrink grout conforming to Section M.03.

#### **7.06.03 - Construction Methods:**

- 1. Contractor's Experience Requirements:** The micropile Contractor shall be experienced in the construction and load testing of micropiles, having successfully constructed at least five (5) projects in the last five (5) years involving construction totaling at least one hundred (100) micropiles of capacity similar to that required of the ones in these plans and Specifications.

The Contractor shall have previous micropile drilling and grouting experience in soil/rock conditions similar to those on this Project. The Contractor shall submit construction details, structural details and load test results for at least three (3) previous successful micropile load tests from different projects similar in scope to this Project.

The Contractor shall assign or hire a professional engineer, licensed in the State of Connecticut, to supervise the micropile work. That engineer shall have experience on at least ten (10) projects of similar scope to this Project, completed over the past five (5) years. The Contractor shall not use manufacturers' representatives to satisfy the supervising engineer requirements of this Section. The Contractor may use a single independent consultant for this purpose, provided that the consultant has specific experience as described above and operates specifically for the purpose of transferring technology and skills in micropiling to contractors. The on-Site foremen and drill rig operators shall also have experience on at least ten (10) projects over the past five (5) years installing micropiles of equal or greater capacity than is required in these plans and Specifications.

The Contractor shall assign or hire a professional engineer, licensed in the State of Connecticut, to design the micropiles. This engineer shall have experience in the design of at least three (3) successfully-completed micropile projects over the past five (5) years, with micropiles of capacity similar to that required in these plans and specifications. This engineer shall also be responsible for design, supervision and reporting of the verification and proof test(s).

At least forty-five (45) calendar days before the planned start of micropile construction, the Contractor shall submit five (5) copies of the completed Project reference list and a personnel list. The Project reference list shall include a brief Project description with the owner's name and current phone number and load test reports. The personnel list shall identify the supervising Project Engineer, drill rig operators, and on-Site foremen to be assigned to this Project by the Contractor. The personnel list shall contain a summary of each individual's experience and be complete enough for the Engineer to determine whether each individual has the required qualifications.

Work shall not start, nor materials be ordered, until the Engineer gives written approval of the Contractor's experience qualifications. The Engineer may suspend work if the Contractor uses non-approved personnel on the Project. If work is suspended for that reason, the Contractor shall be fully liable for all resulting costs, and Department will not make any Contract time adjustments because of the suspension.

**2. Micropile Design Requirements and Submittals:** The micropiles shall be designed to meet the specific loading conditions, as shown on the plans and approved working drawings. The micropile design shall conform to all required minimum and maximum properties shown on the plans, the "American Association of State Highway and Transportation Officials (AASHTO) LRFD Bridge Design Specifications" (including the latest Interims), and the "Connecticut Department of Transportation Bridge Design Manual."

Where called for on the plans, the Contractor shall provide corrosion protection of the internal steel reinforcing bars, consisting of encapsulation, epoxy coating or grout. Where the permanent casing is used for a portion of the micropile, the corrosion protection shall extend at least 5 ft (1.5 m) into the casing. Steel pipe used for micropile permanent casing shall incorporate an additional 1/16 in (1.6 mm) thickness of sacrificial steel for corrosion protection.

The Contractor shall submit working drawings in accordance with Section 1.05 to the Engineer. The working drawings shall include all information required for the design, plans, construction and quality control of the micropile installation. The information shall include, but not necessarily be limited to, the following;

**(a) Design Computations**

- I. A written summary report describing the overall micropile design.
- II. A statement of applicable code requirements and design references.
- III. Micropile structure critical design cross-section(s) geometry, including soil/rock strata and piezometric levels and location, magnitude and direction of applied loadings, including slope or external surcharge loads.
- IV. A description of design criteria to be applied to the work, including, soil/rock shear strengths (friction angle and cohesion), unit weights, and grout-to-ground bond value(s) and micropile drill-hole diameter assumptions for each soil/rock stratum.
- V. A statement of Resistance/Load factors used in the design of the grout-to-ground

bond value(s), surcharges, soil/rock and material unit weights, steel, grout and concrete materials.

- VI. Design calculation sheets with the Project number, micropile structure location, designation, date of preparation, initials of designer and checker, and page number at the top of each page. Provide an index page for the design calculations.
- VII. Design notes including a list of symbols and computer program used in the design.
- VII. Pile-to-footing connection calculations.

**(b) Plans**

- I. A plan view of the micropile structures providing:
  - i. A reference baseline and elevation datum.
  - ii. The offset from the construction centerline or baseline to the face of the micropile structure at all changes in horizontal alignment.
  - iii. Beginning and end of micropile structure stations.
  - iv. Right-of-way and permanent or temporary construction easement limits, location of all known active and abandoned utilities, adjacent structures or other potential interference; and the centerline of any drainage structure or drainage pipe behind, passing through or passing under the micropile structure.
  - v. Subsurface exploration locations shown on the plan view of the proposed micropile structure alignment with appropriate reference baselines to fix the locations of the exploration relative to the micropile structure.
- II. An elevation view of the micropile structure(s) providing:
  - i. Elevation view showing micropile locations and elevations; vertical and horizontal spacing; batter and alignment and the location of drainage elements (if applicable).
  - ii. Existing and finished grade profiles both behind and in front of the micropile structure.
- III. Design parameters and applicable codes.
- IV. General notes for constructing the micropile structure, including construction sequencing or other special construction requirements.
- V. Horizontal and vertical curve data affecting the micropile structure and micropile structure control points. Match lines or other details to relate micropile structure stationing to centerline stationing.
- VI. A listing of the summary of quantities on the elevation drawing of each micropile structure, showing pay item estimated quantities.

- VII. Micropile typical sections, including micropile spacing and inclination; minimum drill-hole diameter; pipe casing and reinforcing bar size and details; splice type and locations; centralizers and spacers; grout bond zone and casing plunge length (if used); corrosion protection details; and connection details to the substructure footing, anchorages and plates.
- VIII. A typical detail of verification and production proof test micropiles defining the micropile length, minimum drill-hole diameter, inclination, and load test bonded and unbonded test lengths.
- IX. Details, dimensions and schedules for all micropiles, casing and reinforcing steel, including reinforcing bar bending details.
- X. Details for constructing micropile structures around drainage facilities (if applicable).

**(c) Construction Procedures**

- I. Detailed step-by-step description of the proposed micropile construction procedure, including personnel, testing and equipment to ensure quality control. This step-by-step procedure shall be shown in sufficient detail to allow the Engineer to monitor the construction and quality of the micropiles.
- II. Proposed start date, time schedule and micropile installation schedule providing the following:
  - i. Micropile number.
  - ii. Micropile design load.
  - iii. Type and size of rebar.
  - iv. Minimum total bond length.
  - v. Total micropile length.
  - vi. Micropile top footing attachment.
- III. If welding of casing is proposed, submit the welding procedure. All welding shall be done in accordance with the current AWS Structural Welding Code.
- IV. Information on space requirements for installation equipment that verify the proposed equipment can perform at the Site.
- V. Proposed plan describing how surface water, drill flush, and excess waste grout will be controlled and disposed. This will include computations showing that the proposed equipment used for flushing the micropile during installation (*i.e.*, pumps for water flushing and compressors for air flushing) will maintain up-hole (flushing) velocities necessary to ensure that all of the flush and drill cuttings are returned up through the annulus between the drill rod and casing.

- VI. Certified mill test reports for the reinforcing steel and for permanent casing. The ultimate strength, yield strength, elongation, and material properties composition shall be included. For API N-80 pipe casing, coupon test results may be submitted in lieu of mill certification.
- VII. Proposed Grouting Plan. The grouting plan shall include complete descriptions, and details for the following:
  - a. Grout mix design and type of materials to be used in the grout, including certified test data and trial batch reports. The Contractor shall also provide specific gravity of the wet mix design.
  - b. Methods and equipment for accurately monitoring and recording the grout depth and grout volume as the grout is being placed.
  - c. Estimated curing time for grout to achieve specified strength. Previous test results for the proposed grout mix completed within one (1) year of the start of grouting may be submitted for initial verification and acceptance and start of production work. During production, grout shall be tested in accordance with Article M.03.05.
  - d. Procedure and equipment for Contractor monitoring of grout quality. At a minimum, the Contractor shall be required to use a Baroid Mud Balance (per API RP-13B-1) to check the specific gravity of the mixed grout prior to placement into each drilled micropile.
- (d) Detailed plans for the proposed micropile load testing method. This shall include all drawings, details, and structural design calculations necessary to clearly describe the proposed test method, reaction load system capacity and equipment setup, types and accuracy of apparatus to be used for applying and measuring the test loads and pile top movements in accordance with this Specification.
- (e) Calibration reports and data for each test jack, pressure gauge and master pressure gauge and electronic load cell to be used. The calibration tests shall have been performed by an independent testing laboratory within ninety (90) calendar days of the date submitted. Testing shall not commence until the Engineer has reviewed and accepted the jack, pressure gauge, master pressure gauge and electronic load cell calibration data.

Work shall not begin until the construction submittals have been received, reviewed, and accepted in writing by the Engineer. Any submittals found to be unacceptable by the Engineer shall be revised, resubmitted and accepted prior to commencing work.

**3. Pre-construction Meeting:** A pre-construction meeting will be scheduled by the Engineer and held prior to the start of micropile construction. The Engineer, prime Contractor, micropile specialty Contractor and micropile design engineer shall attend the meeting. Attendance is mandatory. The pre-construction meeting will be conducted in order to clarify the construction requirements for the work, to coordinate the construction schedule and activities, and to identify contractual relationships and delineation of responsibilities among the prime Contractor and the various subcontractors - specifically those pertaining to

excavation for micropile structures, installation of temporary sheeting, anticipated subsurface conditions, micropile installation and testing, micropile structure survey control and Site drainage control.

- 4. Site Drainage Control:** The Contractor shall control and properly dispose of drill flush and construction related waste, including excess grout, in accordance with Section 1.10, any related Special Provisions in the Contract, and all applicable codes and regulations. Drill flush shall be conveyed by pipe, hose or conduit away from the location where the micropile is being drilled and away from any adjacent structure or facility. The Engineer will determine the acceptable distance required to convey the drill flush away from the micropile location. The Contractor shall provide positive control and discharge of all surface water that will affect construction of the micropile installation; maintain all pipes or conduits used to control surface water during construction; and repair any damage caused by surface water at no additional cost to the Department. Upon substantial completion of the work, the Contractor shall remove surface water control pipes or conduits from the Site. Alternatively, with the approval of the Engineer, the Contractor may leave pipes or conduits in place if fully grouted.

The Contractor shall immediately contact the Engineer if unanticipated existing subsurface drainage structures or other utilities are discovered during excavation or drilling; and shall suspend work in such areas until remedial measures meeting the Engineer's approval are implemented.

**5. Micropile Allowable Construction Tolerances:**

- (a) Centerline of piling shall not be more than 3 in (75 mm) from indicated plan location. Centerline of reinforcing steel shall not be more than 0.5 in (13 mm) from the centerline of the pile.
- (b) Pile shall be plum or battered within two percent (2%) of total-length plan alignment.
- (c) Top elevation of pile shall be plus 1 in (25 mm) or minus 1 in (25 mm) maximum from vertical elevation indicated.

- 6. Micropile Installation:** The micropile Contractor shall select the drilling method, the grouting procedure and the grouting pressure used for installation of the micropiles. The micropile Contractor shall also determine the micropile casing size, final drill-hole diameter and bond length, and central tendon reinforcement steel size necessary to develop the specified load capacities and load testing requirements. All micropile material properties and dimensions shall conform to minimum/maximum properties and dimensions as shown in the Contract drawings. The micropile Contractor is also responsible for estimating the grout take. The Department will make no extra payment for grout overruns.

Should the plans require uncased drilling of the micropile into bedrock, the permanent or temporary casing shall be drilled a minimum 6 in (150 mm) into ledge or to a depth within the ledge so as to prevent subsidence of overburden into the uncased and bonded zone portion of the drill-hole (*i.e.*, the rock socket). The plans show estimated permanent casing lengths for each substructure unit. Any difference in the required length of permanent casing accepted by the Engineer from the estimated lengths shown on the plans shall be

measured for payment and credit. The Department will make no payment for differences in required length of temporary casing.

The drilling equipment and methods shall be suitable for drilling through the conditions to be encountered, without causing damage to the overburden, any overlying or adjacent structures, buried structures, utilities or services. If called for in the drilling method description, or by the nature of the stratum to be drilled through, the micropile Contractor shall furnish an overburden casing of the type and thickness that can be installed without distortion. Casings that fail, fracture, or otherwise distort during drilling or after drilling shall, unless otherwise directed, be withdrawn or replaced at the micropile Contractor's expense. The drill-hole must be open along its full length to at least the design minimum drill-hole diameter prior to placing grout and reinforcement.

Temporary casing or other approved method of pile drill-hole support will be required in caving or unstable ground in order to permit the pile shaft to form a drill hole of the minimum design diameter. The Contractor's proposed method(s) to provide drill-hole support and to prevent detrimental ground movements must be reviewed by the Engineer in advance of its use. Detrimental ground movement is defined as movement that requires remedial repair measures, in order to maintain Site conditions as determined by the Engineer.

Drilling and flushing methods shall be selected by the Contractor. Use of drilling fluid containing bentonite or any other non-reverting drilling fluid, however, is not allowed. The drilling and flushing system chosen by the Contractor shall be capable of providing the necessary up-hole velocity so as to ensure that all the flush and drill cuttings are returned up through the annulus between the drill rod and casing. The flush must not be allowed to escape in an uncontrollable fashion into the soil and rock formations outside the casing. The return flush must never be blocked or suppressed within the casing on its way back to the surface. The Contractor shall monitor and modify, as needed, the flush velocity and other elements of its drilling methods that could contribute to return of flush outside the casing. When return of flush is substantially lost during drilling, the Contractor shall halt drilling operations and immediately notify the Engineer of the situation.

During construction, the Contractor shall observe the ground conditions in the vicinity of the micropile construction site on a daily basis for signs of ground heave or subsidence, and must immediately notify the Engineer if signs of movements are observed. The micropile Contractor shall immediately suspend or modify drilling or grouting operations if ground heave or subsidence is observed, if the micropile structure is adversely affected, or if adjacent structures are damaged because of the drilling or grouting. If the Engineer determines that the movements require corrective action, the micropile Contractor shall take corrective actions necessary to stop the movement or perform repairs.

Reinforcement may be placed prior to grouting the drill-hole. Reinforcement surface shall be free of deleterious substances such as soil, mud, grease or oil that might contaminate the grout or coat the reinforcement and impair bond. Pile reinforcement groups, if used, shall be sufficiently strong to withstand the installation and grouting process without damage or disturbance.

The micropile Contractor shall check pile-top elevations and adjust all installed micropiles to the planned elevations.

Centralizers and spacers shall be provided at 10 ft (3 m) on center maximum spacing. The uppermost and lowest centralizers shall be located a maximum of 3 ft (0.9 m) from the top and bottom of the micropile. Centralizers and spacers shall be securely attached to the reinforcement, sized to position the reinforcement within 1/2 in (12 mm) of plan location from center of pile, sized to allow grout tremie pipe insertion to the bottom of the drill-hole, and must be of sufficient size to allow grout to flow freely up the drill-hole, up the casing, and between adjacent reinforcing bars. The reinforcing steel shall be inserted into the drill-hole to the desired depth without difficulty. Partially inserted reinforcing bars shall not be driven or forced into the hole. The micropile Contractor shall re-drill and reinsert reinforcing steel when necessary in order to facilitate insertion.

Lengths of casing and reinforcing bars to be spliced shall be secured in proper alignment and in a manner that prevents eccentricity or an angle between the axes of the lengths to be spliced. Splices and threaded joints shall meet the requirements of the rebar material. Threaded pipe casing joints shall be located at least two (2) casing diameters (OD) from a splice in any reinforcing bar. When multiple bars are used, bar splices shall be staggered at least 1 ft (0.3 m).

Micropiles shall be grouted on the same day that the load transfer bond length is drilled. The grouting equipment used shall be a colloidal grout plant and shall produce a grout free of lumps and undispersed cement. Paddle type mixers are not acceptable. The micropile Contractor shall have means and methods of measuring the grout quantity and pumping pressures during the grouting operations. The grout pump shall be equipped with a pressure gauge to monitor grout pressure. A second pressure gauge shall be placed at the point of injection into the pile top. The pressure gauge shall be capable of measuring pressures of at least 145 psi (1000 kPa) or two (2) times the actual grout pressure used, whichever is greater. The grout shall be kept in agitation prior to mixing. Grout shall be placed within one (1) hour of mixing. The grouting equipment shall be sized to enable each pile to be grouted in one continuous operation. The grout shall be injected from the lowest point of the drill-hole, and injection shall continue until uncontaminated grout flows from the top of the pile. The grout may be pumped through grout tubes, casing, hollow stem augers or drill rods. Temporary casing, if used, shall be extracted in stages so as to ensure that, after each length of casing is removed, the grout level is brought back up to the ground level before the next length is removed. The tremie pipe or casing shall always extend below the level of the existing grout in the drill-hole. The grout takes shall be controlled to prevent excessive heave or fracturing of rock or soil formations. Upon completion of grouting, the grout tube may remain in the hole, but must be filled with grout.

If the Contractor elects to use a post-grouting system, working drawings and details shall be submitted to the Engineer for review in accordance with Section 1.05.

Grout within the micropile verification and proof test piles shall attain the minimum required three-(3-)day compressive strength prior to load testing. During production, micropile grout shall be tested by the Contractor for compressive strength in accordance with AASHTO T106/ASTM C109 at a frequency of no less than one (1) set of three (3) each 2 in (50 mm) grout cubes, or 3 in (75 mm) cylinders, from each grout plant each day of operation, or per every ten (10) micropiles, whichever occurs more frequently. The compressive strength shall be the average of the three (3) cubes or cylinders tested.



Grout consistency as measured by grout density shall be determined by the micropile Contractor per API RP-13B-1 at a frequency of at least one (1) test per pile, conducted just prior to start of pile grouting. The Baroid Mud Balance used in accordance with API RP-13B-1 is an approved device for determining the grout density of neat cement grout.

Provide grout cube or cylinder compressive strength and grout density test results to the Engineer within twenty-four (24) hours of testing.

- 7. Micropile Installation Records:** The micropile Contractor shall prepare and submit to the Engineer full-length installation records for each micropile installed. The records shall be submitted within one (1) work shift after that pile installation is completed. The data shall be recorded on a micropile installation log. A separate log shall be provided for each micropile.
- 8. Verification and Proof Tests:** The Contractor shall perform verification and proof testing of piles at the locations specified on the plans, and perform compression load testing in accord with ASTM D1143 and tension load testing in accord with ASTM D3689, except as modified herein. If the Contractor designs micropiles using tip resistance, it shall use ASTM 1143 for verification and proof tests thereof.

The Contractor shall perform pre-production verification pile load test(s) to verify the design of the pile system and the construction methods proposed prior to installing any production piles. Sacrificial verification test pile(s) shall be constructed by the Contractor in conformance with the approved working drawings, and shall install verification test pile(s) at the location(s) shown on the plans or at location(s) approved by the Engineer.

Verification load test(s) shall be performed in order to verify that the micropiles installed by the Contractor will meet the compression and tensile load capacities and load test acceptance criteria, and to verify that the length of the micropile load transfer bond zone is adequate. The micropile verification load test results must verify the Contractor's design and installation methods.

The drilling method, grouting method, permanent casing length, micropile diameter (cased and uncased) and bond zone length for the verification test pile shall be identical to those specified for the production piles at the given locations. The verification test micropile structural steel sections shall be sized to safely resist the maximum test load.

The maximum verification and proof test loads applied to the micropile shall not exceed eighty percent (80%) of the structural capacity of the micropile structural elements, including steel yield in tension, steel yield or buckling in compression, or grout crushing in compression. Any required increase in strength of the verification and proof test pile elements above the strength required for the production piles shall be provided for in the Contractor's bid price.

Testing equipment used in connection with the micropiles shall include dial gauges, dial gauge independent reference frame, jack and pressure gauge, electronic load cell (with readout device), and a reaction frame. The load cell is required only for the creep test portion of the verification test. The Contractor shall provide a description of test setup and jack, pressure gauge and load cell calibration curves as outlined in the Submittals Section.

The Contractor shall design the testing reaction frame to be sufficiently rigid and of adequate dimensions to ensure that excessive deformation of the testing equipment does not occur; and must align the jack, bearing plates, and stressing anchorage so that unloading and repositioning of the equipment will not be required during the test.

The Contractor shall also apply and measure the test load with a hydraulic jack and pressure gauge. The pressure gauge shall be graduated in 100 psi (690 kPa) increments or less. The jack and pressure gauge shall have a pressure range not exceeding twice the anticipated maximum test pressure. Jack ram travel shall be sufficient to allow the test to be done without resetting the equipment. The Contractor shall monitor the creep-test-load-hold during verification tests with both the pressure gauge and the electronic load cell; and shall use the load cell in order to accurately maintain a constant load hold during the creep-test-load-hold increment of the verification test.

The Contractor shall measure the pile top movement with a dial gauge capable of measuring to 0.001 in (0.025 mm). The dial gauge shall have a travel sufficient to allow the test to be done without having to reset the gauge; and the Contractor shall visually align the gauge to be parallel with the axis of the micropile and support the gauge independently from the jack, pile or reaction frame. The Contractor shall also use a minimum of two (2) dial gauges when the test setup requires reaction against the ground or single reaction piles on each side of the test pile.

The Contractor shall test verification piles to the following loads: Alignment Load ("AL"), Maximum Service Limit Pile Load ("SVL") and the Ultimate Pile Capacity ("UPC"). The SVL and UPC loads are provided on the Contract drawings. The AL is the minimum load applied to the micropile during testing needed to keep the testing equipment correctly positioned. The AL shall not exceed five percent (5%) of the SVL. The verification pile load tests shall be made by incrementally loading the micropile in accordance with the cyclic load schedule shown in Table 7.06-1, for both compression and tension loading (test the compression prior to tension).

**Table 7.06-1, Cyclic Load Schedule for Verification Pile Load Test**

Step	Loading	Applied Load	Hold Time (minutes)
1	Apply AL	AL	2.5
2	Cycle 1	0.15 SVL	2.5
		0.30 SVL	2.5
		0.45 SVL	2.5
		0.60 SVL	2.5
		0.75 SVL	2.5
		0.90 SVL	2.5
		1.00 SVL	10 to 60 minutes
		0.60 SVL	2.5
		0.30 SVL	2.5
		AL	
3	Cycle 2	0.075 UPC	2.5
		0.150 UPC	2.5
		0.225 UPC	2.5
		0.300 UPC	2.5
		0.375 UPC	2.5
		0.450 UPC	2.5
		0.525 UPC	2.5
		0.600 UPC	2.5
		0.675 UPC	2.5
		0.750 UPC	2.5
		0.825 UPC	2.5
		0.900 UPC	2.5
		1.000 UPC	10 to 60 minutes
		0.750 UPC	2.5
		0.525 UPC	2.5
		0.225 UPC	2.5
AL			

Pile-top movement shall be measured at each load increment. The load-hold period shall start as soon as each test load increment is applied. Pile movement during the 1.00 SVL and 1.000 UPC loads shall be measured and recorded at 1,2,3, 4, 5, 6, 10, 20, 30, 50, and sixty (60) minutes. The alignment load shall not exceed five percent (5%) of the SVL. Dial gauges shall be reset to zero after the initial AL is applied.

The acceptance criteria for micropile verification load test are:

- (a) The Engineer shall determine the criteria for tolerable movement during the load test at the top of the micropile.
- (b) At the end of the maximum test load increment for each cycle, test piles shall have a creep rate not exceeding 0.05 in (1.3 mm) /log cycle time (1 to 10 minutes) or 0.1 in (2.5 mm) /log cycle time (6 to 60 minutes or the last log cycle if held longer). The creep rate shall be linear or decreasing throughout the hold period.

- (c) Failure does not occur at any load increment up to and including the maximum test load for each cycle. Failure is defined as load at which attempts to further increase the test load simply result in continued pile movement.

Upon completion of the test, the Contractor shall prepare and submit a report of the test results, stamped by a professional engineer, for review and acceptance by the Engineer prior to beginning installation of production micropiles. This report shall include written confirmation of the verification micropile's capacity.

If a verification tested micropile fails to meet the acceptance criteria, the Contractor shall modify the design, the construction procedure, or both. These modifications may include modifying the installation methods, increasing the bond length, or changing the micropile type. Any modification that necessitates changes of the structure shall be submitted as a revision to the working drawings and require the Engineer's review and acceptance. Any modifications of design or construction procedures or cost of additional verification test piles and load testing shall be at the Contractor's expense. At the completion of verification testing, the Contractor shall remove test piles down to the elevation specified by the Engineer.

The Contractor shall perform proof load tests at the micropile locations as shown on the plans, and shall perform proof-load tests on the first set of production piles installed at each designated substructure unit prior to the installation of the remaining production piles in that unit. The initial proof-test piles shall be installed at the locations shown on the plans. Upon completion of each test, the Contractor shall prepare and submit a report of the test results, stamped by a professional engineer, for review and acceptance by the Engineer

The Contractor shall test proof test piles to a maximum test load of 1.00 times the Maximum Strength Limit Pile Load (STL). The STL load is provided on the Contract drawings. Proof tests shall be made by incrementally loading the micropile as shown in Table 7.06-2, to be used for both compression and tension loading:

**Table 7.06-2, Incremental Loading for Proof Test Piles**

Step	Loading	Applied Load	Hold Time (minutes)
1	Apply AL		2.5
2	Cycle 1	0.15 STL	2.5
		0.30 STL	2.5
		0.45 STL	2.5
		0.60 STL	2.5
		0.75 STL	2.5
		0.90 STL	2.5
		1.00 STL	10 to 60 minutes
		0.60 STL	2.5
		0.30 STL	2.5
		AL	

Depending on performance, either a ten-(10-)minute or sixty-(60-)minute creep test shall be performed at the 1.00 STL test load. Where the pile top movement between one (1) and then (10) minutes exceeds 0.039 in (1 mm), the Maximum Test Load shall be

maintained an additional fifty (50) minutes. Movements shall be recorded at 1, 2, 3, 5, 6, 10, 20, 30, 50 and 60 minutes. The alignment load shall not exceed five percent (5%) of STL. Dial gauges shall be reset to zero after the initial AL is applied.

The acceptance criteria for micropile proof load tests are:

- (a) The Engineer shall determine the criteria for tolerable movement during the load test at the top of the micropile.
- (b) At the end of the 1.00 STL test load increment, test piles shall have a creep rate not exceeding 0.05 in (1.3 mm) /log cycle time (1 to 10 minutes) or 0.1 in (2.5 mm) /log cycle time (6 to 60 minutes). The creep rate shall be linear or decreasing throughout the creep-load hold period.
- (c) Failure does not occur at the 1.00 STL maximum test load. Failure is defined as the load at which attempts to further increase the test load simply result in continued pile movement.

If a proof-tested micropile fails to meet the acceptance criteria, the Contractor shall immediately proof test another micropile within that footing. For failed piles and further construction of other piles, the Contractor shall modify the design, the construction procedure, or both. These modifications may include installing replacement micropiles, incorporating piles at not more than fifty percent (50%) of the maximum load attained, post-grouting the tested pile and re-proof testing the pile, modifying installation methods, increasing the bond length, or changing the micropile type. Any modification that necessitates changes of the structure design shall require the Engineer's prior review and acceptance. Any modifications of design or construction procedures, or cost of additional verification test piles and verification or proof load testing, or replacement production micropiles, shall be at the Contractor's expense.

#### **7.06.04 - Method of Measurement:**

- 1. Micropiles** will be measured for payment by the number of micropiles installed and accepted. There will be no separate measurement or payment for furnishing the design of the micropiles or developing installation methods to meet these Specifications.
- 2. Verification Test for Micropiles** will be measured for payment by the number of verification tests performed on sacrificial micropiles.
- 3. Proof Test for Micropiles** will be measured for payment by the number of proof tests performed on production micropiles.
- 4. Micropile Length Adjustment** will be measured for payment by the length in linear feet (meter) of the difference between the estimated length of permanent casing, as shown on the plans, and the actual length of permanent casing installed and accepted by the Engineer. (Note that the permanent casing length is measured from the bottom of the pile cap to the permanent casing tip, including the required embedment of casing into rock. Embedment into the pile cap will not be measured for payment because it is considered incidental to micropile construction. Any increase in casing length will be measured for

payment to the Contractor, and any decrease in casing length will be measured for credit to the State.)

There will be no separate measurement or payment for mobilization and demobilization associated with this item.

**7.06.05 - Basis of Payment:**

- 1. Micropiles** will be paid for at the Contract unit price each for “Micropiles” complete and accepted in place, including all design, development of installation methods, materials, equipment, tools, proper disposal of drilling spoil and labor incidental thereto.
- 2. Verification Test for Micropiles** will be paid for at the Contract unit price each for “Verification Test for Micropiles” completed on sacrificial micropiles, including all materials, testing equipment, tools, test reports, removal of test piles and labor incidental thereto.
- 3. Proof Test for Micropiles** will be paid for at the Contract unit price each for “Proof Test for Micropiles” completed on production micropiles, including all materials, testing equipment, tools, test reports and labor incidental thereto.
- 4. Micropile Length Adjustment** will be paid for at the Contract unit price per linear foot (meter) for “Micropile Length Adjustment” complete and accepted, including all materials, equipment, tools, and labor incidental thereto.

Pay Item	Pay Unit
Micropiles	ea. (ea.)
Verification Test for Micropiles	ea. (ea.)
Proof Test for Micropiles	ea. (ea.)
Micropile Length Adjustment	l.f. (m)

**CONNECTICUT  
SUPPLEMENTAL SPECIFICATION  
SECTION 8.22  
TEMPORARY PRECAST CONCRETE BARRIER CURB**

**8.22.04 – Method of Measurement:**

*Add the following sentence to the end of the second paragraph:*

“Relocation of Temporary Precast Concrete Barrier Curb for access to the work area or for the convenience of the Contractor shall be considered incidental to Maintenance and Protection of Traffic and will not be measured for payment.”

**CONNECTICUT  
SUPPLEMENTAL SPECIFICATION  
SECTION 9.10  
METAL BEAM RAIL**

**9.10.02 – Materials:**

*Change the only sentence in Subarticle 1 as follows:*

“Chemical anchoring material shall meet the requirements of Article M.03.07.”

**9.10.04 – Method of Measurement**

**1 – Metal Beam Rail (Type)**

*Delete the only sentence and replace with the following:*

“The length of metal beam rail measured for payment will be the number of linear feet (meters) of accepted rail of the type or designation installed, including radius rail other than Curved Guide Rail Treatment, measured along the top of rail between centers of end posts in each continuous section.”



**CONNECTICUT  
SUPPLEMENTAL SPECIFICATION  
SECTION 9.18  
THREE CABLE GUIDE RAILING  
(I-BEAM POSTS) AND ANCHORAGES**

**9.18.03 – Construction Methods:**

*In the 10<sup>th</sup> paragraph, replace “MIL” with “MILSPEC.”*

**CONNECTICUT  
SUPPLEMENTAL SPECIFICATION  
SECTION 9.22  
BITUMINOUS CONCRETE SIDEWALK  
BITUMINOUS CONCRETE DRIVEWAY**

**9.22.03 – Construction Methods:**

*Replace the first paragraph with the following:*

**“1. Excavation:** Excavation, including saw cutting, removal of any existing sidewalk, or driveway, shall be made to the required depth below the finished grade, as shown on the plans or as directed by the Engineer. All soft and yielding material shall be removed and replaced with suitable material.”

**9.22.05 – Basis of Payment:**

*Replace the only paragraph with the following:*

“This work will be paid for at the contract unit price per square yard (square meter) for "Bituminous Concrete Sidewalk" or "Bituminous Concrete Driveway," as the case may be, complete in place, which price shall include all saw cutting, excavation as specified above, backfill, disposal of surplus material, gravel or reclaimed miscellaneous aggregate base, and all equipment, tools, labor and materials incidental thereto.”

**CONNECTICUT  
SUPPLEMENTAL SPECIFICATION  
SECTION 9.44  
TOPSOIL**

**9.44.03—Construction Methods:**

*Add the following paragraph to the beginning of the article:*

“The Contractor shall notify the Engineer of the location of the topsoil at least 15 calendar days prior to delivery. The topsoil and its source shall be inspected and approved by the Engineer before the material is delivered to the project. Any material delivered to the project, which does not meet specifications or which has become mixed with undue amounts of subsoil during any operation at the source or during placing and spreading, will be rejected and shall be replaced by the Contractor with acceptable material.”

**CONNECTICUT  
SUPPLEMENTAL SPECIFICATION  
SECTION 9.49  
FURNISHING, PLANTING and MULCHING  
TREES, SHRUBS, VINES and GROUND COVER PLANTS**

**9.49.03 – Construction Methods:**

*Replace subarticle “5. Pits” with the following:*

**“5. Pits:** The pit diameters shall be twice the diameter of the root-spread or container diameters, and shall be 2- inches (50 millimeters) less than the height of the rootball measured from the bottom of the ball to the root collar. (i. e. A 12-inch (300 millimeters) measurement between the root collar and the bottom of the rootball will require a 10- inch (250 millimeters) deep pit). Any excavation in excess of that required shall be replaced with planting soil and compacted to the satisfaction of the Engineer.”

*Add the following sentence to subsection “6. Obstructions Below Ground:”*

“If removal of obstructions results in a deeper hole than needed for planting, backfill material shall be added and compacted to the satisfaction of the Engineer.”

*Replace subarticle “7. Preparation of Backfill” with the following:*

**“7. Backfill:** Backfill shall conform to M.13.01-1 Planting Soil.”

*Replace subarticle “8. Setting Plants” with the following:*

**“8. Setting Plants:** All plants shall be plumb and at a level that is 2-inches (50 millimeters) higher than the surrounding ground. Backfill material for all plants shall be thoroughly and properly settled by firming or tamping. Thorough watering shall accompany backfilling. Saucers capable of holding water shall be formed at individual plants (exclusive of plant beds) by placing ridges of planting soil around each, or as directed by the Engineer.

**a. Balled and Burlapped plants:** Plants shall be handled in such manner so that the soil will not be loosened from the roots inside of the ball. Carefully place the plant into the prepared pits and backfill with planting soil to one - half the depth of the pit, thoroughly tamp to the satisfaction of the Engineer around the ball. Fill the remaining area of the pit with water. Once water has completely drained, loosen the burlap and peel down the top one third. If wire baskets are used, cut and bend down the top third of the basket. Roots that have been wrapped around the ball within the burlap shall be straightened and the remainder of the pit filled with planting soil tamped to ensure that no air pockets remain.

**b. Container Grown Plants:** Carefully remove the plant from the container over the prepared pits. Gently loosen the soil and straighten all roots as naturally as possible. Place into the bottom of the pit. Backfill with planting soil to one - half the depth of the pit. Thoroughly tamp to the satisfaction of the Engineer. Fill remaining area of the pit with water. Once water has completely drained fill the remainder of the pit with planting soil tamped to ensure that no air pockets remain.

**c. Bare-roots Plants:** Carefully spread roots as naturally as possible and place into the bottom of the pit. All broken or frayed roots shall be cleanly cut off. Backfill with planting soil to one - half the depth of the pit. Thoroughly tamp to the satisfaction of the Engineer. Fill remaining area of the pit with water. Once water has completely drained fill the remainder of the pit with planting soil tamped to ensure that no air pockets remain.”

*Replace subarticle “10. Watering” with the following:*

**“10. Watering:** All plants shall be watered upon setting and as many times thereafter as conditions warrant.

The following is a guide for minimum requirements:

Trees:

2 ½” Caliper and less – Fifteen (15) gallons each.

3” to 5” Caliper – Twenty (20) gallon each.

5 ½” Caliper and above – Twenty-five (25) gallon each.

Shrubs:

24” and less – Six (6) gallon each.

More than 24”- Ten (10) gallon each.

Vines, Perennials, and Ornamental Grasses – Three (3) gallons each.

Groundcovers and Bulbs – Two (2) gallons per square foot.

Water shall be applied at a controlled rate and in such a manner to ensure that the water reaches the root zone (saucer) of the plant or plant bed and does not run off to adjacent areas. Watering shall be applied in a manner that does not dislodge plants, erode soil or mulch, or cause damage to saucer.

The Contractor may use slow-release, drip irrigation bags for watering in accordance with manufacturer’s instructions. The use of these portable/temporary irrigation bags will require the approval of the Engineer.

Overhead hydro-seeder spray nozzles shall not be used as watering devices.”

*Replace subarticle “17. Establishment Period” with the following:*

**“17. One-Year Establishment Period:** All plant material shall be subject to a One-Year Establishment Period. During this time, the Contractor shall use currently accepted horticultural practices to keep all plant material installed in a healthy, vigorous growing condition at the date of final acceptance. The date of final acceptance shall be one full

calendar year following the satisfactory completion of the planting activities as confirmed by the Engineer.

An inspection will be held one year from the date of installation with the Contractor, Engineer, and Landscape Designer to determine the acceptability of the plant establishment. An inventory of losses and rejected materials will be made and corrective and necessary clean up measures will be determined at the plant inspection.”

**CONNECTICUT  
SUPPLEMENTAL SPECIFICATION  
SECTION 9.75  
MOBILIZATION**

*Delete the entire section and replace with the following new section:*

**SECTION 9.75  
MOBILIZATION AND PROJECT CLOSEOUT**

**9.75.01 – Description:** This item consists of

1. all work necessary for moving Project personnel and equipment to the Project Site;
2. all work necessary for the establishment of the Contractors' field offices, buildings and other facilities necessary for Contract performance;
3. the preparation of work plans and other documents that must be submitted by the Contractor to the Department prior to the start of physical Project construction. These initial submittals are identified elsewhere in the Contract and may include Project schedules, Project management plans, staging and storage areas, safety plans, quality control plans, erosion and sedimentation control plans, and other documents addressing general Project sequencing or management;
4. demobilization of plant and equipment;
5. completion of all physical work, and
6. completion of administrative closeout items as required by the Contract.

The work entailed in this item shall not be subcontracted in whole or part.

**9.75.04 – Method of Measurement:** This work will be measured for payment in the manner described hereinafter; however, the total Contract amount earned will not include payments for mobilization that were earned during the period covered by the current monthly estimate, but will include those payments for mobilization that were previously earned and certified for payment.

1. When the first Project payment estimate is reviewed by the Engineer, twenty-five percent (25%) of the lump sum bid price for this item or two and a half percent (2.5%) of the total original Contract price, whichever is less, will be certified for payment as a part of that estimate.
2. When the Contractor's initial Project submittals are accepted by the Engineer, fifty percent (50%) of the lump sum bid price for this item or five percent (5%) of the total original Contract price, whichever is less, minus any previous Project payments made to the Contractor for this item, will be certified for payment.
3. When the Contractor's initial Project submittals are accepted by the Engineer, and fifteen percent (15%) of the total original Contract price has been earned by the Contractor, seventy percent (70%) of the lump sum price of this item or seven percent (7%) of the total original Contract price, whichever is less, minus any previous Project payments made to the Contractor for this item, will be certified for payment.
4. When thirty percent (30%) of the total original Contract price has been earned by the Contractor, eighty-five percent (85%) of the lump sum price of this item or eight and a half percent (8.5%) of the total original Contract price, whichever is less, minus any previous payments made to the Contractor for this item, will be certified for payment.

5. When the requirements of Article 1.08.13 have been satisfied by the Contractor, ninety-five percent (95%) of the lump sum price of this item, minus any previous payments made to the Contractor for this item, will be certified for payment.
6. When the requirements of Article 1.08.14 have been satisfied by the Contractor, one hundred percent (100%) of the lump sum price of this item, minus any previous payments made to the Contractor for this item, will be certified for payment. When this payment is made, the Contractor should have received full Contract payment for this item.

Nothing herein shall be construed to limit or preclude the Department from making partial payments to the Contractor that are provided for elsewhere in this Contract.

**9.75.05 – Basis of Payment:** The work under this item will be paid for at the Contract lump sum price for “Mobilization and Project Closeout,” which price shall include materials, equipment, tools, transportation, labor and all work incidental thereto.

Payment for this item shall be made only once; *i.e.*, for only one instance of mobilization as described in Article 9.75.01 above. If the Contractor mobilizes equipment or facilities more than one time during the course of the Project, due to reasons solely the responsibility of the Department, the additional work entailed therein will be paid for as Extra Work under Section 1.04.05 hereof.

Pay Item	Pay Unit
Mobilization and Project Closeout	l.s. (l.s.)



**CONNECTICUT  
SUPPLEMENTAL SPECIFICATION  
SECTION 10.00  
GENERAL CLAUSES FOR HIGHWAY  
ILLUMINATION AND TRAFFIC SIGNAL  
PROJECTS**

*Add the following new article after 10.00.13 Service Installations:*

**“ 10.00.14- Maintenance of Illumination During Construction:** The Contractor shall organize the Project work so that any portion of roadway which has existing roadway illumination and is open for use remains lighted. The Contractor shall also provide illumination on all temporary crossovers, ramps and roadways that are constructed as part of staged construction and that are open for use. Highway illumination may consist of: existing lighting, new lighting, temporary lighting, or any combination thereof. It is the Contractor’s responsibility to stage the installation or relocation of service cabinets, poles, lights, and circuitry so that all roadways of the kind described above remain lighted. If it is necessary to install temporary poles, lights, or circuitry to maintain the integrity of the highway illumination system, such work shall be submitted to the Engineer for approval prior to installation, and will be paid for at the Contract bid unit price for the relevant items. Temporary illumination work not specifically covered by the Contract specifications and pay items will be paid for as extra work at the discretion of the Engineer.

If the Contract includes temporary illumination plans, those plans shall serve as a framework for providing roadway illumination during construction. Temporary illumination plans may not represent the full extent of the temporary illumination work required, or the exact quantity of temporary lights required to maintain proper roadway illumination.

Prior to the start of any work that will interfere with the existing lighting system, the Contractor and ConnDOT District Electrical Maintenance personnel shall inspect the system for lighting outages, pole knockdowns, and circuit malfunctions. Deficiencies will be noted and repaired by Department forces prior to the start of work by the Contractor.

Once the Contractor’s work interferes with or impacts the existing roadway lighting system, maintenance of that system within the Project limits becomes the Contractor’s responsibility. The repair of lighting system malfunctions occurring outside of the project limits, caused by the Contractor’s work, shall also be the Contractor’s responsibility. District Construction personnel will note the start and end date of the Contractor’s responsibility for maintenance of any existing lighting system.

The Contractor shall maintain the illumination throughout the duration of the Project, until the Project is accepted by the State. The Contractor shall supply to the Project Engineer and to the ConnDOT District Electrical Maintenance Supervisor, the names and phone numbers of a primary and back-up representative, to be contacted should a problem with the lighting system occur.

Whoever discovers a lighting outage or pole damage/knockdown within the Project limits shall immediately notify ConnDOT Highway Operations of same as follows:

1. For projects in Districts 1, 2, and 4, call (860) 594-3447.
2. For projects in District 3 and along the Interstate 95 corridor within District 2, call (203) 696-2690.

The following procedures will be followed for lighting outages:

- 1) Once notified of a lighting outage, ConnDOT Electrical Maintenance personnel will assess the situation, and in the case of a pole knockdown, may clear the pole from the roadway and make safe any exposed wires.
- 2) The Project Inspector and the Contractor's designated representative shall be notified after the lighting outage has been assessed by ConnDOT Electrical Maintenance, transferring responsibility for further repairs to the Contractor.
- 3) Upon notification, the Contractor shall be responsible to repair the lighting system before the normal nighttime turn-on of the lights. If this cannot be achieved, the Contractor shall make the lighting operational prior to the next normal nighttime turn-on of the lights, up to a maximum of 24 hours from the time the Contractor was notified of the problem. The Contractor shall contact the Project Inspector to discuss the situation, the steps to be taken to bring the lighting back on line, and the time frame for doing so.
- 4) For isolated individual luminaire outages (not a continuous circuit), the Contractor shall repair such luminaires within 48 hours from the time that the Contractor became aware of the outage.

The Contractor shall follow standard "lock-out," "tag-out," and "Call Before You Dig" procedures when working on the lighting circuit. Both the Contractor and ConnDOT Electrical Maintenance shall have mutual access to active lighting control cabinets.

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

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

Temporary illumination circuitry shall consist of pre-assembled aerial cable of the type and size as indicated in the Contract documents or as directed by the Engineer.

The Contractor shall notify the Engineer when aerial cable cannot be installed due to construction activities and shall suggest another method for installation of the cable.

Alternate options may include installing cable in duct underground, or installing surface-mounted cable in duct or PVC conduit with cable along the backside of a bridge parapet or temporary concrete barrier curbing. Temporary cable in duct/conduit or aerial cable lying directly on the ground will not be allowed. The option of surface-mounting duct or conduit to the backside of a parapet or barrier will be allowed only when construction activities make it necessary, and where the surface-mounted conduit will not expose workers to a high voltage hazard. The Contractor must obtain the Engineer's approval to do so prior to installing temporary circuitry not installed overhead, unless otherwise indicated on the plans.

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

**CONNECTICUT  
SUPPLEMENTAL SPECIFICATION  
SECTION 10.01  
TRENCHING AND BACKFILLING**

**10.01.01- Description:**

*In the only sentence of the first paragraph after "...satisfactory..." add the following: "clean-up and".*

*In the only sentence of the second paragraph after "...reconstruction of..." add the following: "bituminous, concrete and granite curbing,".*

**10.01.05- Basis of Payment:**

*In the only sentence of the second paragraph after "...mulching..." add the following: "clean-up and". After "...installing..." add the word "curbing,".*

*At the end of the third paragraph, add the following: "In the absence of a "Rock in Trench Excavation" item, the work will be compensated as extra work."*

*In the only sentence of the sixth paragraph, after "...unit price for 'Concrete Sidewalk'..." add the following: "or as extra work, if no unit price has been established."*

**CONNECTICUT  
SUPPLEMENTAL SPECIFICATION  
SECTION 10.10  
CONCRETE HANDHOLE**

**10.10.02 – Materials:**

*Replace “M.03.01” with “M.03” for both Class A and Class C Concrete.*

**10.10.05 – Basis of Payment**

*In the first sentence, remove the words “ground wire”.*

*At the end of the paragraph add the following sentence:*

“The ground wire (bonding wire) is included in the Contract unit price under Section 10.08 – Electrical Conduit.”

*Add the word “Cover” to the end of the pay item “Cast Iron Handhole”*

**CONNECTICUT  
SUPPLEMENTAL SPECIFICATION  
SECTION 11.13  
CONTROL CABLE**

**11.13.03 – Construction Methods:**

*In the 1st paragraph of subsection 2 replace “MIL” with “MILSPEC.”*

**CONNECTICUT  
SUPPLEMENTAL SPECIFICATION  
SECTION 12.10  
EPOXY RESIN PAVEMENT MARKINGS, SYMBOLS AND LEGENDS**

**12.10.03—Construction Methods:**

**2. Procedures:**

*Insert the following after the sixth paragraph:*

“The epoxy shall be uniformly applied to the surface to be marked to ensure a wet film thickness of the applied epoxy, without glass beads, of 20 mils +/- 1 mil (500 um +/- 25 um).”

**CONNECTICUT  
SUPPLEMENTAL SPECIFICATION  
SECTION M.03  
PORTLAND CEMENT CONCRETE**

*Delete the entire Section and replace it with the following:*

**SECTION M.03  
PORTLAND CEMENT CONCRETE**

- 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 be broken stone, gravel, or reclaimed concrete aggregate defined as mortar-coated rock, consisting of clean durable fragments of uniform quality throughout. It shall be free from soft, disintegrated pieces, mud, dirt, organic or other injurious material and shall not contain more than 1 percent of dust by mass, as determined by AASHTO T-11. Coarse aggregate of a size retained on a 1-inch (25 mm) square opening sieve shall not contain more than 8% of flat or elongated pieces, whose longest dimension exceeds 5 times their maximum thickness. Heating or cooling of coarse aggregates may be required to meet concrete mix temperature requirements at time of placement.

- (a) Soundness:** When tested with magnesium sulfate solution for soundness, using AASHTO Method T 104, coarse aggregate shall not have a loss of more than 10% at the end of 5 cycles.
- (b) Loss on Abrasion:** When tested by means of the Los Angeles Machine, using AASHTO Method T 96, coarse aggregate shall not have a loss of more than 40%.
- (c) Gradation:** Grading and stone sizes of the coarse aggregate shall conform to Article M.01.01 as determined by AASHTO T-27. All coarse aggregate proportions shall be approved in advance by the Transportation Division Chief (TDC) as part of the Mix Design requirements.
- (d) Storage:** Aggregate stockpiles shall be located on smooth, hard, sloped/well-drained areas. Each source and gradation shall have an individual stockpile or bin. Aggregates shall be handled from stockpiles or other sources to the batching plant in such manner as to minimize segregation of the material. Aggregates that have become segregated, or mixed with earth or foreign material, shall not be used.



(e) **Reclaimed Concrete Aggregate:** In addition to the above requirements (a-d), when reclaimed concrete aggregate is proposed, it shall be tested for chloride in AASHTO T-260 "Sampling and Testing for Chloride Ion in Concrete and Concrete Raw Materials." Aggregate shall not be used if the chloride content as determined from this test exceeds 0.5 pound/cubic yard (297 g/cubic meter). Regardless of chloride content, reclaimed concrete aggregate shall not be used in concrete mixes used for pre-stressed concrete construction.

**2. Fine Aggregate:** Fine aggregate shall be natural or manufactured sand consisting of clean, hard, durable, uncoated particles of quartz or other rock, free from lumps of clay, soft or flaky material, mica, loam, organic or other injurious material. In no case shall fine aggregate containing lumps of frozen material be used. Heating or cooling of fine aggregates may be required to meet concrete mix temperature requirements at time of placement.

For continued shipments of fine aggregate from a given source, the fineness modulus of any sample shall not vary more than 0.20 from the base fineness modulus. The base fineness modulus for a source shall be established by the Engineer and may be revised based on current testing results.

- (a) **Fine Material:** Fine aggregate shall contain not more than 3% of material finer than a #200 sieve (75µm), as determined by AASHTO T 11.
- (b) **Organic Impurities:** Fine aggregate subjected to the colorimetric test shall not produce a color darker than Gardner Color Standard No. 11, using AASHTO T 21. If the fine aggregate fails to meet this requirement, the provisions of AASHTO M 6, Section 7.2.3, may apply.
- (c) **Gradation:** Fine aggregate gradation shall be within the ranges listed in Table M.03.01-1 for any source. All fine aggregate proportions shall be approved in advance by the TDC as part of the Mix Design requirements.
- (d) **Soundness:** When tested with magnesium sulfate solution for soundness, using AASHTO T 104, fine aggregate shall not have a loss of more than 10% at the end of 5 cycles. Fine aggregate that fails to meet this requirement, but meets all other requirements, may be allowed for use on a restricted basis with the approval of the Engineer on a case-by-case basis. Typically concrete forming any surface subject to polishing or erosion from running water will not be allowed to contain such material.
- (e) **Storage:** Aggregate stockpiles shall be located on smooth, hard, sloped/well-drained areas. Each source and gradation shall have an individual stockpile or bin. Aggregates shall be handled from stockpiles or other sources to the batching plant in such manner as to minimize segregation of the material. Aggregates that have become segregated, or mixed with earth or foreign material, shall not be used.

**Table M.03.01-1 TOTAL % PASSING BY WEIGHT**

Sieve Size	3/8" (9.5mm)	No. 4 (4.75mm)	No. 8 (2.36mm)	No. 16 (1.18mm)	No. 30 (600µm)	No. 50 (300µm)	No. 100 (150µm)
Percent Passing	100	95-100	80-100	50-85	25-60	10-30	2-10

**3. Cement:**

- (a) **Portland:** Types I, II, and III Portland cement shall conform to 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 Department's 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 Subarticles 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. The fly ash shall be substituted on a weight (mass) basis, with a minimum of 1 pound (45 kg) of fly ash for 1 pound (45 kg) 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 conform to 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. 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 (mass) basis, with a minimum of 1 pound (45 kg) of slag for 1 pound (45 kg) 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 clear in appearance and free from oil, salt, acids, alkalis, sugar, and organic matter. 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 (250 mg/L). 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 (150 mm x 300 mm) 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 conforming to 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, but 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 conform to 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<sup>1</sup>, and water proportioned in accordance with Table M.03.02-1. The mixtures shall also be designed to obtain the physical properties of plastic concrete as specified in Article 6.01.03.

**Table M.03.02-1**

<b>TYPE</b>	<b>28-day Minimum Compressive Strength psi (megapascals)</b>	<b>Water / Cement; or Water / Cement plus other approved Cementitious Material, by weight (mass), Maximum</b>	<b>Minimum Cement<sup>2</sup> Required lbs/cy (kg/cm)</b>	<b>Maximum Aggregate Size Required Section M.01.01</b>
Class "A"	3300 (23)	0.53	615 (365)	No. 4
Class "C"	3300 (23)	0.53	658 (390)	No. 6
Class "F"	4400 (30)	0.44	658 (390)	No. 6
Pavement	3500 (24)	0.49	615 (365)	No. 4
Slope Paving	2200 (15)	0.69	455 (270)	No. 3
<sup>1</sup> Approved admixtures may be used in proportions recommended by the manufacturer.				
<sup>2</sup> Portland Cement may be partially replaced within a Standard Mix Design by other approved cementitious material meeting the requirements of Article M.03.01-3(b) if permitted by the Engineer.				

Mix designs shall indicate the dosage of admixtures anticipated to provide plastic properties required in the Project specification. Properties of standard classes of concrete in the plastic state are listed in Article 6.01.03

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 ConnDOT 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 lbs/cubic yard (390 kg/cubic meter) of cementitious materials.

Concrete used in applications such as flowable fill or controlled low-strength material may be designed with less than 658 lbs/cubic yard (390 kg/cubic meter) 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 Section 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 conform to Subarticle 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 cubic yard (0.5 cubic meter) 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 (610 mm) 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 conform to the requirements of AASHTO M 148 Type 2, Class B, or shall be a water-soluble linseed oil-based compound conforming to the requirements of AASHTO M 148, Type 2.

**4. White Polyethylene Sheeting (Film):** White polyethylene sheeting (film) shall conform to 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 C 1107. The grout shall be mixed with potable water for use. The grout shall be mixed to a flowable consistency as determined by ASTM C 230. 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 C 1107.

### **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 conforming to the following requirements:

1. The anchoring cement shall have a minimum 24 hour compressive strength of 2,600 psi (18 megapascals) when tested in accordance with ASTM C 109.
2. The water content of the anchoring cement shall be as recommended by the manufacturer. Water shall conform to the requirements of Subarticle M.03.01-4.

The Contractor shall provide a Certified Test Report and Materials Certificate for the premixed anchoring cement in conformance with Article 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 conformance with Article 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 conforming to 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 conform to 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 conforming to the requirements of Article 1.06.07 demonstrating that the load transfer device conforms to the requirements of AASHTO M 254 for the type of device supplied. The Engineer reserves the right to reject any load transfer device which he deems 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 conform to the following requirements:
- (a) Preformed expansion joint filler shall be the bituminous cellular type and shall conform to 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 (1.9 meters) 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 (1.6 millimeters) thickness, plus 1/8-inch (3.2 millimeters) depth and plus 1/4-inch (6.4 millimeters) length will be permitted.
  - (d) All wood joint filler boards shall be given a preservative treatment by brushing with creosote oil conforming to 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 (6.4 millimeters) 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 conform to 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 conform to the requirements of AASHTO M 153, Type I or Type II.
  - (b) Pre-molded expansion joint filler for bridge bearings shall conform to 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 conform to 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 conform to the Federal Specifications SS-S-200-E (Self-leveling type), TT-S-0227E (COM-NBS) Type II-Class A (Non-sag type), or 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 Article 1.06.07, certifying the conformance of the sealant to 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:
  - Sealant, manufactured by the Dow Corning Corporation, Midland, Michigan Dow Corning 888 Silicone Joint Sealant or
  - Dow Corning 888-SL Self-Leveling Silicone Joint 48686-0994
6. **Closed Cell Elastomer:** The closed cell elastomer shall conform to 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 one time from one batch of elastomer. A batch is defined as that amount of elastomer prepared and compounded at one time. The Contractor shall furnish a Certified Test Report in accordance with Article 1.06.07, confirming the conformance of the closed cell elastomer to 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 (305 millimeter) length of closed cell elastomer in each lot for purposes of inspection and testing by the Engineer. The Engineer will cut a 1 foot (305 millimeter) 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 conform to 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 conforming to ASTM Specification A653 (Structural Steel (SS) Grade 33 through 80). The minimum thickness shall be 20 gage (810 micrometers). Coating weight shall conform to 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 documents.

Form supports shall either be fabricated and conform to the same material requirements as the forms, or be fabricated from structural steel conforming to 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.

**CONNECTICUT  
SUPPLEMENTAL SPECIFICATION  
SECTION M.06  
METALS**

**M.06.01 – Reinforcing Steel:****1. Bar Reinforcement:**

*Delete the third paragraph and replace it with:*

“Epoxy coated bar reinforcement shall conform to the requirements of ASTM A 615/A 615M, Grade 60 (420) and shall be epoxy coated to the requirements of ASTM A 775/A 775M. All field repairs of the epoxy coating shall conform to the requirements of ASTM D 3963/D 3963M.”

**M.06.02—Structural Steel and Other Structural Materials:**

*Delete the entire article and replace it with the following:*

**"M.06.02—Structural Steel:** The materials for this work shall conform to the following requirements:

**1. Structural Steel:**

Structural steel for bridges shall conform to the designation shown on the plans. Unless otherwise indicated in the plans or specifications, structural steel for non-bridge related members or components shall conform to ASTM A709/A709M, Grade 36 (250).

All surfaces of steel plates and shapes used in the fabrication of bridge girders shall be blast cleaned and visually inspected by the Contractor prior to any fabrication or preparation for fabrication. Blast cleaning shall conform to the requirements of SSPC-SP-6-Commercial Blast.

All steel plates and shapes used in the fabrication of bridge girders shall be substantially free from pitting and gouges, regardless of the cause. Substantially free is defined as:

- The measured surface area of all pits and gouges regardless of depth represent less than 1% of the surface area of the plate or shape.
- No pit or gouge greater than 1/32 (0.08mm) inch deep.
- No pit or gouge closer than six inches (15.25 cm) from another.

Any repair of plates or shapes will be performed in accordance with ASTM A6/A 6M.



## **2. Anchor Bolts:**

Unless otherwise designated on the plans, anchor bolts, including suitable nuts and washers, shall conform to the following requirements:

Anchor bolt assemblies shall conform to the requirements of ASTM F1554, Grade 36 (250). All components of the bolt assembly shall be galvanized in conformance with ASTM A 153/A 153M.

Certified Test Reports and Material Samples: The Contractor shall submit notarized copies of Certified Test Reports in conformance with Article 1.06.07. Prior to incorporation into the work, the Contractor shall submit samples of the anchor bolt assemblies to the Engineer for testing in accordance with the latest edition of the "Schedule of Minimum Requirements for Acceptance Testing". One sample shall be submitted for each diameter, material designation, grade or coating of anchor bolt assembly.

## **3. High Strength Bolts:** High strength bolts, including suitable nuts and hardened washers, shall conform to the following requirements:

- a) High strength bolts shall conform to ASTM A325 or ASTM 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 A325 bolts shall conform to 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 or DH3. Where Type 3 high-strength bolts are used, the nuts shall be grade C3 or DH3.

Nuts for ASTM A490 bolts shall conform to the requirements of ASTM A563, grades DH and DH3. 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 conform to 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 conform to ASTM F959. Where galvanized high-strength bolts are used, the washers shall be galvanized in accordance with ASTM B695, Class 50. Where Type 3 high-strength bolts are used, the washers shall be galvanized in accordance with ASTM B695, Class 50 and coated with epoxy.

- b) Identifying Marks:** ASTM 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. Head markings must identify the grade by the symbol "A325", the manufacturer and the type, if Type 2 or 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 "325". Other washer markings must identify the manufacturer and if Type 3, the type.

ASTM A490 for bolts and the specifications reference 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. Head markings must identify the grade by the symbol "A490", the manufacturer and the type, if Type 2 or 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 "490". Other washer markings must identify the manufacturer and if Type 3, the type.

- c) Dimensions:** Bolt and nuts dimensions shall conform to the requirements for Heavy Hexagon Structural Bolts and for Heavy Semi-Finished Hexagon Nuts given in ANSI Standard B18.2.1 and B18.2.2, respectively.
- d) Galvanized Bolts:** Galvanized bolts shall conform to ASTM A325, Type 1. The bolts shall be hot-dip galvanized in accordance with ASTM A153, Class C or mechanically galvanized in accordance with ASTM B695, Class 50. 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 A 490 bolts shall not be galvanized.
- e) Test Requirements:** The maximum hardness of A325 bolts 1" or less in diameter shall be 33 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 8.3 of ASTM A325. 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 job 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 conformance with Article 1.06.07 for fastener assemblies. In addition the Certified Test Reports and Materials Certificates shall include the following:

- a. Mill test reports shall indicate the place where the material was melted and manufactured.
- b. 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.
- c. 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 "Schedule of Minimum Requirements for Acceptance Testing". Samples shall be submitted for each diameter, length, material designation, grade, coating and manufacturer of bolt assembly.

#### **4. Welded Stud Shear Connectors:**

**a) Materials:** Stud shear connectors shall conform to the requirements of ASTM A 108, cold-drawn bar, Grades 1015, 1018 or 1020, either semi- or fully-killed. If flux-retaining caps are used, the steel for the caps shall be of a low carbon grade suitable for welding and shall comply with ASTM A 109.

Stud shear connectors shall be of a design suitable for electrically end-welding to steel with automatically timed stud welding equipment. The studs shall be of the sizes and dimensions noted on the plans. Flux for welding shall be furnished with each stud, either attached to the end of the stud or combined with the arc shield for automatic application in the welding operation. Each stud shall be furnished with a disposable ferrule of sufficient strength to remain intact during the welding operation and not crumble or break; it shall not be detrimental to the weld or create excessive slag.

Tensile properties, as determined by tests of bar stock after drawing or of finished studs, shall conform to the following requirements in which the yield strength is as determined by the 0.2% offset method:

Tensile strength (min.)	60,000 psi (415 megapascals)
Yield strength (min.)	50,000 psi (345 megapascals)
Elongation (min.)	20% in 2 inches (50 millimeters)
Reduction of area (min.)	50%

- b) Test Methods:** Tensile properties shall be determined in accordance with the applicable sections of ASTM A 370. Tensile tests of finished studs shall be made on studs welded to test plates using a test fixture similar to that shown in Figure 7.2 of the current AASHTO/AWS D1.5 – Bridge Welding Code. If fracture occurs outside of the middle half of the gage length, the test shall be repeated.
- c) Finish:** Finished studs shall be of uniform quality and condition, free from injurious laps, fins, seams, cracks, twists, bends or other injurious defects. Finish shall be as produced by cold-drawing, cold-rolling or machining.
- d) Certified Test Reports and Materials Certificates:** The Contractor shall submit a certified copy of the in-plant quality control test report in conformance with Article 1.06.07. The Contractor shall submit a Materials Certificate in conformance with Article 1.06.07 for the welded studs.
- e) Sample Materials for Testing:** Prior to incorporation into the work, the Contractor shall submit samples of the stud shear connectors to the Engineer for testing in accordance with the latest edition of the "Schedule of Minimum Requirements for Acceptance Testing". One sample shall be submitted for each diameter and length of welded stud."

**CONNECTICUT  
SUPPLEMENTAL SPECIFICATION  
SECTION M.08  
DRAINAGE**

*Delete the entire Section and replace with the following:*

**SECTION M.08  
DRAINAGE**

**M.08.01 – Pipe**

**General**

**Iron/Steel**

1. Cast Iron Pipe
2. Coated Corrugated Metal Pipe and Coated Corrugated Metal Pipe Elbows
3. Perforated or Plain Coated Metal Pipe for Underdrains or Outlets
4. Coated Corrugated Metal Pipe Arches
5. Corrugated Structural Plates and Bolts
6. Metal Culvert Ends

**Concrete**

7. Reinforced Concrete Pipe
8. Reinforced Concrete Elliptical Pipe
9. Perforated Reinforced Concrete Pipe for Underdrains and Outlets
10. Slotted Drain Pipe
11. Reinforced Concrete Culvert Ends

**Aluminum**

12. Corrugated Aluminum Pipe
13. Corrugated Aluminum Pipe for Underdrains and Outlets
14. Corrugated Aluminum Pipe Arches

**Sealers/Gaskets**

15. Cold-Applied Bituminous Sealer
16. Preformed Plastic Gaskets
17. Flexible, Watertight, Rubber-Type Gaskets

**Plastic**

18. Corrugated Polyethylene Pipe
19. Geotextiles
20. Polyvinyl Chloride Plastic Pipe
21. Polyvinyl Chloride Gravity Pipe

**M.08.02 – Catch Basins, Manholes, and Drop Inlets**

**M.08.03 – Aggregates**

1. Bedding Material
2. Aggregates for Underdrains

**M.08.01 – Pipe**

**General**

The Contractor shall submit manufacturer's material certifications for all metal and plastic pipes other than PVC, metal pipe-arches, metal fittings and metal coupling bands in accordance with Section 1.06.07.

## IRON/STEEL

**1. Cast Iron Pipe:** This material shall conform to the requirements of AASHTO M 64 for Extra-Heavy Cast Iron Culvert Pipe.

**2. Coated Corrugated Metal Pipe and Coated Corrugated Metal Pipe Elbows:**  
This material shall conform to the following:

Pipe fabricated from zinc-coated steel sheet and aluminum-coated (Type 2) steel sheet must conform to AASHTO M 36, Type 1 or IR.

Pipe fabricated from metallic-coated and polymer-precoated steel sheet must conform to AASHTO M 245, Type 1.

Unless otherwise indicated on the plans, the corrugation size and sheet thickness shall conform to the following:

Nominal Inside Diameter (inches)	Corrugations	Minimum Specified Sheet Thickness (inches)	
		Steel	Aluminum
6	1 1/2" X 1/4"	.052	
8, 10	1 1/2" X 1/4"	.064	
12, 15, 18 & 21	2 2/3" X 1/2"	.064	
24, 30 , 36	2 2/3" X 1/2"	.079	
42, 48	2 2/3" X 1/2"	.109	
54, 60	3" X 1" or 5" X 1"	.064	
66, 72	3" X 1" or 5" X 1"	.079	
78, 84, 90, & 96	3" X 1" or 5" X 1"	.109	
18, 24, 30	Helical Rib 3/4" X 3/4" X 7 1/2"	.064	.060
36	Helical Rib 3/4" X 3/4" X 7 1/2"	.064	.075
42, 48 & 54	Helical Rib 3/4" X 3/4" X 7 1/2"	.079	.105
60, 66, 72, 78, 84	Helical Rib 3/4" X 3/4" X 7 1/2"	.109	.135

Aluminum pipe sheet thickness may be .004 inch less than specified above for 1 1/2-inch x 1/4-inch, 2 2/3-inch x 1/2-inch and 3-inch x 1-inch or 5-inch x 1-inch corrugations. Helical Rib shall be as specified above.

Zinc coated steel pipe, fittings, and coupling bands shall be coated with bituminous material as specified in AASHTO M 190 Type C. Pipe, fittings and coupling bands

fabricated from aluminum coated steel sheet (Type 2) does not require coating of bituminous material or paved invert.

Metallic-coated and polymer-precoated steel pipe, fittings, and coupling bands shall be coated as specified in AASHTO M 246, Type B. The thicker polymeric coating shall be on the inside of the pipe.

Only one type of coating will be allowed for any continuously connected run of pipe.

If elongation of the pipe is required, it shall be done by the manufacturer.

**3. Perforated or Plain Coated Metal Pipe for Underdrains or Outlets:** This material shall conform to the requirements of AASHTO M 36, Type III or AASHTO M 245, Type III.

**(a) Perforations:** The minimum diameter of perforations after asphalt coating shall be 1/4 inch.

**(b) Coating:** All requirements of M.08.01-2 shall apply except that the minimum thickness of the bituminous coating on zinc coated steel pipe, fittings, and coupling bands pipe shall be 0.03 inches instead of 0.05 inches.

**4. Coated Corrugated Metal Pipe-Arches:** This material shall conform to the requirements of AASHTO M 36, Type II, Type IIR or AASHTO M 245, Type II. All coating requirements of M.08.01-1 shall apply.

Unless otherwise indicated on the plans, the corrugation size and sheet thickness shall conform to the following:

Pipe-Arch Equivalent Diameter (Inches)	Corrugations	Minimum Sheet Thickness (Inches)
15, 18, 21	2 2/3" X 1/2"	.064
24, 30	2 2/3" X 1/2"	.079
36, 42, 48	2 2/3" X 1/2"	.109
54, 60	2 2/3" X 1/2"	.138
60, 66, 72	3" X 1" or 5" X 1"	.079
78, 84, 90, 96	3" X 1" or 5" X 1"	.109
18, 21, 24	Helical Rib 3/4" X 3/4" X 7 1/2"	.064
30, 36	Helical Rib 3/4" X 3/4" X 7 1/2"	.079
42, 48, 54, 60	Helical Rib 3/4" X 3/4" X 7 1/2"	.109

**5. Corrugated Structural Plates and Bolts:** These plates and bolts are for use in the construction of metal pipe of the large diameter and for metal plate arches or pipe arches to be assembled in the field, and they shall conform to the requirements of AASHTO M 167 for corrugated metal pipe.

The dimensions of plates and details of fabrication shall conform to the requirements of the manufacturer. Where the plans call for a heavier gage for the bottom of the pipe than for the remainder of the pipe circumference, the lower fourth of the circumference shall be the minimum width of the heavier gage material.

The coating shall conform to the requirements of AASHTO M 243.

**6. Metal Culvert End:** The materials used in this work shall meet the pertinent requirements of Articles M.08.01-2 and M.08.01-4.

Bolts and fittings shall conform to the requirements of ASTM A 307 and shall be galvanized to conform to the requirements of ASTM A 153.

The units shall be coated as specified in Articles M.08.01-2, M.08.01-4 or M.08.01-5.

**Fabrication:** These units shall be formed from a rectangular sheet of metal by cutting and bending to form the desired shape. Two or more sheets may be fastened together by riveting or bolting so as to form a rectangular sheet of the required width. Skirt extensions and a top plate, as needed to complete the unit, shall be separately formed. Skirt extensions shall be riveted or bolted to the skirt.

All edges, which will be exposed above the surface of the ground, shall be reinforced before forming the unit by either of the following means:

- (1) The edge shall be bent to form a semicircular roll with an exterior diameter of 1 inch, as shown in the detail drawing on the plans.
- (2) A split tube of 1 inch outside diameter and not lighter than 14 gage, shall be slipped over a row of rivets spaced not more than 6 inches apart, as shown in the detail drawing on the plans.

One corrugation, matching the corrugations of the pipe or pipe-arch to which the unit is to be attached, shall be formed in the unit to insure secure and accurate alignment.

**Attachment:** The unit may be shop-riveted to a length of the appropriate pipe or pipe-arch, or may be field attached to the pipe or pipe arch by either of the other attachment systems shown on the plans, or by other means acceptable to the Engineer. If the unit is shop-riveted to a length of pipe or pipe-arch, this length shall be sufficient to permit proper use of standard coupling bands.

## CONCRETE

**7. Reinforced Concrete Pipe:** Unless otherwise specified, this material shall conform to the requirements of AASHTO M 170, Class IV, as supplemented and modified by the following:



- (a) Reinforcement:** In circular pipe, only circular reinforcement will be allowed.
- (b) Laps and Welds:** The reinforcement shall be lapped not less than 2 inches and welded with an electric welding machine.
- (c) Quality Assurance Testing:** Circular and elliptical reinforced concrete pipe shall be tested by the three-edge bearing method prescribed in AASHTO T 280, except as follows:
- 1) Modified or special design pipe shall be tested to the 0.01-inch load and the ultimate load requirements as per AASHTO M 170 and M 207.
  - 2) At the discretion of the Engineer, pipe of standard design, as specified in AASHTO M 170 and M 207, may be tested to the 0.01-inch requirement plus 10% additional load in lieu of ultimate load testing. Test pipe attaining a 0.01-inch crack will not be acceptable for use on Department projects.
  - 3) Cores for absorption and determination of steel reinforcement shall be taken on a random basis as determined by the Engineer. The cores shall be at least 6 inches in diameter.
- (d) Inspection:** The pipe plant, materials, processes of manufacture and the finished pipe shall be subject to inspection and approval by the Department. The pipe manufacturer's records related to component materials, production and shipment of pipe for Department use shall be made available to the Department on request. The equipment and labor necessary for inspection, sampling and testing as required by the Department shall be furnished by the pipe manufacturer. Test equipment shall be calibrated at least once each 12 months, or as directed by the Engineer. The plant cement and aggregate scales shall be inspected and sealed by the approved agency at least once every twelve months.
- (e) Preliminary Tests and Tests for Extended Deliveries:** As directed by the Engineer, the Department shall select for test from the stock of any manufacturer proposing to supply pipe to the Department, 2 of each size pipe up through 30-inch diameter and 1 of each size greater than 30-inch diameter. These sample pipes shall be tested under Department supervision by the three-edge bearing method. For pipe that fails, it shall be necessary for the manufacturer to either physically isolate the rejected pipe at his plant or to provide some means to clearly indicate the unacceptability of the pipe. Either method shall be performed to the satisfaction of the Engineer. When production is resumed on any size, wall thickness or class previously rejected, preliminary tests shall be required. If 95% of all pipe tested at a particular plant from the first of the calendar year to September 30 meet specifications, including both preliminary and extended tests, it will not be necessary to perform the Fall three-edge bearing tests at this plant.

Use of compression tests on representative cylinders or cores to determine the compressive strength of the concrete incorporated into the pipe products will be at the discretion of the Engineer.

(f) **Shipping:** Pipe shall not be shipped until it is at least 7 days old unless earlier shipment is authorized by the Engineer on the basis of tests.

(g) **Certification:** Pipe will be accepted by the Department on the basis of manufacturer's certification. The manufacturer shall certify each shipment of pipe on Department Form MAT-073(PC-1), "Certification of Precast Concrete Products." Two (2) copies of this certification shall be furnished with the shipment to the Engineer at the project site.

**8. Reinforced Concrete Elliptical Pipe:** This material shall conform to the requirements of AASHTO M 207, Class HE IV and supplemented as follows:

(a) Manufacturing and testing shall conform to Subarticle M.08.01-7.

**9. Perforated Reinforced Concrete Pipe for Underdrains and Outlets:** This material shall conform to the requirements of Subarticle M.08.01-7 and shall be slotted in accordance with AASHTO M 175, Type 2, or as shown on the plans. Pipe for outlets shall not be perforated.

**10. Slotted Drain Pipe:** The pipe shall be asphalt coated and conform to Subarticle M.08.01-2. Concrete shall conform to Article M.03.01, Class "A" or pavement type. Concrete shall be cured in conformance with M.03. The inlet aperture shall be longitudinal on top of the pipe and may be continuous or intermittent. The opening in the pipe wall may be fabricated in the form of continuous bar risers and spacers or of intermittent cut-out segments with structural members supporting a continuous grating as indicated in the plans. End caps shall be as provided by the manufacturer.

Elastomeric polymer sealer shall meet the physical requirements of ASTM D 3406 and be accepted on manufacturer's certification.

The pipe shall be helically corrugated with a continuous welded or lock seam. Pipe ends shall have 2 rolled annular corrugations on each end for jointing.

Bar Riser and Spacer Type: Riser assemblies shall be fabricated from structural steel, in accordance with the dimensions on the plans. The riser assemblies shall be hot dipped galvanized according to ASTM A123. The assemblies shall be welded to the corrugated pipe on each side of the riser at the location of the solid web spacers. The riser shall terminate 1 inch from the ends of each pipe length to allow clearance for single bolt coupling bands. The ends of the riser shall be closed with a suitable welded plate where solid web spacers do not come to the ends of the riser.

The maximum deviation from straight in both the vertical and horizontal plane of the riser assembly shall not exceed 3/4 inch in a 20-foot length.

Continuous Grating Type: The cut-out pipe segments shall provide a 2-inch wide slot of maximum length between the lock seams. The slot shall be left intact 1 inch on each side of the lock seam and this material shall be utilized to fasten the reinforcing bar in place.

A bent epoxy coated reinforcing bar shall cross the slotted opening on 6-inch centers.

The reinforcing bar shall be an ASTM A 615, No. 13, deformed bar epoxy coated with 7 mils of fusion bonded epoxy powder conforming to AASHTO M 284.

Grating shall be furnished unless noted in the contract documents. Grating and all bearing bars, cross bars, and bent connecting bars shall be welding quality, mild carbon steel conforming to ASTM A 569 and to the dimensions shown on the plans.

Tie down bolts shall be J-Type bolts, plated, ASTM A 307 steel supplied with self-locking nuts.

Concrete forms shall be of cellular foam plastic base, fabricated as an integral part of the pipe and reinforcing bar assembly. The form shall be capped with a thick wood or plastic cap resting on top of the foam plastic and reinforcing bar.

The maximum deviation from straight in both the vertical and horizontal plane of the completed assembly shall not exceed 3/4 inch in a 20-foot length. All grating and hardware shall be galvanized in conformance with Article M.06.03. Expansion joint filler shall conform to M.03.

**11. Reinforced Concrete Culvert End:** The barrel shall conform to the requirements of AASHTO M 170, Class II, except that the three-edge bearing tests will not be required. The flare shall be of the same thickness and materials as the barrel and shall have steel reinforcement equaling or exceeding the amount shown on the table for the pertinent size.

Tongues and grooves shall be compatible with tongues and grooves of pipe meeting AASHTO M 170, Class IV.

Air entrainment shall be added to these units so as to maintain 5 to 8% entrained air.

## ALUMINUM

**12. Corrugated Aluminum Pipe:** This material shall conform to the requirements of AASHTO M 196 Type I or Type IR. Sheet thickness shall conform to the requirements of M.08.01-2.

**13. Corrugated Aluminum Pipe for Underdrains and Outlets:** This material shall conform to the requirements of AASHTO M 196, Type III or Type IIIR. Sheet thickness shall conform to the requirements of M.08.01-2. Pipe for outlets shall not be perforated.

**14. Corrugated Aluminum Pipe Arches:** These pipe arches shall conform to the requirements of AASHTO M 196, Type II or Type IIR. Sheet thickness shall conform to the requirements of M.08.01-4.

## SEALERS/GASKETS

**15. Cold-Applied Bituminous Sealer:** This material, for use in sealing of joints in concrete pipes, shall be free of asbestos and shall meet the following requirements:

It shall be of such consistency that it may be spread on the joints with a trowel when

the temperature of the air is between -20° F and 100° F. The bituminous material shall adhere to the concrete pipe so as to make a watertight seal and shall not flow, crack or become brittle when exposed to the atmosphere.

Unless otherwise specified, sampling shall be done in accordance with AASHTO T 40.

The bituminous sealer shall be delivered to the project in suitable containers for handling and shall be sealed or otherwise protected from contamination. The container shall show the brand name, net mass or volume, and the requirements for application.

**16. Preformed Plastic Gaskets:** This material for use in sealing of joints in concrete pipe shall conform to the requirements of ASTM C 1478.

**17. Flexible, Watertight, Rubber-Type Gaskets:** This material for use in sealing concrete pipe joints shall conform to the requirements of ASTM C 443.

## PLASTIC

**18. Corrugated Polyethylene Pipe:** Corrugated Polyethylene Pipe, either corrugated interior surface (Type C) or smooth interior surface (Type S) without perforations or with perforations (Type CP or SP), shall conform to AASHTO M 252 or M 294. Type D pipe shall have a smooth interior surface braced circumferentially or spirally with projections or ribs joined to a smooth outer wall. Both surfaces shall be fused to, or be continuous with, the internal supports. Type D shall conform to AASHTO M 294.

**19. Geotextiles:** The geotextile shall be non-rotting, acid and alkali resistant, and have sufficient strength and permeability for the purpose intended including handling and backfilling operations. Fibers shall be low water absorbent. The fiber network must be dimensionally stable and resistant to delamination. The geotextile shall be free of any chemical treatment or coating that will reduce its permeability. The geotextile shall also be free of any flaws or defects which will alter its physical properties. Torn or punctured geotextiles shall not be used. For each specific use, only geotextiles that are already on the Connecticut Department of Transportation's Qualified Products List for the geotextile type will be used. The Engineer reserves the right to reject any geotextile he deems unsatisfactory for a specific use. The brand name shall be labeled on the geotextile or the geotextile container. Geotextiles that are susceptible to damage from sunlight or heat shall be so identified by suitable warning information on the packaging material.

Geotextiles susceptible to sunlight damage shall not be used in any installations where exposure to light will exceed 30 days, unless specifically authorized in writing by the Engineer.

**20. Polyvinyl Chloride Plastic Pipe:** The pipe shall conform to the requirements of ASTM D 1785. Couplings and elbows shall conform to the requirements of ASTM D 2466 or D 2467.

**21. Polyvinyl Chloride Gravity Pipe:** This pipe shall conform to one of the following specifications: ASTM F789, ASTM F 679, or ASTM F 794.

**M.08.02—Catch Basins, Manholes, and Drop Inlets:** The materials to be used in the construction shall conform to the following:

**1. Brick for Catch Basins, Manholes or Drop Inlets:** Brick for catch basins, manholes or drop inlets shall conform to the requirements of ASTM C 32, except that the depth shall be 2 1/4 inches, the width 3 5/8 inches, and the length 8 inches, and except that the maximum water-absorption by 5-hour boiling shall not exceed the following limits:

Average of 5 bricks	15%
Individual brick	18%

**2. Concrete Building Brick for Catch Basins, Manholes, or Drop Inlets:** Concrete building brick for catch basins, manholes, or drop inlets shall conform to the requirements of ASTM C 55, Grade S II.

**3. Masonry Concrete Units for Catch Basins, Manholes, or Drop Inlets:** Masonry concrete units for catch basins, manholes, or drop inlets shall conform to the requirements of ASTM C 139.

**4. Precast Units for Drainage Structures:** Precast units for drainage structures may be used except where particular conditions require building or casting structures in place.

Fabrication plants shall have a quality control plan approved by the Division Chief of Materials Testing that is demonstrated to the satisfaction of the Engineer. The facility, the quality of materials, the process of fabrication, and the finished precast units shall be subject to inspection by the Engineer.

Precast manholes shall conform to the requirements of AASHTO M 199 (ASTM C 478).

Circular precast catch basins and drop inlets shall conform to AASHTO M 199 (ASTM C 478) as supplemented below. Rectangular precast catch basins and drop inlets shall conform to ASTM C 913 as supplemented below:

All materials used for concrete shall conform to the requirements of Section M.03.

The provisions of Subarticle 4.01.03 (A) shall apply except that the concrete shall contain 5.0%-8.0% entrained air. Water-absorption of individual cores taken from precast units shall be not more than 7%.

Reinforcement shall conform to the requirements of Article M.06.01.

Suitable provision shall be made in casting the units for convenient handling of the completed casting, and additional reinforcement steel shall be provided to allow for such handling in the casting yard and during transportation and placement. Each completed unit shall be identified with the name of manufacturer and date of the concrete pour from which it was cast, either by casting this information into an exposed face of the unit or by suitable stencil. For each day's production of precast units, the

fabricator shall mold, cure, and test standard cylinders, or cylinders compacted in a similar manner to the parent precast units, for the purpose of determining the compressive strength of the concrete incorporated into the precast units. Concrete used in molding the cylinders shall be representative of the concrete incorporated into the precast units during the production period. Cylinders shall be molded in accordance with AASHTO T 23, cured by the same method as the units they represent, and tested as prescribed in AASHTO T 22.

The fabricator shall determine the air content of the concrete used in the day's production of precast units by performing tests as prescribed in AASHTO T 152.

The equipment and personnel necessary to perform the required testing shall be furnished by the fabricator and approved by the Engineer. All testing equipment shall be calibrated at least once each 12 months or as directed by the Engineer. The fabricator shall maintain records relative to the production, testing, and shipment of precast units supplied to the Department. Said records shall be available to a representative of the Department upon his request.

The Department may accept precast concrete units on the basis of fabricator's certification. The fabricator shall certify each shipment of precast concrete units on Department Form MAT 314 (PC-1), "Certification of Precast Concrete Products." Two (2) copies of this certification shall be furnished with the shipment to the Engineer at the Project site.

Precast units that are cracked, show evidence of honeycomb, or have over 10% of their surface area patched may be subject to rejection, even though meeting other requirements.

**5. Metal for Drainage Structures:** Metal for catch basins, drop inlet and manhole frames, extensions, covers, and gratings shall be cast iron, cast steel, structural steel or malleable iron conforming to the requirements of the plans. Covers and gratings shall bear uniformly on their supports.

Extensions shall be designed so that the existing manhole cover or catch basin grate, when set in place, will have substantially the same bearing, fit, and load carrying capacity as in the existing frame. The extension shall be designed to fit into the original frame, resting specifically on the flange and rim area. The extension shall accept the existing cover or grate so that the cover or grate is seated firmly without movement.

Ladder rungs for manholes shall conform to AASHTO M 199 (ASTM C 478).

**Cast iron** shall conform to the requirements of AASHTO M 105, Class 25 for the frames and Class 30 for gratings.

**Cast steel** shall conform to the requirements of ASTM A 27, Grade optional, and shall be thoroughly annealed.

**Structural Steel** shall conform to the requirements of ASTM A 36, or A 283, Grade B or better, as to quality and details of fabrication, except that in the chemical composition of the steel, the 2/10 of 1% of copper may be omitted.

**Malleable iron** shall conform to the requirements of ASTM A 47, Grade 22010.

The materials and method of manufacture for drop inlets shall conform to the requirements as stated on the plans or as ordered.

### **M.08.03—Aggregates**

**1. Bedding Material:** Material for pipe bedding shall be sand or sandy soil, all of which passes a 3/8-inch sieve and not more than 10% passes a No. 200 sieve.

When ground water is encountered, the Engineer may allow No. 6 stone conforming to Article M.01.01 to be used instead of sand or sandy soil.

**2. Aggregates for Underdrains:** Materials for filling the trench shall consist of well-graded, clean, non-plastic sands or well-graded, clean, durable broken stone or screened gravel. Unless otherwise noted, the type of material to be used shall be sand.

**Sand:** This material shall meet the requirements of Subarticle M.03.01-2

**Broken Stone or Screened Gravel:** This material shall conform to the gradation requirements for Size No. 8 under Article M.01.01.

**CONNECTICUT  
SUPPLEMENTAL SPECIFICATION  
SECTION M.11  
MASONRY FACING  
CEMENT AND DRY RUBBLE MASONRY  
BRICK  
MORTAR**

**M.11.01 – Masonry Facing:**

**1. Masonry Facing Stone:**

*Delete the third sentence:*

“Preferably, the stone shall be from a quarry the product of which is known to be of satisfactory quality.”

*Delete “2. : Vacant:”*

**M.11.04—Mortar:**

*Delete the entire article and replace it with the following:*

**M.11.04—Mortar:** Mortar shall be either Pre-blended or Pre-packaged material conforming to:

ASTM C1714 - Standard Specification for Pre-blended Dry Mortar Mix for Unit Masonry;

ASTM C387 - Standard Specification for Packaged, Dry, Combined Materials for Concrete and High Strength Mortar;

or be composed of one part Portland cement and two parts, by volume, of surface dry fine aggregate blended on site.

Hydrated lime, in an amount not to exceed 4 pounds (1.8 kilograms) of lime to each bag of cement, may be added when the material is blended on site at the option of the Engineer. Cement and hydrated lime shall conform to the following requirements:

**(a) Portland cement, Types I, II or IS, and water** shall conform to the requirements of Article M.03.

**(b) Hydrated lime** shall conform to the requirements of ASTM C 6.



When mortar is mixed on the project site, **fine aggregate** shall conform to Grading A or B as indicated in the table below, and to the requirements of Section M.03. For laying stone, precast units, or for shotcrete, fine aggregate shall conform to Grading A. For pointing stone or the precast units and for laying brick or sealing pipe joints, the fine aggregate shall conform to Grading B.

**Table of Gradation, Fine Aggregate for Mortar**

<u>Square Mesh Sieves</u>	<u>Grading</u>	
	A	B
	Percentage Passing by weight (mass)	
Pass 3/8 inch (9.5 millimeters)	100	
Pass #4 (4.75 millimeters)	95-100	
Pass #8 (2.36 millimeters)	80-100	100
Pass #16 (1.18 millimeters)	50-85	
Pass #30 (600 microns)	25-60	
Pass #50 (300 microns)	10-30	10-40
Pass #100 (150 microns)	2-10	0-10

**CONNECTICUT  
SUPPLEMENTAL SPECIFICATION  
SECTION M.13  
ROADSIDE DEVELOPMENT**

**M.13.01—Topsoil:**

*Delete the entire article and replace it with the following:*

**“ M.13.01 – Topsoil:** The term topsoil used herein shall mean a soil meeting the soil textural classes established by the USDA Classification System based upon the proportion of sand, silt, and clay size particles after passing a No. 10 (2 millimeter) sieve and subjected to a particle size analysis. The topsoil shall contain 5% to 20% organic matter as determined by loss on ignition of oven-dried samples dried at 221° F (105° C). The pH range of the topsoil shall be 5.5 to 7.0.

The following textural classes shall be acceptable:

Loamy sand, including coarse, loamy fine, and loamy very fine sand, with not more than 80% sand

Sandy loam, including coarse, fine and very fine sandy loam

Loam

Clay loam, with not more than 30% clay

Silt loam, with not more than 60% silt

Sandy clay loam, with not more than 30% clay

All textural classes of topsoil with greater than 80% sand content will be rejected.

The topsoil furnished by the Contractor shall be a natural, workable soil that is screened and free of subsoil, refuse, stumps, roots, brush, weeds, rocks and stones over 1 1/4 inches (30 millimeters) in diameter, and any other foreign matter that would be detrimental to the proper development of plant growth.

The Contractor shall notify the Engineer of the location of the topsoil at least 15 calendar days prior to delivery. The topsoil and its source shall be inspected and approved by the Engineer before the material is delivered to the project. Any material delivered to the project, which does not meet specifications or which has become mixed with undue amounts of subsoil during any operation at the source or during placing and spreading, will be rejected and shall be replaced by the Contractor with acceptable material.

When topsoil is not furnished by the Contractor, it shall be material that is stripped in accordance with Section 2.02 or is furnished by the State, and will be tested as determined by the Engineer.

1. Planting Soil: Soil Material to be used for plant backfill shall be one of the following textural classes:

- Loamy sand, with not more than 80% sand
- Sandy loam
- Loam
- Clay loam, with not more than 30% clay
- Silt loam, with not more than 60% silt
- Sandy clay loam, with not more than 30% clay

Planting soil shall be premixed, consisting of approximately 50 % topsoil, 25 % compost or peat, and 25% native soil. Planting soil shall be loose, friable, and free from refuse, stumps, roots, brush, weeds, rocks and stones 2 inches (50 millimeters) in diameter. In addition, the material shall be free from any material that will prevent proper development and plant growth.

- (a) For ericaceous plants and broad-leaved evergreens requiring an acid soil, planting soil shall have a true pH of 4.5 to 5.5. If it has not, it shall be amended by the Contractor at his own expense to the proper pH range by mixing with sulphur.
- (b) Planting soil for general planting of nonacid-loving plants shall have a true pH value of 5.6 to 6.5. If it has not, it shall be amended by the Contractor at his own expense to the proper pH range by mixing with dolomitic limestone.

The amount of either sulphur or limestone required to adjust the planting soil to the proper pH range (above) shall be determined by the Engineer based on agronomic tests. The limestone shall conform to the requirements of Article M.13.02. The sulphur shall be commercial or flour sulphur, unadulterated, and shall be delivered in containers with the name of the manufacturer, material, analysis, and net weight (mass) appearing on each container.

The Engineer reserves the right to draw such samples and to perform such tests as he deems necessary to ensure that these specifications are met.”

**M.13.03 – Fertilizer:**

*In the last sentence of the first paragraph change “AOAC International.” to “AOAC.”*

**M.13.04 – Seed Mixture:**

*Replace Subarticle (a) with the following:*

“(a) The grass seed mixture shall conform to the following:

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

Under no circumstances should annual Ryegrass, Italian Rye, or any other seed be added to the seed mixture.”

**M.13.06 – Compost:**

*In the third to last sentence, replace “DEP” with “DEEP”.*

**CONNECTICUT  
SUPPLEMENTAL SPECIFICATION  
SECTION M.16  
TRAFFIC CONTROL SIGNALS**

**M.16.04 – Poles:**

**1. Steel Poles:**

(i) Wire Entrance Fitting:

*In the second sentence, delete “required to accept the cables”.*

**M.16.06 – Traffic Signals:**

**9. Painting:**

*In the first sentence, replace “MIL” with “MILSPEC”.*

**Subsection Third Coat:**

*Replace the first two sentences with the following:*

“Dark Green Enamel: Shall be Dark Green exterior baked enamel and shall comply with FS A-A 2962. The color shall be No. 14056, FS No. 595.”

*and in the third sentence replace “MIL” with “MILSPEC”.*

**M.16.08 – Pedestrian Push Button**

*In the last sentence of the second paragraph, change “Americans With Disabilities Act (ADA)” to “ADA”.*

**Subarticle Painting**

**Subsection Third Coat:**

*Delete the entire paragraph and replace it with the following:*

“**Third Coat:** Dark Green Enamel, shall be DARK GREEN exterior-baking enamel and shall comply with Federal Specifications A-A 2962. The color shall be No. 14056, Federal Standard No. 595.”

**M.16.10 – Flasher Cabinet:**

**1. Cabinet:**

*In subsection (f), change “Underwriter’s Laboratory” to “UL”.*

### **M.16.15 – Messenger and Span Wire:**

*Delete the entire article and replace it with the following:*

**“M.16.15 – Messenger and Span Wire:** The materials for this work shall conform to the following requirements:

1. Messenger wire shall be made of double-galvanized 7-strand utilities-grade steel wire cable, not less than 3/16 inch (4.8 millimeters) in diameter, with at least a 2,400-pound (10.7-kilonewton) breaking strength.
2. Span wire:
  - (a) “Span wire” shall be made of double-galvanized 7-strand utilities-grade steel wire cable, not less than 3/8 inch (9.5 millimeters) in diameter, with at least an 11,200-pound (50-kilonewton) breaking strength.
  - (b) “Span wire (high strength)” shall be made of double-galvanized 7-strand extra-high-strength-grade steel wire cable, not less than 7/16 inch (11.1 millimeters) in diameter, with at least a 20,800-pound (94-kilonewton) breaking strength.
3. All hardware accessories shown on the plans to be used in span wire or messenger mounting shall be made of high-strength, double-galvanized, first-quality materials.”

**CONNECTICUT  
SUPPLEMENTAL SPECIFICATION  
SECTION M.17  
ELASTOMERIC MATERIALS**

**M.17.01 – Elastomeric Bearing Pads:**

**2. Laminae:**

*In the last sentence of Subsection (a), replace “AAA 6061-T6” with “AA 6061-T6”.*

**4. Adhesive for Bonding:**

*In the 2nd paragraph of Subsection (b), replace “MS MIL” with “MILSPEC”.*

**CONNECTICUT  
SUPPLEMENTAL SPECIFICATION  
SECTION M.18  
SIGNING**

**M.18.10 – Demountable Copy:**

**2. Type III Reflective Sheeting:**

*In the first paragraph, second sentence replace “Section M.18.09.01” with “Subarticle M.18.09-1.”*

**3. Non-Reflective Plastic Sheeting:**

H. Solvent and Chemical Resistance:

*In the chart under this subsection, replace “MIL” with “MILSPEC.”*



**Construction Contracts - Required Contract Provisions  
(FHWA Funded Contracts)**

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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
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- EXHIBIT C – Contractor Work Force Utilization (Federal Executive Order 11246) / Equal Employment Opportunity (page 35)
- EXHIBIT D – Health Insurance Portability and Accountability Act of 1996 (HIPAA) (page 42)
- EXHIBIT E - Campaign Contribution Restriction (page 50)
- 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**

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.”

### **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](http://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 the applicable parts of Executive Order No. 7C of Governor M. Jodi Rell, promulgated July 13, 2006, concerning contracting reforms and Executive Order No. 14 of Governor M. Jodi Rell, promulgated April 17, 2006, concerning procurement of cleaning products and services, in accordance with their respective terms and conditions. If Executive Orders 7C and 14 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:

- i. "Commission" means the Commission on Human Rights and Opportunities;
- ii. "Contract" and "contract" include any extension or modification of the Contract or contract;
- iii. "Contractor" and "contractor" include any successors or assigns of the Contractor or contractor;
- iv. "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.
- v. "good faith" means that degree of diligence which a reasonable person would exercise in the performance of legal duties and obligations;
- vi. "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;
- vii. "marital status" means being single, married as recognized by the State of Connecticut, widowed, separated or divorced;
- viii. "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;

- ix. "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
- x. "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, including, but not limited to, a municipality, (2) a quasi-public agency, as defined in Conn. Gen. Stat. Section 1-120, (3) any other state, including but not limited to any federally recognized Indian tribal governments, as defined in Conn. Gen. Stat. Section 1-267, (4) the federal government, (5) a foreign government, or (6) an agency of a subdivision, agency, state or government described in the immediately preceding enumerated items (1), (2), (3), (4) or (5).

- (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, 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, 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.”

The Nondiscrimination Certifications can be found at the Office of Policy and Management website.

<http://www.ct.gov/opm/cwp/view.asp?a=2982&Q=390928>

## 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(g)(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 Agreement 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," 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.

## 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

### ATTACHMENTS

A. Employment and Materials Preference for Appalachian Development Highway System or Appalachian Local Access Road Contracts (included in Appalachian contracts only)

#### 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.



**ATTACHMENT A - EMPLOYMENT AND MATERIALS PREFERENCE FOR  
APPALACHIAN DEVELOPMENT HIGHWAY SYSTEM OR APPALACHIAN LOCAL  
ACCESS ROAD CONTRACTS**

This provision is applicable to all Federal-aid projects funded under the Appalachian Regional Development Act of 1965.

1. During the performance of this contract, the contractor undertaking to do work which is, or reasonably may be, done as on-site work, shall give preference to qualified persons who regularly reside in the labor area as designated by the DOL wherein the contract work is situated, or the subregion, or the Appalachian counties of the State wherein the contract work is situated, except:

a. To the extent that qualified persons regularly residing in the area are not available.

b. For the reasonable needs of the contractor to employ supervisory or specially experienced personnel necessary to assure an efficient execution of the contract work.

c. For the obligation of the contractor to offer employment to present or former employees as the result of a lawful collective bargaining contract, provided that the number of nonresident persons employed under this subparagraph (1c) shall not exceed 20 percent of the total number of employees employed by the contractor on the contract work, except as provided in subparagraph (4) below.

2. The contractor shall place a job order with the State Employment Service indicating (a) the classifications of the laborers, mechanics and other employees required to perform the contract work, (b) the number of employees required in each classification, (c) the date on which the participant estimates such employees will be required, and (d) any other pertinent information required by the State Employment Service to complete the job order form. The job order may be placed with the State Employment Service in writing or by telephone. If during the course of the contract work, the information submitted by the contractor in the original job order is substantially modified, the participant shall promptly notify the State Employment Service.

3. The contractor shall give full consideration to all qualified job applicants referred to him by the State Employment Service. The contractor is not required to grant employment to any job applicants who, in his opinion, are not qualified to perform the classification of work required.

4. If, within one week following the placing of a job order by the contractor with the State Employment Service, the State Employment Service is unable to refer any qualified job applicants to the contractor, or less than the number requested, the State Employment Service will forward a certificate to the contractor indicating the unavailability of applicants. Such certificate shall be made a part of the contractor's permanent project records. Upon receipt of this certificate, the contractor may employ persons who do not normally reside in the labor area to fill positions covered by the certificate, notwithstanding the provisions of subparagraph (1c) above.

5. The provisions of 23 CFR 633.207(e) allow the contracting agency to provide a contractual preference for the use of mineral resource materials native to the Appalachian region.

**EXHIBIT B****TITLE VI CONTRACTOR ASSURANCES**

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 shall comply with the regulations relative to nondiscrimination in federally assisted programs of the United States Department of Transportation (hereinafter, "USDOT"), Title 49, Code of Federal Regulations, Part 21, as they may be amended from time to time (hereinafter referred to as the "Regulations"), 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, shall not discriminate on the grounds of race, color, national origin, sex, age, or disability in the selection and retention of subcontractors, including procurements of materials and leases of equipment. The Contractor shall not participate either directly or indirectly in the discrimination prohibited by Subsection 5 of the Regulations, including employment practices when the Contract covers a program set forth in Appendix B of the Regulations.

**3. Solicitations for Subcontracts, Including Procurements of Materials and Equipment:**

In all solicitations either by competitive 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 shall be notified by the Contractor of the Contractor's obligations under this contract and the Regulations relative to nondiscrimination on the grounds of race, color, national origin, sex, age, or disability.

**4. Information and Reports:** The Contractor shall provide all information and reports required by the Regulations or directives issued pursuant thereto and shall permit access to its books, records, accounts, other sources of information, and its facilities as may be determined by the Connecticut Department of Transportation (ConnDOT) or the Funding Agency (FHWA, FTA and FAA) to be pertinent to ascertain compliance with such Regulations, orders, 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 shall so certify to ConnDOT or the Funding Agency, as appropriate, and shall set forth what efforts it has made to obtain the information.

**5. Sanctions for Noncompliance:** In the event of the Contractor's noncompliance with the nondiscrimination provisions of this Contract, the ConnDOT shall impose such sanctions as it or the Funding Agency may determine to be appropriate, including, but not limited to:

- A. Withholding contract payments until the Contractor is in-compliance; and/or
- B. Cancellation, termination, or suspension of the Contract, in whole or in part.

**6. Incorporation of Provisions:** The Contractor shall include the provisions of paragraphs 1 through 5 in every subcontract, including procurements of materials and leases of equipment, unless exempt by the Regulations or directives issued pursuant thereto. The Contractor shall take such action with respect to any subcontract or procurement as the ConnDOT or the Funding Agency may -direct as a means of enforcing such provisions including sanctions for noncompliance. Provided, however, that in the event a Contractor becomes involved in, or is threatened with, litigation with a subcontractor or supplier as a result of such direction, the Contractor may request the ConnDOT to enter into such litigation to protect the interests of the Funding Agency, and, in addition, the Contractor may request the United States to enter into such litigation to protect the interests of the United States

**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**

<b>Bridgeport – Stamford – Norwalk – Danbury</b>	<b>10.2%</b>
<b>6.9%</b>	

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	

<b>Hartford – Bristol – New Britain</b>	<b>6.9%</b>
<b>6.9%</b>	

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

<b>New Haven – Waterbury – Meriden</b>	<b>9.0%</b>
<b>6.9%</b>	

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		

<b>New London – Norwich</b>	<b>4.5%</b>
<b>6.9%</b>	

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  
6.9%**

**5.9%**

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 result in 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](http://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)