

VOLUME 1 OF 2

COMMONWEALTH OF MASSACHUSETTS



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CONTRACT DOCUMENTS  
AND SPECIAL PROVISIONS

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PROPOSAL NO.	608433-126697
P.V. =	\$12,773,000.00
PLANS	YES

FOR

**Federal Aid Project No. HSI/STP/CMQ-0033(039)X**

**Intersection Improvements at I-395 Ramps (Exit 3) at Route 16 (East Main Street) and Sutton Road**

**in the Town of**

**WEBSTER**

In accordance with the STANDARD SPECIFICATIONS  
for HIGHWAYS and BRIDGES dated 2024

This Proposal to be opened and read:

**TUESDAY, AUGUST 6, 2024 at 2:00 P.M.**

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DOCUMENT 00010

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DOCUMENT 00104

**NOTICE TO CONTRACTORS**

Electronic proposals for the following project will be received through the internet using Bid Express until the date and time stated below and will be posted on [www.bidx.com](http://www.bidx.com) forthwith after the bid submission deadline. No paper copies of bids will be accepted. All Bidders must have a valid vendor code issued by MassDOT in order to bid on projects. Bidders need to apply for a Digital ID at least 14 days prior to a scheduled bid opening date with Bid Express.

**TUESDAY, AUGUST 6, 2024 at 2:00 P.M. \*\***

**WEBSTER**

**Federal Aid Project No. HSI/STP/CMQ-0033(039)X  
Intersection Improvements at I-395 Ramps (Exit 3)  
at Route 16 (East Main Street) and Sutton Road**

**\*\*Date Subject to Change**

PROJECT VALUE = \$12,773,000.00

Bidders must be pre-qualified by the Department in the HIGHWAY - CONSTRUCTION category to bid on the above project. An award will not be made to a Contractor who is not pre-qualified by the Department prior to the opening of Proposals.

All prospective Bidders who intend to bid on this project must obtain “Request Proposal Form (R109)”. The blank “Request Proposal Form (R109)” can be obtained at:  
<https://www.mass.gov/prequalification-of-horizontal-construction-firms>.

All prospective Bidders must complete and e-mail an electronic copy of “Request Proposal Form (R109)” to the MassDOT Director of Prequalification for approval:  
[prequal.r109@dot.state.ma.us](mailto:prequal.r109@dot.state.ma.us).

Proposal documents for official bidders are posted on [www.bidx.com](http://www.bidx.com). Other interested parties may receive informational Contract Documents containing the Plans and Special Provisions, free of charge.

Bids will be considered, and the contract awarded in accordance with statutes governing such contracts in accordance with Massachusetts General Laws Chapter 30 § 39M.

The Project Bids File Attachments folder for proposals at [www.bidx.com](http://www.bidx.com) shall be used for submitting at the time of bid required information such as the Bid Bond required document, and other documents that may be requested in the proposal.

**NOTICE TO CONTRACTORS** (Continued)

All parties who wish to have access to information plans and specification must send a “Request for Informational Documents” to [MassDOTBidDocuments@dot.state.ma.us](mailto:MassDOTBidDocuments@dot.state.ma.us).

A Proposal Guaranty in the amount of 5% of the value of the bid is required.

This project is subject to the schedule of prevailing wage rates as determined by the Commissioner of the Massachusetts Department of Labor and Workforce Development, and the Division of Occupational Safety, and the United States Department of Labor.

Plans will be on display and information will be available at the MassDOT Boston Office and at the District Office in WORCESTER.

The Massachusetts Department of Transportation, in accordance with Title VI of the Civil Rights Act of 1964 (78 Stat. 252, 42 U.S.C. §§ 2000d to 2000d-4) and the Regulations, hereby affirmatively ensures that for any contract entered into pursuant to this advertisement, all bidders, including disadvantaged business enterprises, will be afforded full and fair opportunity to submit bids in response to this invitation and will not be discriminated against on the grounds of race, color, national origin in consideration for an Award.

This Proposal contains the "STANDARD FEDERAL EQUAL EMPLOYMENT OPPORTUNITY CONTRACT SPECIFICATIONS (EXECUTIVE ORDER 11246)". The goals and timetables applicable to this proposal for minority and female participation, expressed in percentage terms for the Contractor's aggregate work force in each trade on all work, are contained in Appendices A and B-80 of the above specifications.

The Contractor (hereinafter includes consultants) will comply with the Acts and Regulations relative to Non-discrimination in Federally-assisted programs of the U.S. Department of Transportation, Federal Highway Administration (FHWA), as they may be amended from time to time, which are herein incorporated by reference and made a part of this Contract as contained in Appendices C and D of the above specifications.



**NOTICE TO CONTRACTORS** (Continued)

**PRICE ADJUSTMENTS**

This Contract contains price adjustments for hot mix asphalt and Portland cement mixtures, diesel fuel, and gasoline. For reference the base prices are as follows: liquid asphalt \$610.00 per ton, Portland cement \$425.53 per ton, diesel fuel \$2.865 per gallon, and gasoline \$2.764 per gallon, and Steel Base Price Index 428.4. MassDOT posts the **Price Adjustments** on their Highway Division's website at

<https://www.mass.gov/massdot-contract-price-adjustments>

This Contract contains Price Adjustments for steel. See Document 00813 - PRICE ADJUSTMENT FOR STRUCTURAL STEEL AND REINFORCING STEEL for their application and base prices.

MassDOT projects are subject to the rules and regulations of the Architectural Access Board (521 CMR 1.00 et seq.)

Prospective bidders and interested parties can access this information and more via the internet at [WWW.COMMBUYS.COM](http://WWW.COMMBUYS.COM).

BY: Monica G. Tibbits-Nutt, Secretary and CEO, MassDOT  
Jonathan L. Gulliver, Administrator, MassDOT Highway Division  
SATURDAY, JULY 6, 2024

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DOCUMENT 00210

REQUIREMENTS OF MASSACHUSETTS GENERAL LAWS  
CHAPTER 30, SECTION 39R;  
CHAPTER 30, SECTION 39O

July 1, 1981, updated October 2016

**M.G.L. c. 30, § 39R. Award of Contracts; Accounting Statements; Annual Financial Statements; Definitions.**

(a) The words defined herein shall have the meaning stated below whenever they appear in this section:

- (1) "Contractor" means any person, corporation, partnership, joint venture, sole proprietorship, or other entity awarded a contract pursuant to sections thirty-eight A1/2 to thirty-eight O, inclusive, of chapter seven and any contract awarded or executed pursuant to section eleven C of chapter twenty-five A, section thirty-nine M of chapter thirty, or sections forty-four A to forty-four H, inclusive, of chapter one hundred and forty-nine, which is for an amount or estimated amount greater than one hundred thousand dollars.
- (2) "Contract" means any contract awarded or executed pursuant to sections thirty-eight A1/2 to thirty-eight O, inclusive, of chapter seven and any contract awarded or executed pursuant to section eleven C of chapter twenty-five A, section thirty-nine M of chapter thirty, or sections forty-four A through forty-four H, inclusive, of chapter one hundred and forty-nine, which is for amount or estimated amount greater than one hundred thousand dollars.
- (3) "Records" means books of original entry, accounts, checks, bank statements and all other banking documents, correspondence, memoranda, invoices, computer printouts, tapes, discs, papers and other documents or transcribed information of any type, whether expressed in ordinary or machine language.
- (4) "Independent Certified Public Accountant" means a person duly registered in good standing and entitled to practice as a certified public accountant under the laws of the place of his residence or principal office and who is in fact independent. In determining whether an accountant is independent with respect to a particular person, appropriate consideration should be given to all relationships between the accountant and that person or any affiliate thereof. Determination of an accountant's independence shall not be confined to the relationships existing in connection with the filing of reports with the awarding authority.
- (5) "Audit", when used in regard to financial statements, means an examination of records by an independent certified public accountant in accordance with generally accepted accounting principles and auditing standards for the purpose of expressing a certified opinion thereon, or, in the alternative, a qualified opinion or a declination to express an opinion for stated reasons.
- (6) "Accountant's Report", when used in regard to financial statements, means a document in which an independent certified public accountant indicates the scope of the audit which he has made and sets forth his opinion regarding the financial statements taken as a whole with a listing of noted exceptions and qualifications, or an assertion to the effect that an overall opinion cannot be expressed. When an overall opinion cannot be expressed the reason therefor shall be stated. An accountant's report shall include as a part thereof a signed statement by the responsible corporate officer attesting that management has fully disclosed all material facts to the independent certified public accountant, and that the audited financial statement is a true and complete statement of the financial condition of the contractor.
- (7) "Management", when used herein, means the chief executive officers, partners, principals or other person or persons primarily responsible for the financial and operational policies and practices of the contractor.
- (8) Accounting terms, unless otherwise defined herein, shall have a meaning in accordance with generally accepted accounting principles and auditing standards.

(b) Subsection (a)(2) hereof notwithstanding, every agreement or contract awarded or executed pursuant to sections thirty-eight A 1/2 to thirty-eight O, inclusive, of chapter seven, or eleven C of chapter twenty-five A, and pursuant to section thirty-nine M of chapter thirty or to section forty-four A through H, inclusive, of chapter one hundred and forty-nine, shall provide that:

- (1) The contractor shall make, and keep for at least six years after final payment, books, records, and accounts which in reasonable detail accurately and fairly reflect the transactions and dispositions of the contractor, and
- (2) Until the expiration of six years after final payment, the office of inspector general, and the commissioner of capital asset management and maintenance shall have the right to examine any books, documents, papers or records of the contractor or of his subcontractors that directly pertain to, and involve transactions relating to, the contractor or his subcontractors, and
- (3) If the agreement is a contract as defined herein, the contractor shall describe any change in the method of maintaining records or recording transactions which materially affect any statements filed with the awarding authority, including in his description the date of the change and reasons therefor, and shall accompany said description with a letter from the contractor's independent certified public accountant approving or otherwise commenting on the changes, and
- (4) If the agreement is a contract as defined herein, the contractor has filed a statement of management on internal accounting controls as set forth in paragraph (c) below prior to the execution of the contract, and
- (5) If the agreement is a contract as defined herein, the contractor has filed prior to the execution of the contracts and will continue to file annually, an audited financial statement for the most recent completed fiscal year as set forth in paragraph (d) below.

(c) Every contractor awarded a contract shall file with the awarding authority a statement of management as to whether the system of internal accounting controls of the contractor and its subsidiaries reasonably assures that:

- (1) transactions are executed in accordance with management's general and specific authorization;
- (2) transactions are recorded as necessary
  - i. to permit preparation of financial statements in conformity with generally accepted accounting principles, and
  - ii. to maintain accountability for assets;
- (3) access to assets is permitted only in accordance with management's general or specific authorization; and
- (4) the recorded accountability for assets is compared with the existing assets at reasonable intervals and appropriate action was taken with respect to any difference.

Every contractor awarded a contract shall also file with the awarding authority a statement prepared and signed by an independent certified public accountant, stating that he has examined the statement of management on internal accounting controls, and expressing an opinion as to:

- (1) whether the representations of management in response to this paragraph and paragraph (b) above are consistent with the result of management's evaluation of the system of internal accounting controls; and
- (2) whether such representations of management are, in addition, reasonable with respect to transactions and assets in amounts which would be material when measured in relation to the applicant's financial statements.



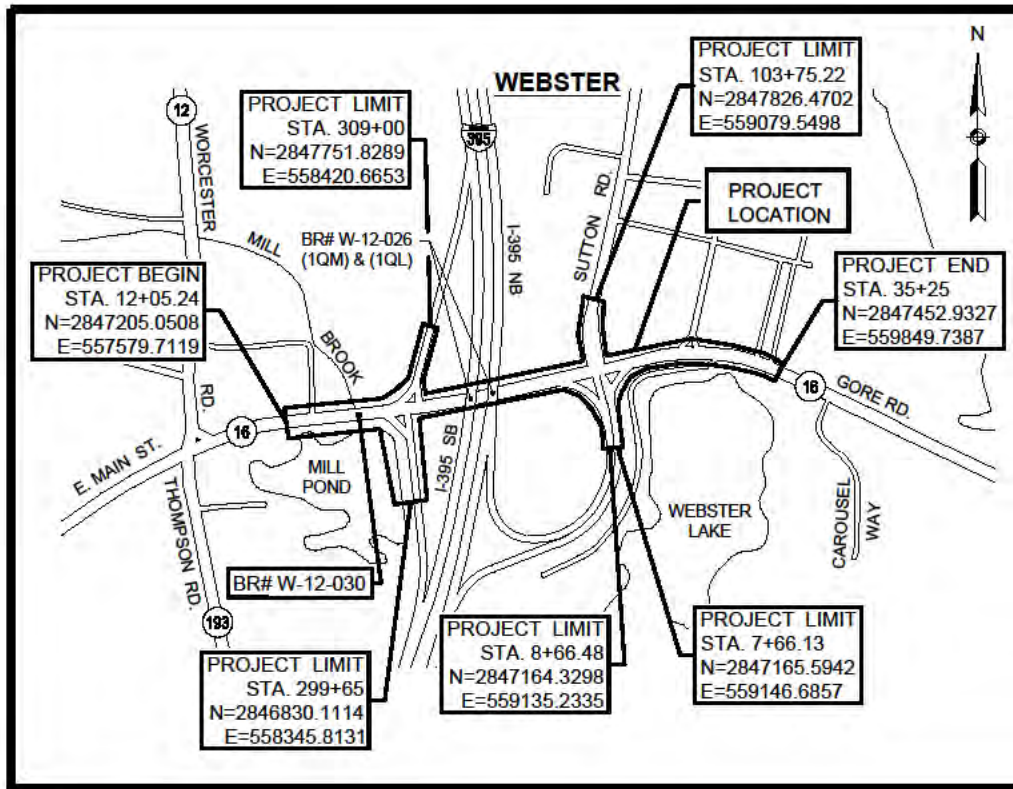
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DOCUMENT 00331

### LOCUS MAP

#### WEBSTER

**Federal Aid Project No. HSI/STP/CMQ-0033(039)X  
Intersection Improvements at I-395 Ramps (Exit 3)  
at Route 16 (East Main Street) and Sutton Road**



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Final Report   
Interim Report

## CONTRACTOR PROJECT EVALUATION FORM

*For instructions on using this form, see Engineering Directive E-10-002, Dated 4/20/2010*

Date: \_\_\_\_\_

City/Town: \_\_\_\_\_ Contractor: \_\_\_\_\_

Project: \_\_\_\_\_ Address: \_\_\_\_\_

F.A. No. \_\_\_\_\_ Contract Number: \_\_\_\_\_

Bid Price: \_\_\_\_\_ Notice to Proceed: \_\_\_\_\_

Funds: State: \_\_\_\_\_ Fed Aid: \_\_\_\_\_ Current Contract Completion Date: \_\_\_\_\_

Date Work Started: \_\_\_\_\_ Date Work Completed\*: \_\_\_\_\_

Contractor's Superintendent: \_\_\_\_\_

Division: (indicates class of work) Highway: \_\_\_\_\_ Bridge: \_\_\_\_\_ Maintenance: \_\_\_\_\_

\*If work was NOT completed within specified time (including extensions) give reasons on following page.

	Excellent 10	Very Good 9	Average 8	7	Fair 6	5	Poor 4	% Rating
<b>1. Workmanship</b>								x 2=
<b>2. Safety</b>								x 2=
<b>3. Schedule</b>								x 1.5=
<b>4. Home Office Support</b>								x 1=
<b>5. Subcontractors Performance</b>								x 1=
<b>6. Field Supervision/ Superintendent</b>								x 1=
<b>7. Contract Compliance</b>								x 0.5=
<b>8. Equipment</b>								x 0.5=
<b>9. Payment of Accounts</b>								x 0.5=
<b>(use back for additional comments)</b>								<b>Overall Rating:</b>

*(Give explanation of items 1 through 9 on the following page in numerical order if overall rating is below 80%. Use additional sheets if necessary.)*

\_\_\_\_\_  
District Construction Engineer's Signature/Date

\_\_\_\_\_  
Resident Engineer's Signature/Date

\_\_\_\_\_  
Contractor's Signature Acknowledging Report/Date

Contractor Requests Meeting with the District: No  Yes  Date Meeting Held: \_\_\_\_\_

Contractor's Comments/Meeting Notes (extra sheets may be added to this form and noted here if needed):

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_





Final Report

Interim Report

## SUBCONTRACTOR PROJECT EVALUATION FORM

*For instructions on using this form, see Engineering Directive E-10-002, Dated 4/20/2010*

Date: \_\_\_\_\_

City/Town: \_\_\_\_\_

Subcontractor: \_\_\_\_\_

Project: \_\_\_\_\_

Address: \_\_\_\_\_

F.A. No.: \_\_\_\_\_

Contract Number: \_\_\_\_\_

Prime Contractor \_\_\_\_\_

Current Contract Completion Date: \_\_\_\_\_

Date Work Started: \_\_\_\_\_

Date Work Completed\*: \_\_\_\_\_

Subcontractor's Superintendent: \_\_\_\_\_

Type of Work Performed by Subcontractor: \_\_\_\_\_

\*If work was NOT completed within specified time (including extensions) give reasons on following page.

	Excellent 10	Very Good 9	Average 8	7	Fair 6	5	Poor 4	% Rating
<b>1. Workmanship</b>								x 2=
<b>2. Safety</b>								x 2=
<b>3. Schedule</b>								x 1.5=
<b>4. Home Office Support</b>								x 1.5=
<b>5. Field Supervision/ Superintendent</b>								x 1=
<b>6. Contract Compliance</b>								x 1=
<b>7. Equipment</b>								x 0.5=
<b>8. Payment of Accounts</b>								x 0.5=
<b>(use back for additional comments)</b>								<b>Overall Rating:</b>

*(Give explanation of items 1 through 8 on the following page in numerical order if overall rating is below 80%. Use additional sheets if necessary.)*

\_\_\_\_\_  
District Construction Engineer's Signature/Date

\_\_\_\_\_  
Resident Engineer's Signature/Date

\_\_\_\_\_  
Contractor Signature Acknowledging Report/Date

\_\_\_\_\_  
Subcontractor Signature Acknowledging Report/Date

Subcontractor Requests Meeting with the District: No  Yes  Date Meeting Held: \_\_\_\_\_

Subcontractor's Comments / Meeting Notes (extra sheets may be added to this form and noted here if needed): \_\_\_\_\_

\_\_\_\_\_

Contractor's Comments: \_\_\_\_\_

\_\_\_\_\_



DOCUMENT 00710  
GENERAL CONTRACT PROVISIONS  
Revised: 05/06/24

NOTICE OF AVAILABILITY

The STANDARD SPECIFICATIONS FOR HIGHWAYS AND BRIDGES dated 2024, the SUPPLEMENTAL SPECIFICATIONS, the 1996 METRIC CONSTRUCTION AND TRAFFIC STANDARD DETAILS, the 1990 STANDARD DRAWINGS FOR SIGNS AND SUPPORTS; the 1968 STANDARD DRAWINGS FOR TRAFFIC SIGNALS AND HIGHWAY LIGHTING and the 2017 CONSTRUCTION STANDARD DETAILS are available online at <https://www.mass.gov/massdot-highway-division-manuals-and-publications>

SPECIAL PROVISIONS FOR RIGHT-TO-KNOW ACT REQUIREMENTS

The Contractor's attention is directed to Massachusetts General Laws, Chapter 111F, commonly known as the Right-To-Know Act, and to the regulations promulgated pursuant thereto. Among the provisions of the Right-To-Know Act is a requirement that employers make available to employees Materials Safety Data Sheets (MSDS) for any substance on the Massachusetts Substance List (MSL) to which employees are, have been, or may be exposed.

To ensure prompt compliance with these regulations and legislation, the Contractor shall:

1. Deliver to the Department, prior to the start of any work under this contract, copies of MSDS for all MSL substances to be used, stored, processed or manufactured at the worksite by the Contractor.
2. Train employees of the Department, who may be exposed to MSL substances as a result of the Contractor's work under this contract, with regard to those specific substances in accordance with requirements of the Right-To-Know Act.
3. Observe all safety precautions recommended on the MSDS for any MSL substance to be used, stored, processed, or manufactured at the worksite by the Contractor.
4. Inform the Department in writing regarding specific protective equipment recommended in the MSDS for MSL substances to which employees of the Department may be exposed as a result of the Contractor's work under this contract.

The Department shall not be liable for any delay or suspension of work caused by the refusal of its employees to perform any work due to the Contractor's failure to comply with the Right-To-Know Act. The Contractor agrees to hold the Department or the Commissioner of the Department harmless and fully indemnified for any and all claims, demands, fines, actions, complaints, and causes of action resulting from or arising out of the Contractor's failure to comply with the requirements of the Right-To-Know Act.

ALTERNATIVE DISPUTE RESOLUTION

Forum, Choice of Law and Mediations:

Any actions arising out of a contract shall be governed by the laws of Massachusetts and shall be brought and maintained in a State or federal court in Massachusetts which shall have exclusive jurisdiction thereof. MassDOT and the Contractor may both agree to mediation of any claim and will share the costs of such mediation pro rata based on the number of parties involved.

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DOCUMENT 00713

**Subsection 701**  
**Cement Concrete Sidewalks, Pedestrian Curb Ramps, and Driveways**  
**and**  
**Guide to the Interim Subsection 701**  
**Cement Concrete Sidewalk Specification**

(March 31, 2022)

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**SUBSECTION 701: CEMENT CONCRETE SIDEWALKS, PEDESTRIAN CURB RAMPS, AND DRIVEWAYS**

Replace this Subsection with the following:

**INTERIM SUBSECTION 701: CEMENT CONCRETE SIDEWALKS, PEDESTRIAN CURB RAMPS, AND DRIVEWAYS**

**DESCRIPTION**

**701.20: General**

This work shall consist of the construction of cement concrete sidewalks, pedestrian curb ramps, and driveways in accordance with the specifications and within the tolerances established on the plans.

**MATERIALS**

**701.30: General**

Materials shall meet the requirements specified in the following Subsections of Division III, Materials except as noted herein:

Gravel Borrow, Type b.....	M1.03.0
Cement Concrete ( $\geq 4,000$ psi).....	M4.02.00
Preformed Expansion Joint Filler.....	M9.14.0 <sup>[1]</sup>

<sup>[1]</sup> Preformed expansion joint filler shall conform to Subsection M9.14.0 or ASTM D8139.

The following best practices may be incorporated into the cement concrete mix design at no additional cost to the Department as identified herein.

**A. Combined Aggregate System.**

The combined aggregate system for the mix design may be analyzed using the Tarantula Curve, Shilstone Chart, fineness modulus, and coarse aggregate content to enhance the properties of the concrete.

**1. Tarantula Curve.**

The combined aggregate system for the mix design may be analyzed using the Tarantula Curve to evaluate potential properties of the concrete, including workability, segregation, edge slumping, surface finishing, and cohesion.

**Table 701.30-1: Tarantula Curve Particle Size Distribution**

Sieve Opening	Percent by Mass Targets (%)		Percent by Mass Retained (%)		
	Passing	Retained			
1-1/2 in.	100	–	–	–	–
1 in.	92	8	0 – 16	–	–
3/4 in.	82	10	0 – 20	–	–
1/2 in.	69	13	4 – 20	–	–
3/8 in.	56	13	4 – 20	–	–
No. 4	43	13	4 – 20	–	–
No. 8	37	6	0 – 12	Coarse Sand 20 – 40	–
No. 16	31	6	0 – 12		–
No. 30	18	13	4 – 20	Fine Sand 24 – 34	–
No. 50	5	13	4 – 20		–
No. 100	0	5	0 – 10		–
No. 200	0	0	0 – 2		–

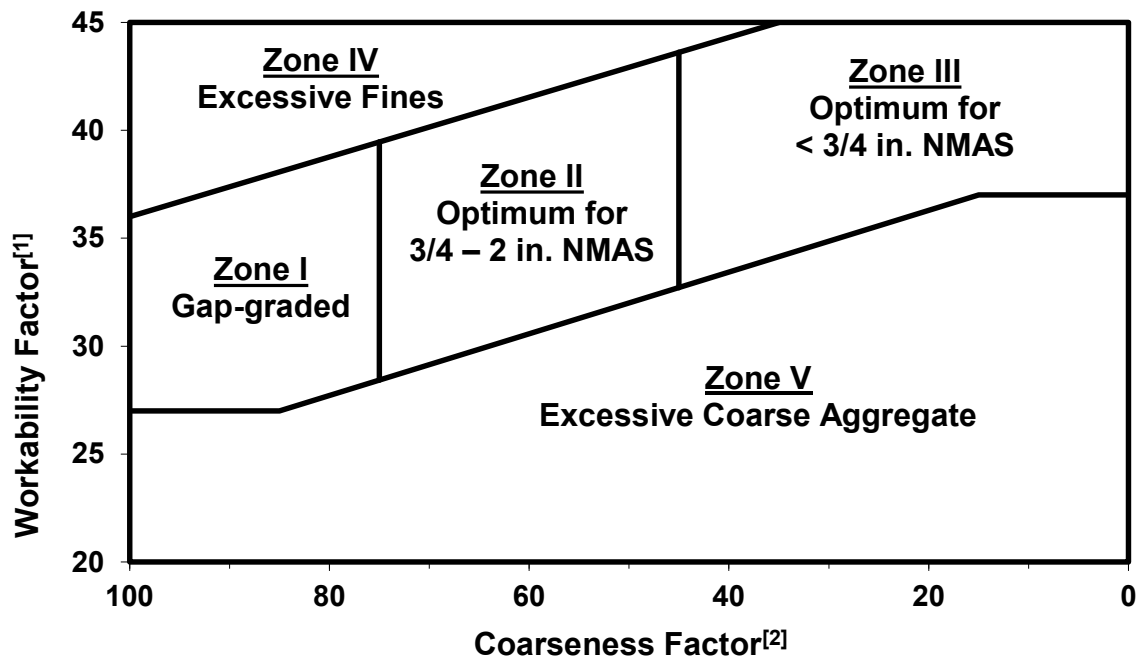
**2. Shilstone Workability-Coarseness Chart.**

The combined aggregate system for the mix design may be analyzed using the Shilstone Workability-Coarseness Chart, to evaluate potential properties of the concrete, including workability.

**Table 701.30-2: Shilstone Workability-Coarseness**

Zone	Property	Cause
Zone I	Gap-graded; High potential for segregation during placement and consolidation; Cracking, blistering, spalling, and scaling	Deficiency in intermediate particles; Non-cohesive
Zone II	Optimum mixture for nominal maximum aggregate size from 2 in. – 3/4 in.	Optimized workability factor and coarseness factor
Zone III	Optimum mixture for nominal maximum aggregate size < 3/4 in.	Optimized workability factor and coarseness factor
Zone IV	Sticky; High potential for segregation during consolidation and finishing; Variable strength, high shrinkage, cracking, curling, spalling, and scaling	Excessive fines
Zone V	Rocky; Lacking plasticity	Excessive amount of coarse and intermediate aggregate

Figure 701.30-1: Shilstone Workability-Coarseness Chart



<sup>[1]</sup> The workability factor is determined by the equation  $WF = W + (C - 564) / 38$ , where WF = workability factor, W = percent passing No. 8 sieve and C = total cementitious materials content.

<sup>[2]</sup> The coarseness factor is determined by the equation  $CF = (Q/R) / 100$ , where CF = coarseness factor, Q = cumulative percent retained on 3/8 in. sieve and R = cumulative percent retained on No. 8 sieve.

**3. Fineness Modulus.**

The combined aggregate system for the mix design may be analyzed using the fineness modulus, to evaluate potential properties of the concrete, including the fineness or coarseness of the mix design and estimating the design proportions of fine and coarse aggregates. The coarseness of the mix design increases as the fineness modulus increases. The fineness modulus is determined by calculating the total cumulative percentages by mass retained on each designated sieve and dividing by 100.

**4. Coarse Aggregate Content.**

The combined aggregate system for the mix design may be analyzed using the coarse aggregate content. The coarse aggregate content is determined by calculating the total cumulative percentages by mass retained on the No. 4 sieve.

**B. Paste System.**

The quality of the paste system is determined by the water-cementitious ratio, air content, cementitious materials, and chemical admixtures incorporated into the mix design.

**1. Water-Cementitious Ratio.**

The water-cementitious ratio for the mix design may be analyzed to evaluate potential properties of the concrete, including strength, concrete and reinforcement bonding, and resistance to freezing, thawing, de-icing, sulfate reaction, corrosion of steel reinforcement, drying shrinkage, cracking, and

volume change from wetting and drying. The water-cementitious ratio is determined by calculating the total water content by mass and dividing by the total cement and supplementary cementitious material (SCM) content by mass. The recommended water-cementitious ratio design target is identified in Table 701.30-3. The water-cementitious ratio shall be less than or equal to 0.45.

**Table 701.30-3: Freezing, Thawing, and De-icing Resistance**

Exposure Class	Severity	Condition	Water-Cementitious Ratio
			Requirement
F3	Very Severe	Exposed to freezing and thawing cycles and accumulation of snow, ice, and de-icing chemicals; Frequent exposure to water	≤ 0.45

## 2. Air Content.

The air content for the mix design may be analyzed to evaluate potential properties of the concrete, including strength and resistance to freezing, thawing, de-icing, and sulfate reaction. The recommended air content design targets are identified in Table 701.30-4.

**Table 701.30-4: Freezing, Thawing, and De-icing Resistance**

Exposure Class	Severity	Condition	Nominal Maximum Aggregate Size (in.)	Air Content Target Recommendation (%)
F3	Very Severe	Exposed to freezing and thawing cycles and accumulation of snow, ice, and de-icing chemicals; Frequent exposure to water	3/8	7.5
			1/2	7.0
			3/4	7.0
			1	6.5
			1 1/2	6.5

## 3. Cement and Supplementary Cementitious Materials Content.

The cement and supplementary cementitious materials content incorporated into the mix design shall promote quality properties of the cement concrete, including resistance to alkali silica reaction, freezing, thawing, de-icing, and sulfate reaction. Incorporation of supplementary cementitious materials (SCM) in cement concrete may affect workmanship properties, including workability, bleed rate, setting time, and other properties. Adequate adjustments in Contractor workmanship practices, including placement, finishing, curing, and other construction practices shall be required to account for these changes in properties and to prevent scaling due to freezing, thawing, and de-icing cycles. The cement and supplementary cementitious materials content shall meet the design criteria identified in Table 701.30-5.

**Table 701.30-5: Alkali Silica Reaction and Freezing, Thawing, and De-icing Resistance<sup>[1][2]</sup>**

Exposure Class	Severity	Condition	Material	Replacement by Weight of Cement (%)
F3	Very Severe	Exposed to freezing and thawing cycles and accumulation of snow, ice, and de-icing chemicals; Frequent exposure to water	Low Alkali Cement ( $\leq 0.60\%$ Alkalinity)	–
			Blended Hydraulic Cement <sup>[3]</sup>	–
			Fly Ash (Class F)	15 – 30
			Slag (Grade 100 or 120)	25 – 50
			Silica Fume	5 – 10
			Total SCM	$\leq 50$
			Total Fly Ash and Silica Fume	$\leq 35$

<sup>[1]</sup> Acceptable replacement by weight of cement for alkali silica reaction resistance shall be determined by the alkali silica reaction resistance performance test results and the criteria identified in Table 701.73-1: Minimum Acceptance Sampling and Testing Requirements.

<sup>[2]</sup> Test results meeting the alkali silica reaction resistance performance criteria of Table 701.30-6: Alternative Performance Evaluation to Alkali Silica Reaction Resistance Design Criteria may supersede the replacement by weight of cement design criteria.

<sup>[3]</sup> SCMs in blended hydraulic cement shall meet the criteria identified for fly ash, slag, and silica fume.

**Table 701.30-6: Alternative Performance Evaluation to Alkali Silica Reaction Resistance Design Criteria**

Method	Quality Characteristic	Criteria
C295	Petrographic Examination for Potential Alkali Aggregate Reactive Constituents and Deleterious Materials in Aggregate <sup>[1]</sup>	–
	Optically Strained, Microfractured or Microcrystalline Quartz (%)	$\leq 5.0$
	Chert or Chalcedony (%)	$\leq 3.0$
	Trydimite or Cristobalite (%)	$\leq 1.0$
	Opal (%)	$\leq 0.5$
	Natural Volcanic Glass (%)	$\leq 3.0$
T 380	Alkali Silica Reaction Resistance: Expansion of Miniature Concrete Prisms at 56 days (%)	$\leq 0.03$ <sup>[2]</sup>

<sup>[1]</sup> Examination of aggregate shall be performed and reported to identify and quantify potential alkali-aggregate reactive constituents and deleterious materials in aggregate, as defined in ASTM C294 Standard Descriptive Nomenclature for Constituents of Concrete Aggregates and ASTM C295 Standard Guide for Petrographic Examination of Aggregates for Concrete.

<sup>[2]</sup> 56-day expansion results greater than 0.03 but less than or equal to 0.04 shall be considered non-reactive if the average two-week rate of expansion from day 56 to day 84 is less than or equal to 0.01%, otherwise, expansion results shall be considered reactive.

#### 4. Chemical Admixtures.

Chemical admixtures may be incorporated into the mix design to enhance the properties of the concrete.

**Table 701.30-7: Chemical Admixtures**

Spec.	Type	Chemical Admixture	Properties
M 194	A	Water-Reducing	Increases Workability and Air Content; Decreases Water Demand (5 – 10%, 3 – 6 in. Slump)
	B	Retarding	Increases Initial and Final Setting Time, Air Content, Long-Term Strength; Offsetting of Accelerating Effect of Hot Weather; Decreases Early-Age Strength
	C	Accelerating	Increases Early-Age Strength; Decreases Initial and Final Setting Time
	D	Water-Reducing and Retarding	Type A and Type B Admixture Properties
	E	Water-Reducing and Accelerating	Type A and Type C Admixture Properties
	F	High Range Water-Reducing	Increases Workability (More Effective than Type A), Air Content, Early-Age Strength, and Ultimate Strength; Decreases Water Demand (12 – 40%, > 6 in. Slump) and Permeability
	G	High Range Water-Reducing and Retarding	Type F and Type B Admixture Properties
	S-SRA	Shrinkage Reducing	Increases Setting Time; Decreases Drying Shrinkage Cracking and Bleed Rate
	S-CRA	Crack Reducing	Decreases Cracking (More Effective than SRAs) and Crack Width
M 154	AEA	Air-Entraining	Increases Cohesion, Workability, Stabilization of Air Bubbles, Resistance to Freezing, Thawing, and De-icing, Resistance to Alkali-Reactive Environment, and Resistance to Sulfate Reaction
M 194 <sup>[1]</sup>	MRWRA	Mid Range Water-Reducing	Type A and Type F Admixture Properties; Increases Workability (Especially Concrete with SCMs); Decreases Water Demand (6 – 12 %, 5 – 8 in. Slump)
C1622	CWA	Cold Weather	Increases Hydration Rate; Decreases Freezing Point of Mixing Water

<sup>[1]</sup> Mid range water-reducing admixtures (MRWRA) may meet either water-reducing (A) or high range water-reducing (F) admixture criteria.

### 5. Paste Content.

The paste content for the mix design may be optimized to enhance potential properties of the concrete, including workability, strength, permeability, and resistance to drying shrinkage and cracking and volume change from wetting and drying. The volume of paste should adequately fill the voids and provide sufficient separation between the aggregate particles to promote workability and effective bonding of particles.

**Table 701.30-8: Paste Content**

Mix Design Characteristic	Recommendation
Volume of Cement Concrete (cf) <sup>[1]</sup>	27
Paste Content (%) <sup>[2]</sup>	≤ 28 <sup>[3]</sup>
Paste Content to Aggregate Void Content Ratio <sup>[4]</sup>	1.25 – 1.75
Excess Volume of Paste for Workability (%) <sup>[5]</sup>	–

<sup>[1]</sup> The volume of cement concrete is determined by the following equation, where W = Weight (lbs.), SG = Specific Gravity, D = Density (pcf), and V = Volume (cf).

$$V_{CEMENT} = W_{CEMENT} / SG_{CEMENT} * D_{WATER}$$

$$V_{SCM} = W_{SCM} / SG_{SCM} * D_{WATER}$$

$$V_{ADMIXTURE} = V_{ADMIXTURE} \text{ in oz.} / 957.5 \text{ oz. per cf}$$

$$V_{WATER} = V_{WATER} \text{ in gal.} / 7.48 \text{ gal. per cf}$$

$$V_{COARSE} = W_{COARSE} / SG_{COARSE} * D_{WATER}$$

$$V_{FINE} = W_{FINE} / SG_{FINE} * D_{WATER}$$

$$V_{CONCRETE} = V_{CEMENT} + V_{SCM} + V_{ADMIXTURE} + V_{WATER} + V_{COARSE} + V_{FINE} + V_{AIR}$$

<sup>[2]</sup> The paste content by volume of cement concrete is determined by the following equation, where V = Volume (cf) and PC = Paste Content (%).

$$V_{PASTE} = V_{CEMENT} + V_{SCM} + V_{ADMIXTURE} + V_{WATER}$$

$$PC_{CONCRETE} = V_{PASTE} / V_{CONCRETE}$$

<sup>[3]</sup> The cracking tendency of structural concrete is significantly reduced when the paste content by volume is less than or equal to 28 percent.

<sup>[4]</sup> The paste content to aggregate void content ratio is determined by the following equation, where D = Density (pcf), SG = Specific Gravity, BD = Bulk Density (pcf), VC = Void Content (%), V = Volume (cf), AVC = Aggregate Void Content (%), PC = Paste Content (%), and R = Ratio. Workability increases as the paste content to aggregate void content ratio increases. Decreased paste content to aggregate void content ratios will result in decreased workability, where water-reducing admixtures provide no benefit.

$$V_{COARSE} = SG_{COARSE} * D_{WATER} - BD_{COARSE} / D_{COARSE}$$

$$V_{FINE} = SG_{FINE} * D_{WATER} - BD_{FINE} / D_{FINE}$$

$$V_{AGGREGATE} = [(V_{COARSE} / (V_{COARSE} + V_{FINE})) * VC_{COARSE} + (V_{FINE} / (V_{COARSE} + V_{FINE})) * VC_{FINE}]$$

$$AVC_{CONCRETE} = [V_{AGGREGATE} * ((V_{COARSE} + V_{FINE}) / V_{CONCRETE})]$$

$$R_{PC-AVC} = PC_{CONCRETE} / AVC_{CONCRETE}$$

<sup>[5]</sup> The excess paste content for workability is determined by the following equation, where PC = Paste Content (%), AC = Air Content (%), AVC = Aggregate Void Content (%), and EPC = Excess Paste Content for Workability (%).

$$EPC_{CONCRETE} = PC_{CONCRETE} + AC_{CONCRETE} - AVC_{CONCRETE}$$

### C. Initial Curing Materials.

The materials and procedures used for initial curing methods of cement concrete shall meet the Manufacturer's instructions and recommendations and the requirements specified herein.

Cement concrete with a low to negligible bleeding rate, exposure to highly evaporative environments, high content of silica fume, fine cement, or other fine cementitious material, low water to cementitious ratio, high air content, or water-reducing admixtures have an increased susceptibility to surface drying and plastic shrinkage between placement and finishing operations. Initial curing materials and procedures shall be applied immediately after the bleed water sheen has disappeared from the surface of the concrete or the concrete surface exhibits loss of moisture and surface drying, between placement and finishing operations. Initial curing materials shall not be worked into the surface in subsequent finishing operations.

#### 1. Liquid-Applied Evaporation Reducers.

Liquid-applied evaporation reducers used for initial curing methods shall produce an effective monomolecular film over the bleed water layer, to reduce the rate of evaporation of the bleed water from the surface and plastic shrinkage when the evaporation rate equals or exceeds the bleeding rate.

### D. Intermediate Curing Materials.

The materials and procedures used for intermediate curing methods of cement concrete shall meet the Manufacturer's instructions and recommendations and the requirements specified herein.

In instances where finishing operations have been completed prior to the concrete achieving final set and the concrete surface exhibits loss of moisture and surface drying, the following curing materials and procedures shall be applied immediately to the concrete surface prior to the application of final curing materials, to prevent the loss of moisture without damaging the concrete surface, until final set of the concrete has been achieved and final curing materials have been applied to the concrete surface.

- 701.30.C.1: Liquid-Applied Evaporation Reducers
- 701.30.E.3.a: Liquid Membrane-Forming Compounds for Curing
- 701.30.E.3.b: Liquid Membrane-Forming Compounds for Curing and Sealing

### E. Final Curing Materials.

The materials and procedures used for final curing methods of cement concrete shall meet the Manufacturer's instructions and recommendations and the requirements specified herein.

Curing water shall be free of deleterious impurities, causing staining and deterioration. The potential staining ability of curing water shall be evaluated by means of CRD-C401 (US Army Corps



of Engineers 1975) for instances where curing water quality is questioned. Curing water shall not exceed a temperature differential of more than 20°F from the internal concrete temperature, to prevent cracking due to temperature gradients causing strain that exceeds the strain capacity of concrete. Curing water shall remain above freezing temperatures throughout the duration of the curing cycle.

Final curing materials and procedures shall be applied to the concrete surface immediately after application of initial and intermediate curing materials, finishing operations, and final set of cement concrete, to prevent the loss of moisture and surface drying.

Materials used for final curing methods of cement concrete shall accommodate all exposed cement concrete surfaces with a continuous application of moisture throughout the entire duration of the final curing method cycle and provide controlled and gradual termination of the final curing method cycle.

Final curing materials applied to the concrete shall allow the concrete to mature sufficiently to achieve its designed and desired properties, including strength, volume stability, permeability, durability, and resistance to freezing, thawing, and de-icing cycles. Insufficient application of final curing materials results in decreased strength and durability of the top surface of concrete.

Protection to the concrete surface and curing materials shall be required in instances where adverse weather conditions are present, until curing operations can be initiated without damaging the surface of the concrete.

Final curing materials and procedures shall be applied to the concrete surface throughout the entire duration of the curing cycle and meet minimum sustained temperature, duration, and strength requirements, as specified in applicable Division II: Construction Details and herein. Controlled and gradual termination of the final curing method cycle shall begin only after all specified conditions are met, until the concrete gradually cools to within 20°F of the ambient temperature.

### **1. Saturated Covers.**

Saturated covers used for final curing methods shall meet AASHTO M 182, Class 3. Saturated covers shall be in good condition, free from holes, tears, or other defects that would render it unsuitable for curing cement concrete and cementitious materials. Saturated covers shall be dried to prevent mildew when storing. Prior to application, saturated covers shall be thoroughly rinsed in water and free of harmful substances that are deleterious or cause discoloration to cement concrete and cementitious materials. Saturated covers shall have sufficient thickness and proper positioning onto the surface to maximize moisture retention. Saturated covers shall contain a sufficient amount of moisture to prevent moisture loss from the surface of cement concrete and cementitious materials. Saturated covers shall have the ability to retain sufficient moisture from continuous watering so that a film of water remains on the surface of cement concrete and cementitious materials throughout the entire duration of the final curing method cycle. Saturated covers shall not absorb water from cement concrete and cementitious materials. Polyethylene film may be applied over the saturated cover to limit the amount of continuous watering required for sufficient moisture retainage. Saturated covers shall accommodate uniform and slow drying of cement concrete and cementitious materials surfaces immediately prior to removal.

## **2. Sheet Materials.**

Sheet materials, including polyethylene film, white burlap-polyethylene sheeting, and reinforced paper, used for final curing methods shall meet ASTM C171 and the requirements specified herein. Sheet materials shall inhibit moisture loss and reduce temperature rise in concrete exposed to radiation from the sun during the final curing method cycle. Adjoining covers shall overlap not less than 12 inches. All edges of the sheet materials shall be secured to maintain a moist environment.

### **a. Polyethylene Film.**

Polyethylene film shall be clear, white, or black in color and consist of a single sheet manufactured from polyethylene resins, be free of visible defects, including tears, wrinkles, and discontinuity. The film shall prohibit mottling and uneven spots from appearing on the surface of concrete, due to variations in temperature, moisture content, or both. Application of additional curing water under the film or application of a polyethylene film bonded to absorbent fabric to the concrete surface may be required to prevent mottling and to retain and evenly distribute the moisture. Polyethylene film shall accommodate concrete surfaces with constant contact without damage. The film shall be sufficient in length to extend beyond the edges of the concrete surface. Edges of adjacent polyethylene film shall overlap a minimum of 6 inches and be tightly sealed with the use of sand, wood planks, pressure-sensitive tape, mastic, or glue to maintain close contact with the concrete surface, retain moisture, and prevent the formation of air pockets throughout the entire duration of the final curing method cycle.

#### **i. White Polyethylene Film.**

White polyethylene film shall minimize heat gain caused by absorption of solar radiation and shall be exclusively used during warm weather applications.

#### **ii. Clear and Black Polyethylene Films.**

Clear and black polyethylene films shall inhibit absorption of solar radiation for cold weather applications.

### **b. White Burlap-Polyethylene Sheeting.**

White burlap-polyethylene sheeting shall be securely bonded to the burlap so to avoid separation of the materials during handling and curing of the concrete.

### **c. Reinforced Impervious Paper.**

Reinforced impervious paper shall be white in color, consist of two sheets of kraft paper cemented together with a bituminous adhesive, and reinforced with embedded cords or strands of fiber running in both directions. Reinforced impervious paper shall be free of holes, tears, and pin holes from deterioration of the paper through repeated use. Reinforced impervious paper shall be treated to prevent tearing when wetted and dried. Reuse of reinforced impervious paper shall be permitted so long as it is able to retain moisture on the surface of concrete. The paper shall be discarded and prohibited from use when moisture is no longer retained in the material.

## **3. Liquid Membrane-Forming Compounds.**

Compounds shall form a continuous, non-yellowing, and durable film with quality moisture-retention properties. Compounds shall maintain the relative humidity of the concrete surface

above 80% for seven days to sustain cement hydration. Compounds shall not affect the original color of the concrete surface. Compounds shall not degrade due to exposure to ultraviolet light from direct sunlight. Compounds shall meet the local and federal allowable Volatile Organic Compound (VOC) content limits.

White-pigmented compounds shall be used in instances where solar-heat gain is concern to the concrete surface. White-pigmented compounds shall be agitated in the container prior to application to prevent pigment from settling out resulting in non-uniform overage and ineffective curing.

Careful considerations shall be made by the Contractor to determine if the evaporation rate is exceeding the rate of bleeding, thus causing the surface to appear dry even though bleeding is still occurring. To diagnose and prevent this condition, the Contractor may place a transparent plastic sheet over a test area of the uncured and unfinished concrete surface and shall determine if any bleed water accumulates under the plastic. Under such conditions, the application of liquid membrane-forming compounds to the concrete surface shall be delayed to prevent bleed water from being sealed below the concrete surface, map cracking of the membrane films, reduction in moisture-retention capability, and the need for reapplication of the compound.

Prior to use, compounds shall be thoroughly mixed, stirred, and agitated per the Manufacturer's instructions and recommendations.

Compounds shall be applied continuously and uniformly to the surface of the concrete per the Manufacturer's instructions and recommendations. Compounds shall be applied immediately after the disappearance of the surface water sheen following final finishing. Applying of the compound immediately after final finishing and before all free water on the surface has evaporated will help prevent the formation of cracks. When using compounds to reduce moisture loss from formed surfaces, the exposed surface shall be wetted immediately after form removal and kept moist until the curing compound is applied. The concrete shall be allowed to reach a uniformly damp appearance with no free water on the surface, and then application of the compound shall begin at once. Delayed application will result in surface drying, absorption of the compound into the concrete, and no forming of a continuous membrane.

The concrete surface shall be damp when the compound is applied. Power-driven spray equipment shall be used for uniform application of compounds on large paving projects. Spray nozzles recommended by the compound Manufacturer and use of windshields shall be arranged by the Contractor to prevent wind-blown loss of compound and to ensure proper coverage application rates are achieved. The compound shall be applied by power sprayer, using appropriate wands and nozzles with pressures between 25 and 100 psi. The Contractor shall fill the power sprayer with curing compound from the Manufacturer's original container in the presence of the Engineer. Any dilution as recommended by the Manufacturer shall take place in the presence of the Engineer. For very small areas such as repairs, the compound shall be applied with a wide, soft-bristled brush or paint roller.

The Contractor shall verify the application rate and procedures are in accordance with the Manufacturer's instructions and recommendations. At least one uniform coat shall be applied at a rate of 150 to 200 ft<sup>2</sup>/gallon. On very deeply textured surfaces, the surface area to be treated shall be at least twice the surface area of the surface. In such cases, two separate applications may be needed, each at 200 ft<sup>2</sup>/gallon or greater if specified by the Manufacturer to achieve the desired

moisture retention rate, with the first being allowed to become tacky before the second is applied. If two coats are necessary to ensure complete coverage, for effective protection the second coat should be applied at right angles to the first. Complete coverage of the surface shall be attained due to the potential for formation of small pinholes in the membrane, which will result in loss of moisture from the concrete. Compounds shall not sag, run off peaks, or collect in grooves.

Compounds and procedures shall be compatible with concrete surfaces receiving subsequent applications or placements of concrete, overlays, coatings, paints, sealers, finishes or other toppings to ensure acceptable bonding to the concrete. Testing to establish compatibility among the curing compound, subsequent surface treatments, concrete moisture content and the actual finished surface texture of the concrete shall be conducted when compatibility is not known. The compound Manufacturer shall be consulted by the Contractor to determine the compatibility of the application. Compounds shall not be applied to concrete surfaces where bonding of subsequent applications or placements is incompatible or is of concern. The use of wax-based curing compounds shall be prohibited in instances where concrete surfaces are subject to additional toppings and vehicular, pedestrian, or other traffic. Deliberate removal of compounds in the presence of the Engineer and in accordance with Manufacturer’s instructions and recommendations shall be conducted as an alternative to compatibility testing, incompatibility, or in instances where bonding is of concern. Bonding of subsequent materials may still be inhibited by the presence of the compound even after the moisture retention characteristics of the compound have diminished.

**a. Liquid Membrane-Forming Compounds for Curing.**

Liquid membrane-forming compounds for curing shall meet ASTM C309, the Manufacturer’s instructions and recommendations, and the requirements specified herein.

***Table 701.30-1: Types of Compounds for Curing***

<b>Type</b>	<b>Description</b>
Type 1	Clear or translucent without dye
Type 1-D	Clear or translucent with fugitive dye
Type 2	White pigmented

***Table 701.30-2: Composition Class of Compounds for Curing***

<b>Type</b>	<b>Description</b>
Class A	Unrestricted composition, generally wax-based products
Class B	ASTM D883 resin-based products

**b. Liquid Membrane-Forming Compounds for Curing and Sealing.**

Liquid membrane-forming compounds for curing and sealing shall meet ASTM C 1315, the Manufacturer’s instructions and recommendations, and the requirements specified herein.

In addition to moisture-retention capabilities compounds shall exhibit specific properties, including alkali resistance, acid resistance, adhesion-promoting quality, and resistance to degradation by ultraviolet light.

**Table 701.30-3: Types of Compounds for Curing and Sealing**

Type	Description
Type I	Clear or translucent
Type II	White pigmented

**Table 701.30-4: Class of Compounds for Curing and Sealing**

Type	Description
Class A	Non-yellowing

**F. Protective Sealing Compounds.**

Protective sealing compounds shall maintain valid listing on the Department Qualified Construction Materials List (QCML) and meet AASHTO M 224, NCHRP Report 244 and the requirements specified herein.

Protective sealing compounds shall sufficiently penetrate the concrete to seal the surface pores and fill the capillaries of the concrete by chemically reacting with the concrete and forming a hydrophobic layer. Protective sealing compounds shall limit the penetration of liquids, gases, and harmful substances into hardened concrete, including water, de-icing agents, and carbon dioxide to protect concrete from freezing, thawing, and de-icing cycles, corrosion of reinforcing steel, and acid attack. Protective sealing compounds shall limit the buildup of vapor pressure between the concrete and the applied sealer. Protective sealing compounds shall retard the penetration of harmful substances into hardened concrete. Protective sealing compounds shall maintain their protective properties during environmental exposure to freezing, thawing, and de-icing cycles. Protective sealing compounds shall not reduce the frictional properties of the concrete. Protective sealing compounds shall not affect the original color of the concrete surface if maintaining the original color is desired by the Department. Protective sealers shall meet the local and federal allowable Volatile Organic Compound (VOC) content limits.

Curing methods conforming to Department specifications shall be applied to the concrete prior to the application of protective sealers. Protective sealers shall not be applied to the concrete for a minimum of 28 days after placement and the surface shall be sufficiently prepared, clean, and dry for at least 24 hours with ambient temperatures exceeding 60°F. Protective sealers shall not be applied to concrete placed where freezing, thawing, and de-icing cycles are expected immediately after, due to the retainage of water in the concrete. Periodic re-application shall be required for protective penetrants requiring multiple applications and for concrete surfaces exhibiting wear to ensure long-term protection of the concrete surface.

**G. Cold Weather Concreting Materials.**

Cold weather concreting shall be defined as the procedures, operations, materials, and equipment required for the mixing, delivery, placement, finishing, curing, and protection of concrete during cold weather conditions, while exposed to air temperatures falling below, or expected to fall below 40°F.

The protection period shall be defined as the minimum duration required to prevent concrete from the negative effects of cold weather exposure. The protection period shall remain in place while

cold weather conditions exist. Controlled and gradual termination of the protection period shall be conducted only after 100% f'c is attained and all specified conditions are met.

The procedures, operations, materials, and equipment selected for cold weather concreting shall adequately maintain specified temperature ranges by addressing all variables, including ambient weather conditions, geometry of the structure, and mix design proportions. Concrete temperatures for cold weather concreting shall meet Table 701.30-5.

**Table 701.30-5: Concrete Temperature Requirements for Cold Weather Concreting**

Phase	Cold Weather Temperature (°F)	Concrete Temperature (°F)
Mixing	30-39	60-75
	0-30	65-80
	< 0	70-85
Placement	< 40	55-75
Protection Period	< 40	55-75
Termination of Protection Period – Allowable Rate of Decrease in 24 Hours	< 40	≤ 50

Cold weather concreting procedures, operations, materials, and equipment shall be developed and performed to prevent damage to concrete due to freezing at early ages, to ensure that the concrete develops the recommended strength for safe removal of forms, to maintain curing conditions that promote quality strength and durability development, to limit rapid temperature fluctuation, and to provide protection consistent with intended serviceability of the structure. The Contractor shall develop and submit to the Department for review and approval, cold weather concreting procedures for the mixing, delivery, placement, finishing, curing, and protection of concrete during cold weather, including:

- Procedures for protecting the subgrade from frost and the accumulation of ice or snow on reinforcement or forms prior to placement
- Methods and requirements for cold weather protection and temperature control of constituent materials incorporated into the mix design
- Chemical admixtures incorporated into the mix design for cold weather protection and temperature control
- Methods and requirements for cold weather protection and temperature control during mixing, delivery, placement, finishing, curing, and protection period
- Curing methods to be used during and following the protection period
- Types of covering, insulation, heating, or enclosures to be provided
- Methods for verification of in-place strength
- Procedures for measuring and recording concrete temperatures
- Procedures for preventing drying during dry, windy conditions

All procedures, operations, materials, and equipment required for adequate protection and curing shall be present and ready for use prior to concrete production.

## **1. Insulating Materials.**

Insulating materials used for cold weather concreting shall meet the requirements specified herein. The thermal resistance of the proposed insulation system shall be determined to meet the concrete temperature range requirements specified herein. Supplemental heat, including hydronic heating systems, shall be applied in instances where insulating materials cannot achieve the concrete temperature requirements.

## **2. Heaters.**

Heaters used for cold weather concreting including direct fired, indirect fired, and hydronic heaters shall meet ANSI A10.10 carbon monoxide limits, safety regulations for ventilation, and the stability, operation, fueling, and maintenance of heaters and the requirements specified herein.

### **a. Direct Fired Heaters.**

Direct fired heaters generate heat to an enclosed space through the combustion of fossil fuels, including oil, kerosene, propane, gasoline, and natural gas. Hot air comprised of carbon dioxide and carbon monoxide combustion products, is discharged into the enclosed space. Direct fired heaters shall be prohibited from heating the air directly surrounding the concrete surface due to calcium carbonate formation interfering with the hydration reaction, from the reaction between the carbon dioxide generated from the combustion of fossil fuels and the calcium hydroxide on the surface of freshly placed concrete, resulting in a soft, chalky, and nondurable concrete surface. Direct fired heaters shall only be used on concrete surfaces protected from fossil fuel combustion products.

### **b. Indirect Fired Heaters.**

Indirect fired heaters generate heat to an enclosed space through the combustion of fossil fuels, including oil, kerosene, propane, gasoline, and natural gas. The carbon dioxide and carbon monoxide combustion products are expelled through venting, resulting in clean heated air discharged into the enclosed space. Indirect fired heaters are suitable for heating the air directly surrounding the concrete surface.

### **c. Hydronic Heaters.**

Hydronic heaters generate heat to an enclosed space through the circulation of the heat-transfer fluid in a closed system of pipes or hoses. The heat-transfer fluid is comprised of a propylene glycol water solution and is heated through the combustion of fossil fuels, including diesel fuel and kerosene. The combustion of fossil fuel occurs outside of the enclosed space and does not expose the concrete surface to the deleterious effects of carbon dioxide.

After the concrete placement achieves final set, polyethylene film or other suitable material shall sufficiently serve as a vapor barrier. The heat-transfer hoses shall be placed on top of the vapor barrier and covered with insulating materials meeting 701.30.G.1. Hydronic heaters shall be used to thaw or preheat subgrades prior to concrete placement and provide supplementary heat to insulating materials. Hydronic heaters shall provide an even distribution of heat to prevent curling and cracking induced by temperature gradients within concrete.

### 3. Enclosures.

Enclosures shall be made of wood, canvas tarpaulins, polyethylene film, or prefabricated rigid plastic. Enclosures shall be airtight, block wind, prevent admittance of cold air, conserve heat, and withstand wind and snow loads. Enclosures shall provide adequate headroom for craftsmen and sufficient space between the concrete and the enclosure to permit free circulation of warm air. Supplementary heat shall be supplied to enclosures by hydronic heaters, live steam, hot forced air, or indirect fired combustion heaters. Icing along the perimeter of the enclosure shall be prevented when live steam is utilized. Heaters and ducts shall be positioned to prevent the hot, dry air from overheating or drying the concrete surface. Insulating materials meeting 701.30.G.1 shall be applied as a vapor barrier to the concrete surface immediate after final set is attained.

#### H. Hot Weather Concreting Materials.

Hot weather concreting shall be defined as the procedures, operations, materials, and equipment required for the mixing, delivery, placement, finishing, bleed water evaporation, curing, and protection of concrete during hot weather conditions, while exposed to air temperatures exceeding, or expected to exceed 80°F; concrete temperatures approaching, or expected to approach 90°F; evaporation rates of surface water approaching, or expected to approach the bleeding rate of the concrete; high solar radiation; low relative humidity; and high wind speed.

The protection period shall be defined as the minimum duration required to prevent concrete from the negative effects of hot weather exposure, including the acceleration of rate of moisture loss and rate of cement hydration, difficulties in curing, increased concrete temperature, increased water demand, accelerated slump loss, increased rate of setting, increased tendency for plastic shrinkage and thermal cracking, increased potential for cold joints, and difficulties in controlling entrained air content. The protection period shall remain in place while hot weather conditions exist. Controlled and gradual termination of the protection period shall be conducted when conditions permit. The allowable rate of temperature decrease shall not exceed 5°F per hour and meet the allowable rate of temperature decrease specified in 701.30.G: Cold Weather Concreting Materials.

The procedures, operations, materials, and equipment selected for hot weather concreting shall adequately maintain specified temperature ranges and evaporation rates by addressing all variables, including ambient weather conditions, geometry of the structure, and mix design proportions. Initial materials meeting 701.30.C: Initial Curing Materials shall be applied to the concrete surface while the concrete and air temperatures, relative humidity of the air, and the wind speed have the capacity to evaporate free water from the fresh concrete surface at a rate that is equal to or greater than bleeding rate of the concrete. The evaporation rate of surface water shall be determined by the following equation:

$$E = (T_c^{2.5} - r * T_a^{2.5})(1 + 0.4V) \times 10^{-6}$$

where E = evaporation rate of water-covered surface (lb/ft<sup>2</sup>/hr), T<sub>c</sub> = concrete temperature of the evaporating surface (°F), r = relative humidity of air surrounding the evaporating surface (%), T<sub>a</sub> = temperature of the air surrounding the evaporative surface (°F), and V = average wind speed 20 inches above the evaporating surface. The air surrounding the evaporating surface shall be defined as the air approximately 4 to 6 feet above the evaporating surface on the windward side and shielded from the sun's rays.



Hot weather concreting procedures, operations, materials, and equipment shall be developed and performed to prevent damage to concrete and promote long-term durability. The Contractor shall develop and submit to the Department for review and approval, hot weather concreting procedures for the mixing, delivery, placement, finishing, curing, and protection of concrete during hot weather, including:

- Procedures for preparing the subgrade prior to placement
- Methods and requirements for hot weather protection and temperature control of constituent materials incorporated into the mix design
- Chemical admixtures incorporated into the mix design for hot weather protection and temperature control
- Methods and requirements for hot weather protection and temperature control during mixing, delivery, placement, finishing, curing, and protection period
- Initial curing methods to be used to reduce surface evaporation
- Curing methods to be used during and following the protection period
- Types of covering, insulation, cooling, or enclosures to be provided
- Evaporation rate and bleeding rate of concrete calculations
- Procedures for measuring and recording concrete temperatures
- Procedures for preventing drying during dry, windy conditions

All procedures, operations, materials, and equipment required for adequate protection and curing shall be present and ready for use prior to concrete production.

## **CONSTRUCTION METHODS**

### **701.40: Pre-Placement**

#### **A. Excavation.**

Excavation of the area shall be in accordance with the applicable portions of Subsection 120: Excavation.

#### **B. Subgrade and Subbase.**

The subgrade for the sidewalks and driveways shall be shaped parallel to the proposed surface of the sidewalks and driveways and thoroughly compacted. All depressions in the subgrade shall be filled with suitable material and again compacted until the surface is smooth and hard. Prior to the placement of the subbase, the Contractor shall inspect the prepared subgrade to ensure that it is in conformance with the required grade and cross-section. Subgrade shall be fine graded to meet the applicable requirements of Subsection 170: Grading.

After the subgrade has been prepared, a gravel subbase shall be placed upon it. After being compacted thoroughly, the subbase shall be at least 8 inches thick and parallel to the proposed surface of the sidewalk. Prior to the placement of the cement concrete, the Contractor shall inspect the prepared subbase material to ensure that it is in conformance with the required grade and cross-section. Subbase material that is not in accordance with the plans or specifications shall be reworked or replaced to meet the applicable requirements of Subsection 170: Grading before the start of cement concrete placement. When placing cement concrete, the compacted subbase shall not be frozen or have standing water.

### C. Forms.

Side forms and transverse forms shall be smooth, free from warp, of sufficient strength to resist springing out of shape, of a depth to conform to the thickness of the proposed sidewalk or pedestrian curb ramp and of a type satisfactory to the Engineer.

All mortar or dirt from previously used forms shall be completely removed prior to use. The forms shall be well staked and thoroughly graded and set to the established lines with their upper edge conforming to the grade of the finished sidewalk or pedestrian curb ramp which shall have sufficient pitch to the roadside edge to provide for surface drainage.

All pedestrian curb ramp joints and transition sections which define grade changes shall be formed staked and checked for dimension, grade and slope conformance prior to placing cement concrete.

All forms shall be oiled before placing concrete.

#### 701.41: Placement

The concrete shall be placed in alternate slabs 30 ft long except as otherwise ordered. The slabs shall be separated by transverse preformed expansion joint filler  $\frac{1}{2}$  in. thick.

Preformed expansion joint filler shall be placed adjacent to or around existing structures as directed.

Detectable warning panels conforming to the plans shall be securely incorporated into the work by means acceptable to the Engineer.

On the foundation as specified above, the concrete shall be placed in such quantity that after being thoroughly consolidated in place it shall be 4 in. deep. At driveways, the sidewalks shall be 6 in. deep.

In conveying the concrete from the place of mixing to the place of deposit, the operation shall be conducted in such a manner that no mortar will be lost, and the concrete shall be so handled that the concrete will be of uniform composition throughout, showing neither excess nor lack of mortar in any one place.

The surface of all concrete sidewalks shall be uniformly scored into block units of areas not more than 36 ft<sup>2</sup>. The depth of the scoring shall be at least  $\frac{1}{2}$  in. deep and no more than  $\frac{1}{2}$  in. wide.

#### 701.42: Initial Curing

In instances where the bleed water sheen has disappeared from the surface of the concrete or the concrete surface exhibits loss of moisture and surface drying between placement and finishing operations, the Contractor shall apply one of the following initial curing materials and procedures meeting 701.30.C: Initial Curing Materials until finishing operations occur.

- 701.30.C.1: Liquid-Applied Evaporation Reducers

Initial curing materials shall not be worked into the surface in subsequent finishing operations.

**701.43: Finishing**

The finishing of concrete surface shall be done by experienced and competent cement finishers. No finishing operation shall be performed while free water is present. Finishing operations shall be delayed until all bleed water and water sheen has left the surface and the concrete has started to stiffen. After water sheen has disappeared, edging operations, where required, shall be completed. After edging and joining operations, the surface shall be floated. Magnesium floats shall be used for all finishing operations. If necessary tooled joints and edges shall be rerun before and after floating to maintain uniformity. After floating, the surface shall be brushed by drawing a soft-bristled push broom with a long handle over the surface of the concrete to produce a nonslip surface.

**701.44: Intermediate Curing**

In instances where finishing operations have been completed prior to the concrete achieving final set and the concrete surface exhibits loss of moisture and surface drying, the Contractor shall apply one of the following intermediate curing materials and procedures meeting 701.30.D: Intermediate Curing Materials immediately to the concrete surface prior to the application of final curing materials, to prevent the loss of moisture without damaging the concrete surface, until final set of the concrete has been achieved and final curing materials have been applied to the concrete surface.

- 701.30.C.1: Liquid-Applied Evaporation Reducers
- 701.30.E.3.a: Liquid Membrane-Forming Compounds for Curing
- 701.30.E.3.b: Liquid Membrane-Forming Compounds for Curing and Sealing

**701.45: Final Curing**

The Contractor shall apply one of the following final curing materials and procedures meeting 701.30.E: Final Curing Materials to the concrete surface immediately after application of initial and intermediate curing materials, finishing operations, and final set of cement concrete, to prevent the loss of moisture and surface drying.

- 701.30.E.1: Saturated Covers
- 701.30.E.2: Sheet Materials
- 701.30.E.3.a: Liquid Membrane-Forming Compounds for Curing
- 701.30.E.3.b: Liquid Membrane-Forming Compounds for Curing and Sealing

The Contractor shall apply final curing materials and procedures to the concrete surface throughout the entire duration of the curing cycle and meet minimum sustained temperature, duration, and strength requirements, as specified in in Table 701.45-1. Controlled and gradual termination of the curing cycle shall begin after all specified conditions are met.

**Table 701.45-1: Termination of Curing Cycle**

Sustained Concrete Temperature	Final Curing Cycle Duration	Compressive Strength <sup>[1]</sup>
50°F ≤ °F ≤ 90°F	≥ Seven (7) days	≥ 70% f <sub>c</sub>

<sup>[1]</sup> Compressive strength cylinders for termination of curing cycle shall be cast and field cured with the same environmental conditions that the sidewalk is subjected to throughout the entire duration of the final curing cycle, per 701.73: Acceptance Sampling and Testing.

**701.46: Protective Sealing**

The Contractor shall apply sealing materials and procedures meeting 701.30.F: Protective Sealing Compounds only if one or more of the following final curing materials and procedures were applied:

- 701.30.E.1: Saturated Covers
- 701.30.E.2: Sheet Materials
- 701.30.E.3.a: Liquid Membrane-Forming Compounds for Curing

Protective sealing compounds shall not be applied to concrete surfaces applied with a final curing material and procedure meeting 701.30.E.3.b: Liquid Membrane-Forming Compounds for Curing and Sealing.

**701.47: Cold Weather Concreting**

The Contractor shall conduct cold weather concreting procedures, operations, materials, and equipment required for the mixing, delivery, placement, finishing, curing, and protection of concrete, while surfaces are exposed to air temperatures falling below, or expected to fall below 40°F in accordance with 701.30.G: Cold Weather Concreting Materials. All procedures, operations, materials, and equipment required for adequate protection and curing shall be present and ready for use prior to concrete production.

**701.48: Hot Weather Concreting**

The Contractor shall conduct hot weather concreting procedures, operations, materials, and equipment required for the mixing, delivery, placement, finishing, curing, and protection of concrete, while surfaces are exposed to air temperatures exceeding, or expected to exceed 80°F; concrete temperatures approaching, or expected to approach 90°F; evaporation rates of surface water approaching, or expected to approach the bleeding rate of the concrete; high solar radiation; low relative humidity; and high wind speed in accordance with 701.30.H: Hot Weather Concreting Materials. All procedures, operations, materials, and equipment required for adequate protection and curing shall be present and ready for use prior to concrete production

**CONTRACTOR QUALITY CONTROL****701.60: General**

The Contractor shall provide adequate Quality Control (QC) to ensure that all materials and workmanship conform with the specification requirements. The Contractor shall perform QC activities as outlined further below.

**701.61: Contractor Quality Control Plan**

The Contractor shall provide and maintain a Quality Control Plan (QC Plan). The QC Plan should sufficiently document the QC processes of all Contractor parties (i.e. Prime Contractor, Subcontractors, Producers) performing work required under this specification.

**701.62: Production Personnel**

**A. Foreman.**

A foreman shall be present throughout the entire duration of the construction operation with at least one of the following personnel certifications.

- NRMCA Concrete Exterior Finisher Certification
- ACI Concrete Flatwork Technician and Flatwork Finisher

The foreman is responsible for the oversight of the construction operation per the requirements specified in Table 701.62-1.

*Table 701.62-1: Minimum Foreman Activities*

Operation	Foreman	Activity
Oversight	One (1)	Review and compare batch ticket quantities and sources to approved mix design
		Monitors conformance to AASHTO M 157 Standard Specification for Ready-Mixed Concrete
		Monitors conformance to Department specifications
		Monitors Production Personnel activities
		Verifies proper equipment is on hand prior to start of construction
		Monitors equipment, environmental conditions, materials, and workmanship
		Prohibits the use of prohibited equipment and practices
		Acknowledges sampling, testing, and inspection results

**B. Operators.**

Concrete sidewalk shall be constructed by sufficiently staffed, trained, experienced, and qualified equipment operators and craftsmen, who are presently involved in sidewalk construction, throughout the entire duration of the construction operation, per the requirements specified in Table 701.62-2.

**Table 701.62-2: Minimum Operator Activities**

<b>Operation</b>	<b>Operators<sup>[1]</sup></b>	<b>Activity</b>
701.40: Pre-Placement	Two (2)	Apply sufficient base compaction
		Moisten sub-base, free of standing water
		Secure forms, straight and level
		Mark expansion locations
		Prohibited Practices: Placement on frozen sub-grade
701.41: Placement (Concrete Discharging)	Two (2)	Direct concrete trucks
		Handle chute discharge and truck movement
		Assist in preparing concrete for testing
		Direct trucks to washout area
		Provide general help
		Prohibited Practices: Adding constituent materials not in conformance with AASHTO M 157 or without Department consent
701.41: Placement	Two (2)	Localize placement to minimize moving material
		Level concrete in front of the screed
		Operate come-alongs or flat headed shovel to move concrete in form
		Consolidate concrete along form edge to avoid honeycombing
		Operate screed over top of forms in sawing action for surface leveling
		Operate magnesium bull float to push coarse aggregate below the surface and fill in the low spots or depressions
		Prohibited Practices: Toothed raking, dragging of internal vibrator, and internal vibrator to move concrete; steel troweling or floating
701.42: Initial Curing	Apply an initial curing material and procedure per 701.42	
	One (1)	701.30.C.1: Liquid-Applied Evaporation Reducers
701.43: Finishing	Two (2)	Permit bleed water to dissipate and concrete to set
		Operate a hose drag or squeegee to remove water from the surface
		Check surface for flatness, fill/cut as necessary
		Finish surface with magnesium float
		Apply pulled broom finish at proper time to acceptable texture
		Clean broom when excessive mortar adheres
		Remove excess water from broom before use
		Finish edges and joints
		Finish well formed, properly spaced joints to sufficient depth
Prohibited Practices: Steel troweling or floating; adding water to the surface; excessive working of surface; pushing broom across surface		

<sup>[1]</sup> Recommended number of operators.

**Table 701.62-2: Minimum Operator Activities (Continued)**

<b>Operation</b>	<b>Operators<sup>[1]</sup></b>	<b>Activity</b>
701.44: Intermediate Curing	If applicable, apply an intermediate curing material and procedure per 701.44	
	One (1)	701.30.C.1: Liquid-Applied Evaporation Reducers
	One (1)	701.30.E.3.a: Liquid Membrane-Forming Compounds
	One (1)	701.30.E.3.b: Liquid Membrane-Forming Compounds for Curing and Sealing
701.45: Final Curing	Apply a final curing material and procedure meeting 701.45	
	Four (4)	701.30.E.1: Saturated Covers
	Four (4)	701.30.E.2: Sheet Materials
	One (1)	701.30.E.3.a: Liquid Membrane-Forming Compounds
701.46: Protective Sealing	One (1)	701.30.E.3.b: Liquid Membrane-Forming Compounds for Curing and Sealing
	If applicable, apply a protective sealing material and procedure per 701.46	
701.47: Cold Weather Concreting	Four (4)	If applicable, apply cold weather concreting materials and procedures per 701.47 and the Department approved Contractor cold weather concreting plan
701.48: Hot Weather Concreting	Four (4)	If applicable, apply hot weather concreting materials and procedures per 701.48 and the Department approved Contractor hot weather concreting plan

<sup>[1]</sup> Recommended number of operators.

**701.63: Quality Control Inspection**

Quality Control inspection shall be performed and reported on inspection report forms by qualified Quality Control Technicians, to confirm conformance to specifications and to visually inspect equipment, environmental conditions, materials, and workmanship. Quality Control Technicians shall obtain at least one of the following personnel certifications.

- NRMCA Concrete Exterior Finisher Certification
- ACI Concrete Flatwork Technician and Flatwork Finisher

Quality Control inspection report forms shall be completed by the Contractor and submitted to the Department for review.

**DEPARTMENT ACCEPTANCE**

**701.70: General**

Acceptance shall be performed by the Department, including consultants under direct contract with the Department independent of the Contractor, to evaluate the degree of compliance with contract requirements, to monitor each Contractor entity’s Quality Control activities, to determine the

corresponding value for a given product, and to determine the acceptability of all material produced and placed.

**701.71: Acceptance of Contractor Quality Control Plan**

The Department will review the Contractor Quality Control Plan. Department approval shall be subject to conformance with the requirements specified herein.

**701.72: Acceptance Inspection**

Acceptance inspection will be performed and reported by qualified Department (or designee) Acceptance Technicians, to confirm conformance to specifications and to visually inspect equipment, environmental conditions, materials, and workmanship.

**701.73: Acceptance Sampling and Testing**

Acceptance sampling and testing will be performed and reported by qualified Department (or designee) Acceptance Technicians, to provide quality characteristic data used for Department Acceptance determination, per the requirements specified herein.



**Table 701.73-1: Minimum Acceptance Sampling and Testing Requirements**

Property	Method	Quality Characteristic	Sublot Size	Minimum Test Frequency	Point of Sampling	Criteria
Uniformity	T 119	Slump Allowable Tolerance (in.) <sup>[1]</sup>	100 cy	1 per Sublot	Point of Discharge	Target $\pm$ 1.5
Workability	T 119	Segregation Resistance <sup>[2]</sup>	100 cy	1 per Sublot	Point of Discharge	Pass
Thermal	T 309	Concrete Temperature ( $^{\circ}$ F)	100 cy	1 per Sublot	Point of Discharge	50 – 90
Strength	T 22	Compressive Strength at 7 Days for Curing Termination (psi) <sup>[3]</sup>	100 cy	1 per Sublot	Point of Discharge	$\geq$ 70% $f'_c$
		Compressive Strength at 28 Days (psi) <sup>[3]</sup>	100 cy	1 per Sublot	Point of Discharge	$\geq$ 100% $f'_c$
		Compressive Strength at 56 Days (psi) <sup>[3][4]</sup>	100 cy	1 per Sublot	Point of Discharge	$\geq$ 100% $f'_c$
Durability	T 121 T 152 T 196	Freezing and Thawing Resistance: Air Content (%)	100 cy	1 per Sublot	Point of Discharge	5.5 – 8.5
	T 303 or C1567	Alkali Silica Reaction Resistance: Expansion at 14 Days (%)	–	1 per Annual Mix Design Submission Cycle	–	$\leq$ 0.08

<sup>[1]</sup> Test result and the Producer's mix design target shall be within the specified allowable tolerances. Slump shall be reported on the Producer's mix design batch ticket for each delivery.

<sup>[2]</sup> Testing for segregation resistance shall be performed while the concrete is being discharged and during AASHTO T 119 Standard Method of Test for Slump of Hydraulic Cement Concrete. Visual signs of segregation include coarse particles advancing in front of or behind the fine particles and mortar and a tendency for coarse aggregate to separate from the mortar, particularly when the mixture is being consolidated.

<sup>[3]</sup> Three (3) 4 x 8 in. compressive strength cylinders shall be cast and tested for each age per sublot.

<sup>[4]</sup> Testing only required if compressive strength results at 28 days do not conform with specifications.

## COMPENSATION

### 701.80: Method of Measurement

Cement Concrete Sidewalks, Pedestrian Curb Ramps, and Driveways will be measured in square yards.

Excavation will be measured by the cubic yard as specified in 120.80: Method of Measurement.

Gravel Borrow will be measured by the cubic yard as specified in 150.80: Method of Measurement.

Fine grading and compacting will be measured by the square yard as specified in 170.88: Method of Measurement.

**701.81: Basis of Payment**

Cement Concrete Sidewalk, Cement Concrete Pedestrian Curb Ramp, and Cement Concrete Driveway will be paid for at the contract unit price per square yard complete in place, including detectable warning panels and all incidental materials, labor, and equipment necessary to complete the work to the satisfaction of the Engineer.

Gravel will be paid for at the contract unit price per cubic yard under Item 151: Gravel Borrow.

Fine grading and compacting will be paid for at the contract unit price per square yard under Item 170: Fine Grading and Compacting – Subgrade Areas.

Excavation will be paid for at the contract unit price per cubic yard under the excavation items.

**701.82: Payment Items**

701.	Cement Concrete Sidewalk.....	Square Yard
701.1	Cement Concrete Sidewalk Driveways .....	Square Yard
701.2	Cement Concrete Pedestrian Curb Ramp .....	Square Yard

## GUIDE TO THE INTERIM SUBSECTION 701 CEMENT CONCRETE SIDEWALK SPECIFICATION

### MATERIALS ACTIVITIES

Section	Activity	
<b>701.30.A</b>	<b>Combined Aggregate System</b>	
701.30.A.1	The mix design's combined aggregate system should meet Table 701.30-1: Tarantula Curve Particle Size Distribution.	Recommendation
701.30.A.2	The mix design's combined aggregate system should meet Table 701.30-2 / Figure 701.30-1: Shilstone Workability-Coarseness.	Recommendation
701.30.A.3	The mix design's combined aggregate system should be analyzed using the Fineness Modulus.	Recommendation
701.30.A.4	The mix design's combined aggregate system should be analyzed using the Coarse Aggregate Content.	Recommendation
<b>701.30.B</b>	<b>Paste System</b>	
701.30.B.1	The mix design's Water-Cementitious Ratio should be $\leq 0.40$ (Table 701.30-3: Freezing, Thawing, and De-icing Resistance).	Recommendation
701.30.B.1	The mix design's Water-Cementitious Ratio shall be $\leq 0.45$ (Table 701.30-3: Freezing, Thawing, and De-icing Resistance).	Required
701.30.B.2	The mix design's Air Content should approach the recommended Air Content Targets identified in Table 701.30-4: Freezing, Thawing, and De-icing Resistance.	Recommendation
701.30.B.3	The mix design's Cement and Supplementary Cementitious Materials (SCM) Content shall meet Table 701.30-5: Alkali Silica Reaction and Freezing, Thawing, and De-icing Resistance requirements.	Requirement
701.30.B.3	Test results meeting Table 701.30-6: Alternative Performance Evaluation to Alkali Silica Reaction Resistance requirements may be used in lieu of the mix design requirements identified in Table 701.30-5: Alkali Silica Reaction and Freezing, Thawing, and De-icing Resistance requirements.	Optional
701.30.B.4	The mix design should incorporate Chemical Admixtures identified in Table 701.30-7: Chemical Admixtures to enhance the properties of the concrete.	Recommendation
701.30.B.5	The mix design's Paste Content should approach the recommended targets identified in Table 701.30-8: Paste Content.	Recommendation

<b>701.73 Acceptance Sampling and Testing</b>		
T 119	The Slump shall meet Table 701.71-1: Minimum Acceptance Sampling and Testing Requirements ( $\pm 1.5$ from Slump Target identified by the Concrete Producer on the Batch Ticket).	Requirement
T 119	The Segregation Resistance shall meet Table 701.71-1: Minimum Acceptance Sampling and Testing Requirements.	Requirement
T 309	The Concrete Temperature shall meet Table 701.71-1: Minimum Acceptance Sampling and Testing Requirements.	Requirement
T 22	The Compressive Strength (7, 28, and 56 days) shall meet Table 701.71-1: Minimum Acceptance Sampling and Testing Requirements.	Requirement
T 121 T 152 T 196	The Air Content shall meet Table 701.71-1: Minimum Acceptance Sampling and Testing Requirements (5.5 – 8.5%).	Requirement
T 303 or C1567	The resistance to Alkali Silica Reaction shall meet Table 701.71-1: Minimum Acceptance Sampling and Testing Requirements (One per year for mix design verification).	Requirement

**CONTRACTOR ACTIVITIES**

<b>Section</b>	<b>Activity</b>	
<b>701.40</b>	<b>Pre-Placement</b>	
	The Contractor should have a minimum of two (2) Operators.	Recommendation
	The Contractor shall apply sufficient base compaction.	Requirement
	The Contractor shall moisten sub-base, free of standing water.	Requirement
	The Contractor shall secure forms, straight and level.	Requirement
	The Contractor shall mark expansion locations.	Requirement
	The Contractor shall be prohibited from performing the following practices: Placement on frozen sub-grade.	Requirement
<b>701.41</b>	<b>Placement (Concrete Discharging)</b>	
	The Contractor should have a minimum of two (2) Operators.	Recommendation
	The Contractor shall direct concrete trucks.	Requirement
	The Contractor shall handle chute discharge and truck movement.	Requirement
	The Contractor shall assist in preparing concrete for testing.	Requirement
	The Contractor shall direct trucks to washout area.	Requirement
	The Contractor shall provide general help.	Requirement

	The Contractor / Concrete Producer shall be prohibited from performing the following practices: Adding constituent materials not in conformance with AASHTO M 157 or without Department consent.	Requirement
<b>701.41</b>	<b>Placement</b>	
	The Contractor should have a minimum of two (2) Operators.	Recommendation
	The Contractor shall localize placement to minimize moving material.	Requirement
	The Contractor shall level concrete in front of the screed.	Requirement
	The Contractor shall operate come-alongs or flat headed shovel to move concrete in form.	Requirement
	The Contractor shall consolidate concrete along form edge to avoid honeycombing.	Requirement
	The Contractor shall operate screed over top of forms in sawing action for surface leveling.	Requirement
	The Contractor shall operate magnesium bull float to push coarse aggregate below the surface and fill in the low spots or depressions.	Requirement
	The Contractor shall be prohibited from performing the following practices: Toothed raking, dragging of internal vibrator, and internal vibrator to move concrete; steel troweling or floating.	Requirement
<b>701.42</b>	<b>Initial Curing (When Applicable)</b>	
	The Contractor should have a minimum of one (1) Operator.	Recommendation
	The Contractor shall apply 701.30.C.1: Liquid-Applied Evaporation Reducers when applicable.	Required when applicable
<b>701.43</b>	<b>Finishing</b>	
	The Contractor should have a minimum of two (2) Operators.	Recommendation
	The Contractor shall permit bleed water to dissipate and concrete to set.	Requirement
	The Contractor shall operate a hose drag or squeegee to remove water from the surface.	Requirement
	The Contractor shall check surface for flatness, fill/cut as necessary.	Requirement
	The Contractor shall finish surface with magnesium float.	Requirement
	The Contractor shall apply pulled broom finish at proper time to acceptable texture.	Requirement
	The Contractor shall clean broom when excessive mortar adheres.	Requirement
	The Contractor shall remove excess water from broom before use.	Requirement

	The Contractor shall finish edges and joints.	Requirement
	The Contractor shall finish well formed, properly spaced joints to sufficient depth.	Requirement
	The Contractor shall be prohibited from performing the following practices: Steel troweling or floating; adding water to the surface; excessive working of surface; pushing broom across surface.	Requirement
<b>701.44</b>	<b>Intermediate Curing (When Applicable, Apply One of the Methods)</b>	
	The Contractor should have a minimum of one (1) Operator.	Recommendation
	The Contractor shall apply 701.30.C.1: Liquid-Applied Evaporation Reducers when applicable and if selected.	Required when applicable
	The Contractor shall apply 701.30.E.3.a: Liquid Membrane-Forming Compounds when applicable and if selected.	Required when applicable
	The Contractor shall apply 701.30.E.3.b: Liquid Membrane-Forming Compounds for Curing and Sealing when applicable and if selected.	Required when applicable
<b>701.45</b>	<b>Final Curing (Apply One of the Methods)</b>	
	The Contractor should meet the minimum number of operators identified in Table 701.62-2: Minimum Operator Activities.	Recommendation
	The Contractor shall apply 701.30.E.1: Saturated Covers if selected.	Requirement
	The Contractor shall apply 701.30.E.2: Sheet Materials if selected.	Requirement
	The Contractor shall apply 701.30.E.3.a: Liquid Membrane-Forming Compounds if selected.	Requirement
	The Contractor shall apply 701.30.E.3.b: Liquid Membrane-Forming Compounds for Curing and Sealing if selected.	Requirement
<b>701.46</b>	<b>Protective Sealing (If Required)</b>	
	The Contractor should have a minimum of one (1) Operator.	Recommendation
	The Contractor shall apply 701.30.F: Protective Sealing Compounds at least 28 days after placement. Application of 701.30.F: Protective Sealing Compounds is <b>NOT REQUIRED IF 701.30.E.3.b: Liquid Membrane-Forming Compounds for Curing and Sealing was applied.</b>	Required if 701.30.E.3.b Curing and Sealing Compound was Not Applied
<b>701.47</b>	<b>Cold Weather Concreting (When Applicable)</b>	
	The Contractor should have a minimum of four (4) Operators.	Recommendation
	The Contractor shall submit a Cold Weather Concreting Plan meeting 701.47.	Required when applicable

	The Contractor shall apply cold weather concreting materials and procedures meeting 701.47 and the Department approved Contractor cold weather concreting plan.	Required when applicable
<b>701.48</b>	<b>Hot Weather Concreting (When Applicable)</b>	
	The Contractor should have a minimum of four (4) Operators.	Recommendation
	The Contractor shall submit a Hot Weather Concreting Plan meeting 701.48.	Required when applicable
	The Contractor shall apply hot weather concreting materials and procedures meeting 701.47 and the Department approved Contractor hot weather concreting plan.	Required when applicable
<b>701.61</b>	<b>Contractor Quality Control Plan</b>	
	The Contractor shall prepare and submit a Quality Control Plan (QC Plan) to the Department for review.	Requirement
<b>701.62</b>	<b>Production Personnel</b>	
701.62.A	Foreman	
	The Contractor shall have a minimum of One (1) Foreman.	Requirement
	A Foreman shall be present throughout the entire duration of the construction operation with at least one of the following personnel certifications. <ul style="list-style-type: none"> <li>• NRMCA Concrete Exterior Finisher Certification</li> <li>• ACI Concrete Flatwork Technician and Flatwork Finisher</li> </ul>	Requirement
	The Contractor's Foreman shall review and compare batch ticket quantities and sources to approved mix design.	Requirement
	The Contractor's Foreman shall monitor conformance to AASHTO M 157 Standard Specification for Ready-Mixed Concrete.	Requirement
	The Contractor's Foreman shall monitor conformance to Department specifications.	Requirement
	The Contractor's Foreman shall monitor Production Personnel activities.	Requirement
	The Contractor's Foreman shall verify that proper equipment is on hand prior to start of construction.	Requirement
	The Contractor's Foreman shall monitors equipment, environmental conditions, materials, and workmanship.	Requirement
	The Contractor's Foreman shall prohibit the use of prohibited equipment and practices.	Requirement
	The Contractor's Foreman shall acknowledge sampling, testing, and inspection results.	Requirement

701.62.B	<b>Operators</b>	
	Concrete sidewalk shall be constructed by sufficiently staffed, trained, experienced, and qualified equipment operators and craftsmen, who are presently involved in sidewalk construction, throughout the entire duration of the construction operation, per the requirements specified in Sections 701.40 to 701.48.	Requirement
<b>701.63</b>	<b>Quality Control Inspection</b>	
	<p>Quality Control inspection shall be performed and reported on inspection report forms by qualified Quality Control Technicians, to confirm conformance to specifications and to visually inspect equipment, environmental conditions, materials, and workmanship. Quality Control Technicians shall obtain at least one of the following personnel certifications.</p> <ul style="list-style-type: none"> <li>• NRMCA Concrete Exterior Finisher Certification</li> <li>• ACI Concrete Flatwork Technician and Flatwork Finisher</li> </ul> <p>Quality Control inspection report forms shall be completed by the Contractor and submitted to the Department for review</p>	Requirement



DOCUMENT 00715



## SUPPLEMENTAL SPECIFICATIONS

MARCH 31, 2024

The 2024 *Standard Specifications for Highways and Bridges* are amended by the following modifications, additions and deletions. These Supplemental Specifications prevail over those published in the Standard Specifications.

The Specifications Committee has issued these Supplemental Specifications for inclusion into each proposal until such time as they are updated or incorporated into the next Standard Specifications.

Contractors are cautioned that these Supplemental Specifications are dated and will change as they are updated.

### DIVISION I

### GENERAL REQUIREMENTS AND COVENANTS

### SECTION 4: SCOPE OF WORK

#### Subsection 4.06: Increased or Decreased Contract Quantities

*Replace the second paragraph with the following:*

Where the actual quantity of a pay item varies by more than 25% above or below the estimated quantity stated in the Contract, an equitable adjustment in the Contract Price for that pay item shall be negotiated upon demand of either party regardless of the cause of the variation in quantity. A demand for an equitable adjustment must be submitted to the other party within 30 days after beginning the work of the affected item that is greater than 25% above the bid quantity or within 30 days after completing the work when the actual quantity is 25% less than the bid quantity.

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## DIVISION II

### CONSTRUCTION DETAILS

#### DIVISION II: Construction Details

*Replace M4.02.15 Cement Mortar with M4.04.0 Grout, Mortar, and Concrete Products where encountered, including in sections 230.40, 485.40, 501.40, 685.40, 940.40A and 983.40.*

### **SECTION 100: EARTHWORK, GRADING, DEMOLITION, RODENT CONTROL AND BORINGS**

#### **SECTION 160: CONTROLLED LOW-STRENGTH MATERIAL**

##### Section 160: Controlled Low-Strength Material

*Add this new Section:*

#### DESCRIPTION

##### **160.20: General**

Controlled Low-Strength Material shall be installed in accordance with the relevant provisions of Subsection 150: Embankment, Section 901: Cement Concrete and in accordance with the procedures described herein.

Controlled Low Strength Materials (CLSM) shall be a self-compacting, self-leveling, flowable, excavatable or non-excavatable, low strength, rigid setting, and unshrinkable material, used as an alternative to compacted granular fills, including backfill, structural fill, utility fill, pavement base, subgrade, subbase, base course, conduit bedding, erosion control, and void filling.

#### MATERIALS

##### **160.40: General**

Material for controlled low-strength material shall meet the requirement specified of M4.08.0 Controlled Low-Strength Material. The material shall be specified by the Engineer as one of the following types;

- CLSM – Manual Excavatable ( $\leq 100$  psi)
- CLSM – Mechanical Excavatable (101-300 psi)
- CLSM – Structural Non Excavatable ( $> 300$  psi)

Permeability testing as specified in Table M4.08.0-2 shall be required when the material is placed outside of roadway areas or footings for concrete structures, or as directed by the Engineer.

#### CONSTRUCTION METHODS

##### **160.60: General**

The Contractor shall submit a placement plan for Controlled Low-Strength Material (CLSM). The plan shall include the type of CLSM, detailed descriptions of methods used for placing and containing the controlled density fill and the set time to strength.

The Contractor shall remove all debris prior to placing the fill. Fill shall not be placed against any structural elements or utilities unless approved by the Engineer.

CLSM shall be poured in lifts not exceeding 4 feet to insure stability under the fluid effects of the pour. Care shall be taken to ensure the integrity of the forms or other means of supporting the material until the material sets up.

**COMPENSATION**

**160.80: Method of Measurement**

Controlled Low-Strength Material shall be measured by the cubic yard in place to the neat lines established on the plans or specified by the Engineer. When backfilling pipes the horizontal neat lines shall be not greater than 3.0 ft. greater than the rated inside diameter of the pipe and vertically from the top of the crushed stone foundation material, if any, or 6 in. below the pipe invert whichever is less to the specified top elevation. A deduction shall be made for the volume of the pipe or conduit encased.

**160.81: Basis of Payment**

Payment under this item shall constitute full compensation for the placement, testing, and all material, equipment and labor to complete the work.

**160.82: Payment Items**

- 160.1      Controlled Low-Strength Material - ..... Cubic Yard  
Manual Excavatable ( $\leq$  100 PSI)
- 160.2      Controlled Low-Strength Material - ..... Cubic Yard  
Mechanical Excavatable (101-300 PSI)
- 160.3      Controlled Low-Strength Material ( $>$ 300 PSI) ..... Cubic Yard

**SECTION 200: DRAINAGE**

**SECTION 201: BASINS, MANHOLES AND INLETS**

Section 201.40: General

Replace "Cement Mortar ..... M4.02.15" with "Mortar ..... M4.04.0".

**SECTION 690: HIGHWAY GUARD, FENCES AND WALLS**

**SECTION 690: WALLS REMOVED AND RESET**

Section 690.40: General

Replace the last sentence with the following:

Mortar shall meet the requirement of M4.04.0: Grout, Mortar, and Concrete Products.

**SECTION 800: TRAFFIC CONTROL DEVICES**

**SECTION 825: RECTANGULAR RAPID FLASHING BEACONS**

Section 825: Rectangular Rapid Flashing Beacons

Add this new Section:

DESCRIPTION

**825.20: General**

This work shall consist of furnishing and installing a solar-powered, actuated, Rectangular Rapid Flashing Beacon (RRFB) system at the location(s) shown in the Plans.

MATERIALS

**825.40: General**

Rectangular Rapid-Flashing Beacons shall meet the requirements specified in the following Subsections of Division III, Materials:

Cement Concrete.....	M4.02.00
Signal Posts and Bases .....	M10.05.1
APS Pushbuttons.....	M10.09.1
RRFB Assemblies.....	M10.11.0

An RRFB system shall include the following items (quantities shown in the Major Items List found in the Plans):

- Cement Concrete Foundation
- Signal Post and Pedestal Base
- APS Pushbutton
- Light Bar
- Signage
- Enclosure for Controller, Activation Unit, and Battery System
- Solar Panel
- All mounting and supporting hardware and wiring necessary to complete a working system

The Contractor shall supply cement concrete foundations per the Plans.

The Contractor shall supply Schedule 80 aluminum signal posts with a brushed or spun finish and square, pedestal aluminum bases with a natural finish unless otherwise shown in the Plans or Special Provisions.

Each Light Bar shall have a pair of yellow beacons facing one or both directions of traffic, as shown in the Plans.

All sign designs shall conform to the MUTCD. Sign panel information, including dimensions, shall be per the Plans.

The warning signs (MUTCD code W11-2, W11-15, or S1-1 signs – see Plans for sign type), and the diagonal downward arrow sign (W16-7P) signs shall be on Type A substrate, conforming to 828.42: Panels. The sign sheeting shall be fluorescent yellow-green, conforming to ASTM D4956 Type IX.

An R10-25 sign, conforming to the MUTCD, shall be mounted above the APS Pushbutton on a Type A substrate or may be integral to the button assembly.

The solar panel and battery system may be integrated into a single unit or housed separately, per the manufacturer’s design. These may also be co-housed with the Light Bar and/or the Controller and Activation Unit.

The solar panel and battery system shall be sized appropriately to accommodate 300 actuations per day, 365 days a year, for the duration of the repeating flashing sequence shown in the Plans. The sizing calculations shall be based upon solar and temperature conditions for a typical December-January in Massachusetts. The system shall have a minimum autonomy of 5 days.

Each assembly shall be rated for wind speeds of up to 90 mph.

Any proprietary software required for the programming and/or operation of the system during its lifetime shall be included at no additional cost.

**825.41: Shop Drawings**

Within 30 days from the Notice to Proceed the Contractor shall submit shop drawings for the RRFB system, including cutsheets for all components to show conformance with M10.05, M10.09.1, and M10.11.0 and these specifications.

Shop drawings shall include all solar and battery sizing calculations. These calculations shall have Contractor- or manufacturer-supplied, site-specific shading factors applied.

#### **825.42: Material Warranties**

All RRFB components shall include a minimum 1-year manufacturer's replacement warranty for manufacturing or installation defects starting at the date of acceptance by the Engineer. A battery shall be considered defective should it not retain 80% of its original capacity within the warranty period.

### CONSTRUCTION METHODS

#### **825.60: General**

RRFBs shall be installed on new foundations at the locations as shown in the Plans. Bases shall be secured to the foundation in accordance with the manufacturer's specifications.

All systems shall be installed per the manufacturer's instructions.

The location and orientation of the system shall be per the Plans.

The arrow on each APS pushbutton shall be aligned parallel to the direction of travel of the crosswalk.

The Light Bar(s) shall be oriented towards the incoming lane(s).

Solar panels shall be oriented to maximize sunlight gain.

### SYSTEM OPERATION

#### **825.70: APS Pushbuttons**

APS Pushbuttons shall actuate the RRFB system. Upon actuation, an audible speech message shall be broadcast from each pushbutton in the system that says, "Warning lights are flashing," shall be stated twice. This message shall be repeated upon each actuation. No other messages shall be allowed.

While the system is in dark mode, the APS Pushbuttons shall broadcast a locator tone. The locator tone shall have a duration of 0.15 seconds or less and shall repeat at 1-second intervals at all times that the system is in dark mode. The locator tone shall be set 2 to 5 dBA above ambient sound, shall automatically adjust intensity, but cap at a maximum volume of 100 dBA.

APS Pushbuttons shall have all other vibrotactile and percussive indications disabled.

#### **825.71: Light Bar**

The Light Bar shall remain dark until actuated.

Upon actuation, all Light Bars in the system shall be activated simultaneously for a predetermined repeating flash sequence. The flashing rate shall be 75 flashing sequences per minute.

The left and right yellow beacons shall operate using the following sequence:

- A. The yellow beacon on the left-hand side shall be illuminated for approximately 50 milliseconds.
- B. Both yellow beacons shall be dark for approximately 50 milliseconds.
- C. The yellow beacon on the right-hand side shall be illuminated for approximately 50 milliseconds.
- D. Both yellow beacons shall be dark for approximately 50 milliseconds.
- E. The yellow beacon on the left-hand side shall be illuminated for approximately 50 milliseconds.
- F. Both yellow beacons shall be dark for approximately 50 milliseconds.
- G. The yellow beacon on the right-hand side shall be illuminated for approximately 50 milliseconds.
- H. Both yellow beacons shall be dark for approximately 50 milliseconds.
- I. Both yellow beacons shall be illuminated for approximately 50 milliseconds.
- J. Both yellow beacons shall be dark for approximately 50 milliseconds.

K. Both yellow beacons shall be illuminated for approximately 50 milliseconds.

L. Both yellow beacons shall be dark for approximately 250 milliseconds.

The flash rate of each individual RRFB indication, as applied over the full flashing sequence, shall not be more than 5 flashes per second, to avoid frequencies that might cause seizures.

The sequence shall then be repeated until the duration time has been met and then all yellow beacons shall return to dark mode simultaneously. The duration time shall be per the Plans.

The predetermined repeating flash sequence shall be immediately initiated every time a pushbutton detector is actuated. If the RRFBs are already flashing and an actuation is received, it shall restart the duration time. There shall be no delay time programmed between actuations.

COMPENSATION

**825.80: Method of Measurement**

RRFBs will be measured as a single system, 2-Post Assembly or 3-Post Assembly, furnished and installed.

**825.81: Basis of Payment**

The work will be paid for at the contract price each under the respective item for a 2-Post Assembly System or 3-Post Assembly System. Any additional wiring, mounting equipment, or other materials or labor required to for an operating system per the Plans and Specifications shall be considered as incidental to the construction and be included in the contract price.

**825.82: Payment Item**

825.2	RRFB (2-Post Assembly System) .....	Each
825.3	RRFB (3-Post Assembly System) .....	Each

**SECTION 900: STRUCTURES**

**SECTION 970: DAMP-PROOFING**

Subsection 970.30: General

*Add the following material to this subsection:*

Mortar.....	M4.04.0
-------------	---------

Subsection 970.40: General

*Replace the second sentence in the second paragraph with the following;*

All holes in concrete surfaces shall be satisfactorily filled with mortar before damp-proofing is applied.

**SECTION 983: REVETMENT**

Subsection 983.64 Special Slope Paving Under Bridges

*Replace the last sentence under B. Quarry Stone or Precast Concrete Blocks. with the following:*

Mortar shall then be placed in the joints to the top of the paved surface.

Subsection 983.65 Channel Paving and Grouted Channel Paving

*Replace the last sentence with the following:*

The grout shall conform to M4.04.0: Grout, Mortar, and Concrete Products.

**DIVISION III**  
**MATERIALS SPECIFICATIONS**

**SECTION M4: CEMENT AND CEMENT CONCRETE MATERIALS**

Section M4.02.00 Cement Concrete

Add the following to the end of this section.

**Alkali Silica Reactivity - Resistant Portland Cement Concrete**

All cement concrete and precast/prestressed concrete products shall be alkali silica reactivity-resistant. Proportion Portland cement concrete mixes to include materials that meet either the aggregate requirement or Alkali-Silica Reactivity (ASR) mitigation criteria listed below. Provide cement mill test reports from certified laboratories that show the materials' source, composition and the cement alkali content expressed as sodium oxide equivalent(s) not to exceed 1.4%. Certified test reports according to test procedures as specified in Table A will be required to be submitted with the trial batch submission to RMS for approval every year or whenever the source of material is changed.

Select non-reactive aggregates that meet all the criteria of Table M4.02.00-2. Mitigate the mix as described below when nonreactive aggregates are unavailable. If non-reactive aggregates are used for portland cement concrete mix, 15% by weight of the cementitious content shall be fly ash meeting AASHTO M 295, Type F.

Select a material or a combination of materials that meet the criteria shown in Table M4.02.00-3 to mitigate ASR when concrete mixes must be proportioned with reactive aggregates. Perform verification test according to AASHTO T 303 and ASTM C295 to determine the effectiveness of the resulting mix design against ASR. Use the same proportion of cement and pozzolan for each test mixture as that proposed for the actual mix design. Provide the Department with certified documentation of the mixtures' effectiveness to control ASR.

**Table M4.02.00-2: Tests and Criteria for Proposed Aggregates**

Procedure	Description	Limits
AASHTO T 303: Accelerated Detection of Potentially Deleterious Expansion of Mortar Bars Due to Alkali-Silica Reaction	Mean mortar bar expansion at 14 days. Perform a polynomial fit <sup>(1)</sup> of 4, 7, 11, and 14 days to determine reliability of results	0.08% maximum metamorphic aggregate; 0.10% maximum all other aggregates. Repeat AASHTO T 303 if r <sup>2</sup> is less than 0.95.
ASTM C295: Petrographic Examination of Aggregates for Concrete	Optically strained, microfractured, or microcrystalline quartz	5.0% maximum <sup>(2)</sup>
	Chert or chalcedony	3.0% maximum <sup>(2)</sup>
	Tridymite or cristobolite	1.0% maximum <sup>(2)</sup>
	Opal	0.5% maximum <sup>(2)</sup>
	Natural volcanic glass	3.0% maximum <sup>(2)</sup>
<sup>(1)</sup> Use a second order polynomial of %Exp = A <sup>0</sup> + A <sup>1</sup> SQRT(t) + A <sup>2</sup> t. See publication SD92-04-F.		
<sup>(2)</sup> Based on the total aggregate sample.		

**Table M4.02.00-3: Mitigation Methods for ASR in Portland Cement Concrete**

Material	Specification	Cementitious Material Percentage <sup>(1)</sup>
Low alkali cement <sup>(2)</sup>	AASHTO M 85	100%
Fly ash - Class F	AASHTO M 295	15% minimum to 30% <sup>(4)</sup> maximum
Silica Fume <sup>(5)</sup>	AASHTO M 307	6% ± 1% <sup>(6)</sup>
Slag Grade 100 and 120	AASHTO M 302	25% minimum to 50% maximum

<sup>(1)</sup> Measure this minimum content of cementitious material as percent by weight of cement plus pozzolan.  
<sup>(2)</sup> This single criterion is not effective in all cases in remediating ASR. Low alkali cement (0.60% maximum <sup>(3)</sup>) must be used in combination with other pozzolanic materials in Table B.  
<sup>(3)</sup>  $\text{Na}_2\text{O equivalent} = \% \text{Na}_2\text{O} + 0.658 (\% \text{K}_2\text{O})$   
<sup>(4)</sup> Fly ash, Type F, shall replace 15% by weight of the design cement content, and any additional fly ash will be considered as fine aggregate.  
<sup>(5)</sup> Silica fume shall only be used in silica fume cement concrete.  
<sup>(6)</sup> The total amount of Type F fly ash and silica fume shall constitute 20% by weight of the design cement content, and any additional fly ash shall be considered as fine aggregate.

**Section M4.02.15 Cement Mortar***Delete this section.***Section M4.04.0: Grout, Mortar and Concrete Products***Replace this section with the following.***M4.04.0: Grout, Mortar, and Concrete Products**

Grout, cementitious mortar, and concrete products shall be packaged, dry, and preblended with preformulated constituent materials (excluding mixing water) to produce a material with acceptable quality characteristics and material properties, including time of set, compressive strength, flexural strength, slant shear bond strength, resistance to alkali silica reaction, freezing/thawing, and de-icing cycles, shrinkage, expansion, and sulfate reaction.

Mortar products shall be defined as products containing aggregate of which less than 5% by mass of the total mixture is retained on the 3/8 in. sieve. Mortar products for concrete repairs shall be used only on repair depths of 2 in. or less. Concrete products shall be defined as products containing aggregate of which 5% or more by mass of the total mixture is retained on the 3/8 in. sieve. Concrete products for concrete repairs shall be used only on repair depths greater than 2 in.

The aggregate sources included in the prepackaged product or extended into the product shall meet Section M4.02.02: Aggregates. Grout, cementitious mortar, and concrete products shall only be applied per the requirements provided on the product's technical data sheet. Grout, cementitious mortar, and concrete products shall maintain valid listing on the MassDOT Qualified Construction Materials List (QCML). Grout, cementitious mortar, and concrete products shall meet requirements specified herein.

**A. Technical Data Sheet.**

The Manufacturer shall submit the product's technical data sheet to the Department for review. At a minimum, the product's technical data sheets shall include:

- (a) Product Name
- (b) Manufacturer, including address and contact information
- (c) Packaging
- (d) Yield
- (e) Product Description, including an overview of the product and its intended application(s) and use(s).
- (f) Technical Data, including quality characteristics and corresponding performance criteria with the AASHTO and/or ASTM standard test methods identified.



- (g) Recommended Equipment
- (h) Instructions, including surface preparation, mixing, forming, placing, finishing, curing, and protection from adverse conditions, such as precipitation, cold conditions, and hot conditions.
- (i) Limitations
- (j) Storage and Shelf Life
- (k) Safety

**B. Mix Design Formulation.**

Products that are extended with aggregate not included in the original product packaging shall be formulated per the product's technical data sheet and evaluated through Department mix design evaluation and verification testing. Producers shall report and submit proposed mix design formulations onto the Department issued mix design sheet. The Producer shall select an AASHTO accredited independent laboratory to conduct verification testing. The sampling and testing conducted by the independent laboratory shall be witnessed by the Department.

**C. Product Verification Testing.**

Verification test results shall be within the limits specified herein.

**M4.04.1: Conventional Grout, Cementitious Mortar, and Concrete Products**

Conventional grout, cementitious mortar, and concrete products shall meet the requirements of Section M4: Cement and Cement Concrete Materials, performance criteria of the product's technical data sheet, and the requirements specified herein.

**M4.04.2: Rapid Hardening Cementitious Mortar and Concrete Products**

Rapid hardening cementitious mortar and concrete products shall meet the requirements and performance criteria of the product's technical data sheet, ASTM C928 Standard Specification for Packaged, Dry, Rapid-Hardening Cementitious Materials for Concrete Repairs, and Table M4.04.2-2.

***Table M4.04.2-1: Types of Rapid Hardening Cementitious Products for Concrete Repairs***

<b>Type</b>	<b>Description</b>	<b>Application</b>
R1	General Rapid Hardening	Vertical and Overhead Repairs
R2	Medium Rapid Hardening	Vertical and Overhead Repairs
R3	Very Rapid Hardening	Horizontal, Vertical, and Overhead Repairs

**Table M4.04.2-2: Verification Testing Requirements**

Property	Method	Quality Characteristic		Limits					
				R1		R2		R3	
				Min.	Max.	Min.	Max.	Min.	Max.
Setting	T 197	Initial Set (min.)		Technical Data Sheet					
		Final Set (min.)		Technical Data Sheet					
Strength	T 97 <sup>[1]</sup>	Flexural Strength (psi)	24 Hours	-	-	-	-	650	-
			7 Days	-	-	-	-	-	-
Durability	T 358	Surface Chloride Ion Penetration Resistance (kΩ-cm)	28 Days	21	-	21	-	21	-
			T 161 (A)	Relative Durability Factor		90	-	90	-
		Mass Loss (%)		-	6.0	-	6.0	-	6.0

[1] Not applicable to vertical and overhead repair applications.

**M4.04.3: Mortar Products for Unit Masonry**

Mortar products for unit masonry shall meet the requirements and performance criteria of the product’s technical data sheet and Type M specified in ASTM C270 Standard Specification for Mortar for Unit Masonry. Field proportioned cement mortar for laying brick and block shall be composed of 1 part Portland cement and 2 parts of fine aggregate by volume with a sufficient amount of water to form a workable mixture, while still achieving the properties specified herein.

**M4.04.4: Grout Products for Unit Masonry**

Grout products for unit masonry shall meet the requirements and performance criteria of the product’s technical data sheet and ASTM C476 Standard Specification for Grout for Masonry.

**M4.04.5: Non-Shrink Grout Products**

Non-shrink grout products are intended for use under applied load, including supporting a structure, transfer medium between load-bearing members, shear keys, and other non-shrink applications, where a change in height below initial placement height is to be avoided. Non-shrink grout products shall meet the requirements and performance criteria of the product’s technical data sheet and ASTM C1107 Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink).

**SECTION M5: PIPE, CULVERT SECTIONS AND CONDUIT**

Section M5.01.0: Joint Material for Pipe

Replace M4.02.15 Cement Mortar with M4.04.0 Grout, Mortar, and Concrete Products in paragraph B.

**SECTION M8: METALS AND RELATED MATERIALS**

Section M8.18.1: Traffic Signal Supports

Delete the heading Posts and the two paragraphs under it. Delete the heading Bases and the three paragraphs under it.

## SECTION M10: TRAFFIC CONTROL DEVICES

### Section M10.05.0: Traffic Signal Structures (General)

Add this new Section:

#### **M10.05.0: Traffic Signal Structures (General)**

The bases of all Traffic Signal Structures shall be supplied with a bonding lug.

### Section M10.05.1: Signal Posts and Bases

Add this new Section:

#### **M10.05.1: Signal Posts and Bases**

All Signal Posts shall be one-piece 4-in. diameter, Schedule 40 or Schedule 80, and machine-threaded.

Signal Posts may be fabricated from aluminum with a brushed or spun finish or from steel with a galvanized finish.

The interior of Signal Posts shall be coated as specified in Underwriters Laboratories UL-6 for enameled conduit, or aluminum conduit conforming to M5.07.1: Electrical Conduit-Rigid Metallic (Type RM), Paragraph C.

Signal Posts Bases shall be fabricated to accept the threads from the Signal Post and locked into place with set screws.

Signal Post Bases shall be fabricated from aluminum with a natural or anodized finish or galvanized cast iron.

Signal Post Bases shall be square or octagonal.

Signal Posts and Bases conform to Table M10.05.1-1.

**Table M10.05.1-1: Signal Post and Base Material Requirements**

Component	Material	Specification
Signal Post	Aluminum	6063-T6 (ASTM B221, B429 or B241)
Signal Post	Steel	ASTM A53, Grade A or B
Signal Post Base	Aluminum	356.0-T6 (ASTM B26, B108)
Signal Post Base	Cast Iron	AASHTO M 105

### Section M10.11.0: RRFB Assemblies

Add this new Section:

#### **M10.11.0: RRFB Assemblies**

Rectangular Rapid Flashing Beacon (RRFB) Assemblies shall consist of a Light Bar and an enclosure for the Controller and Activation Unit.

##### **Light Bar**

The Light Bar shall consist of two rapidly-flashed rectangular-shaped yellow indications, each with an LED-array based pulsing light source. The size of each RRFB indication shall conform to the Construction Standard Details.

The light intensity of the yellow indications during daytime conditions shall meet the minimum specifications for Class 1 yellow peak luminous intensity in the publication "Directional Flashing Optical Warning Devices for Authorized Emergency, Maintenance, and Service Vehicles J595," 2005, Society of Automotive Engineers (SAE). A photocell or equivalent device shall be included to reduce the brilliance of the LED beacons during nighttime conditions.



DOCUMENT 00719

(Revised September 14, 2023 – for all Federally Aided Projects)

**SPECIAL PROVISIONS FOR PARTICIPATION BY  
DISADVANTAGED BUSINESS ENTERPRISES**  
(IMPLEMENTING TITLE 49 OF THE CODE OF FEDERAL REGULATIONS, PART 26)

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## POLICY

The Massachusetts Department of Transportation (MassDOT) receives Federal financial assistance from the Federal Highway Administration (FHWA), United States Department of Transportation (U.S. DOT), and as a condition of receiving this assistance, has signed an assurance that it will comply with 49 CFR Part 26 (Participation By Disadvantaged Business Enterprises In Department Of Transportation Financial Assistance Programs). The U.S. DOT Disadvantaged Business Enterprise Program is authorized by the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (“SAFETEA-LU”), as amended, at Title 23, United States Code, § 1101.

Accordingly, MassDOT has established a Disadvantaged Business Enterprise (DBE) Program in accordance with 49 CFR Part 26. It is the policy of MassDOT to ensure that DBEs have an equal opportunity to receive and participate in U.S. DOT assisted Contracts, without regard to race, color, national origin, or sex. To this end, MassDOT shall not directly, or through contractual or other arrangements, use criteria or methods of administration that have the effect of defeating or substantially impairing accomplishment of the program objectives stated below:

- ◆ To ensure nondiscrimination in the award and administration of U.S. DOT assisted Contracts;
- ◆ To create a level playing field on which DBEs can compete fairly for U.S. DOT assisted Contracts;
- ◆ To ensure that the DBE Program is narrowly tailored in accordance with applicable law;
- ◆ To ensure that only firms that fully meet 49 CFR Part 26 eligibility standards are permitted to participate as DBEs;
- ◆ To help remove barriers to the participation of DBEs in U.S. DOT assisted Contracts; and
- ◆ To assist the development of firms that can compete successfully in the market place outside the DBE Program.

The Director of Civil Rights of MassDOT has been designated as the DBE Liaison Officer. The DBE Liaison Officer is responsible for implementing all aspects of the DBE Program. Other MassDOT employees are responsible for assisting the Office of Civil Rights in carrying out this obligation. Implementation of the DBE Program is accorded the same priority as compliance with all other legal obligations incurred by MassDOT in its financial assistance agreements with each operating administration of the U.S. DOT. Information on the Federal requirements and MassDOT’s policies and information can be found at:

<i>Type of Info</i>	<i>Website</i>	<i>Description</i>
MassDOT Highway Division Policies and Info	<a href="https://www.mass.gov/disadvantaged-business-enterprise-goals-2019-2022">https://www.mass.gov/disadvantaged-business-enterprise-goals-2019-2022</a>	MassDOT– Highway Div’n Page
For copies of the Code of Federal Regulations	<a href="http://www.gpo.gov/fdsys/browse/collectionCfr.action?collectionCode=CFR">http://www.gpo.gov/fdsys/browse/collectionCfr.action?collectionCode=CFR</a>	FDsys – US Gov’t Printing Office
For information about the U.S.DOT DBE Program	<a href="https://www.transportation.gov/civil-rights/disadvantaged-business-enterprise">https://www.transportation.gov/civil-rights/disadvantaged-business-enterprise</a>	U.S. DOT/ FHWA page

## 1. DEFINITIONS

As used in these provisions, the terms set out below are defined as follows:

“Broker”, for purposes of these provisions, shall mean a DBE Entity that has entered into a legally binding relationship to provide goods or services delivered or performed by a third party. A broker may be a DBE Entity that arranges or expedites transactions but performs no work or installation services.

“Contractor”, “General” or “Prime” Contractor, “Bidder,” and “DB Entity” shall mean a person, firm, or other entity that has contracted directly with MassDOT to provide contracted work or services.

“Contract” shall mean the Contract for work between the Contractor and MassDOT.

“DBB” or “Design-Bid-Build” shall mean the traditional design, bid and project delivery method consisting of separate contracts between awarding authority and a designer resulting in a fully designed project; and a separate bidding process and Contract with a construction Contractor or Bidder.

“DB” or “Design-Build” shall mean an accelerated design, bid and project delivery method consisting of a single contract between the awarding authority and a DB Entity, consisting of design and construction companies that will bring a project to full design and construction.

“Disadvantaged Business Enterprise” or “DBE” shall mean a for-profit, small business concern:

- (a) that is at least fifty-one (51%) percent owned by one or more individuals who are both socially and economically disadvantaged, or, in the case of any corporation, in which at least fifty-one (51%) percent of the stock is owned by one or more such individuals; and
- (b) where the management and daily business operations are controlled by one or more of the socially and economically disadvantaged individuals who own it.

“FHWA” shall mean the Federal Highway Administration,” an agency within U.S. DOT that supports State and local governments in the design, and maintenance of the Nation’s highway system (Federal Aid Highway Program).

“Good faith efforts” shall mean efforts to achieve a DBE participation goal or other requirement of these Special Provisions that, by their scope, intensity, and appropriateness to the objective, can reasonably be expected to fulfill the program requirement. Such efforts must be deemed acceptable by MassDOT.

“Joint Venture” shall mean an association of a DBE firm and one or more other firms to carry out a single, for-profit business enterprise, for which the parties combine their property, capital, efforts, skills and knowledge, and in which the DBE is responsible for a distinct, clearly defined portion of the work of the Contract and whose share in the capital contribution, control, management, risks, and profits of the joint venture are commensurate with its ownership interest.

“Approved Joint Venture” shall mean a joint venture, as defined above, which has been approved by MassDOT’s Prequalification Office and Office of Civil Rights for DBE participation on a particular Contract.

"Manufacturer" shall mean a firm that operates or maintains a factory or establishment that produces, on the premises, the materials, supplies, articles or equipment required under the contract and of the general character described by the specifications.

"Regular Dealer" shall mean a DBE firm that owns, operates, or maintains a store, warehouse, or other establishment in which 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.

- (a) 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 of the products in question.
- (b) 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 as provided above if the person both owns and operates distribution equipment for the products. Any supplementing of regular dealers' own distribution equipment shall be by long term lease agreement and not on an ad hoc or contract by contract basis.
- (c) Packagers, brokers, manufacturers' representatives, or other persons who arrange or expedite transactions are not regular dealers within the meaning of this definition.

"Responsive" and "Responsible" refers to the bidder's submittal meeting all of the requirements of the advertised request for proposal. The term responsible refers to the ability of the Contractor to perform the work. This ability can be determined prior to bid invitations.

"Small Business or Small Business Concern" shall mean a small business concern or company as defined in Section 3 of the Small Business Act and SBA regulations implementing it (13 CFR Part 121); and is a business that does not exceed the cap on annual average gross receipts established by the U.S. Secretary of Transportation pursuant to 49 CFR Part 26.65; see also 49 CFR Part 26.39.

"SDO" shall mean the Massachusetts Supplier Diversity Office, formerly known as the State Office of Minority and Women Business Assistance (SOMWBA). In 2010, SOMWBA was abolished and the SDO was established. *See* St. 2010, c. 56. The SDO has assumed all the functions of SOWMBA. SDO is an agency within the Commonwealth of Massachusetts Executive office of Administration and Finance (ANF) Operational Services Division (OSD). The SDO mandate is to help promote the development of business enterprises and non-profit organizations owned and operated by minorities and women.

"Socially and economically disadvantaged individuals" shall mean individuals who are citizens of the United States (or lawfully admitted permanent residents) and who are:

- (a) Individuals found by SDO to be socially and economically disadvantaged individuals on a case by case basis.
- (b) Individuals in the following groups, members of which are rebuttably presumed to be socially and economically disadvantaged:



- (1) "Black Americans" which includes persons having origin in any of the Black racial groups of Africa; (2) "Hispanic Americans" which include persons of Mexican, Puerto Rican, Cuban, Dominican, Central or South American, or other Spanish or Portuguese culture or origin, regardless of race; (3) "Native Americans" which include persons who are American Indians, Eskimos, Aleuts, or Native Hawaiians; (4) "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, Tuvalu, Nauru, Federated States of Micronesia, or Hong Kong; (5) "Subcontinent Asian Americans" which includes persons whose origins are from India, Pakistan, Bangladesh, Bhutan, the Maldives Islands, Nepal or Sri Lanka; (6) Women; or (7) Any additional groups whose members are designated as socially and economically disadvantaged by the Small Business Administration (SBA), at such time as the SBA designation becomes effective.

Other terms and definitions applicable to the U.S. DOT DBE Program may be found at 49 CFR Part 26 and related appendices and guidance pages.

## 2. DBE PARTICIPATION

### a. Goal

On this Contract, MassDOT has established the following goal(s) for participation by firms owned and controlled by socially and economically disadvantaged persons. At least half of the goal must be met in the form of DBE Subcontractor construction activity as opposed to material supplies or other services. The applicable goal remains in effect throughout the life of the contract regardless of whether pre-identified DBE Subcontractors remain on the Project or under Contract.

Design-Bid-Build Projects: DBE Participation Goal 12 %  
(One half of this goal shall be met in the form of Subcontractor construction activity)

Design-Build Projects: DBE Design Participation Goal \_\_\_\_% and DBE Construction Participation Goal \_\_\_\_%  
(One half of the Construction Goal shall be met in the form of Subcontractor construction activity)

### b. Bidders List

Pursuant to the provisions of 49 CFR Part 26.11(c), Recipients such as MassDOT, must collect from all Bidders who seek work on Federally assisted Contracts the firm full company name(s), addresses and telephone numbers of all firms that have submitted bids or quotes to the Bidders in connection with this Project. All bidders should refer to the Special Provision Document "A00801" of the Project proposal for this requirement.

In addition, MassDOT must provide to U.S. DOT, information concerning contractors firm status as a DBE or non-DBE, the age of the firm, and the annual gross receipts of the firm within a series of brackets (e.g., less than \$500,000; \$500,000–\$1 million; \$1–2 million; \$2–5 million, etc.). The status, firm age, and annual gross receipt information will be sought by MassDOT regularly prior to setting its DBE participation goal for submission to U.S. DOT. MassDOT will survey each individual firm for this information directly.

Failure to comply with a written request for this information within fifteen (15) business days may result in the suspension of bidding privileges or other such sanctions, as provided for in Section 9 of this provision, until the information is received.

### **3. CONTRACTOR ASSURANCES**

No Contractor or any Subcontractor shall 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 all respects and as applicable prior to, or subsequent to, award of U.S. DOT assisted Contracts. The Contractor agrees to affirmatively seek out and consider DBE firms as Contractors, Subcontractors, and/or suppliers of materials and services for this Contract. No Contract will be approved until MassDOT has reviewed Bidders'/Contractors' affirmative actions concerning DBEs. Failure to carry out these requirements is a material breach of this Contract which may result in the termination of the Contract or such other remedy as MassDOT or FHWA deem appropriate.

### **4. REQUIRED SUBCONTRACT PROVISIONS**

The Prime Contractor shall include the provisions of Section 3 above in every subcontract, making those provisions binding on each Subcontractor; in addition, the Prime Contractor shall include a copy of this Special Provision, in its entirety, in every subcontract with a DBE firm which is, or may be, submitted for credit toward the Contract participation goal.

### **5. ELIGIBILITY OF DBES**

Only firms that have been certified by SDO and confirmed by MassDOT as eligible in accordance with 49 CFR Part 26 to participate as DBEs on federally aided MassDOT Contracts may be used on this Contract for credit toward the DBE participation goal.

#### **a. Massachusetts DBE Directory**

MassDOT makes available to all bidders the most current Massachusetts Disadvantaged Business Enterprise Directory. This directory is made available for Contractors' convenience and is informational only. The Directory lists those firms that have been certified as eligible in accordance with the criteria of 49 CFR Part 26 to participate as DBEs on federally aided MassDOT contracts. The Directory also lists the kinds of work each firm is certified to perform but does not constitute an endorsement of the quality of performance of any business and does not represent MassDOT Subcontractor approval.

Contractors are encouraged to make use of the DBE Directory maintained by SDO on the Internet.

This listing is updated daily and may be accessed at the SDO's website at:

<https://www.diversitycertification.mass.gov/BusinessDirectory/BusinessDirectorySearch.aspx>

#### **b. DBE Certification**

A firm must apply to SDO, currently acting as certification agent for MassDOT, for DBE certification to participate on federally aided MassDOT Contracts. A DBE application may be made in conjunction with a firm's application to SDO for certification to participate in state-funded minority and women business enterprise programs or may be for DBE certification only. An applicant for DBE certification must identify the area(s) of work it seeks to perform on U.S. DOT funded projects.

### **c. Joint Venture Approval**

To obtain recognition as an approved DBE Joint Venture, the parties to the joint venture must provide to MassDOT's Office of Civil Rights and Prequalification Office, at least fourteen (14) business days before the bid opening date, an Affidavit of DBE/Non-DBE Joint Venture in the form attached hereto, and including, but not limited to the following:

1. a copy of the Joint Venture Agreement;
2. a description of the distinct, clearly defined portion of the contract work that the DBE will perform with its own forces; and,
3. all such additional information as may be requested by MassDOT for the purpose of determining whether the joint venture is eligible.

### **6. COUNTING DBE PARTICIPATION TOWARDS DBE PARTICIPATION GOALS**

In order for DBE participation to count toward the Contract participation goal, the DBE(s) must have served a commercially useful function in the performance of the Contract and must have been paid in full for acceptable performance.

#### **a. Commercially Useful Function**

- (1) In general, a DBE performs a commercially useful function when it is responsible for execution of the work of the contract and is carrying out its responsibilities by actually performing, managing, and supervising the work involved. With respect to materials and supplies used on the Contract, the DBE must be responsible for negotiating price, determining quality and quantity, ordering the material, installing (where applicable) and paying for the material itself.
- (2) To determine whether a DBE is performing a commercially useful function, MassDOT will evaluate the amount of work subcontracted, industry practices, whether the amount the firm is to be paid under the Contract is commensurate with the work it is actually performing and the DBE credit claimed for its performance of the work, and other relevant factors.
- (3) A DBE does not perform a commercially useful function if its role is limited to that of an extra participant in a transaction, contract, or project through which funds are passed in order to obtain the appearance of DBE participation. In determining whether a DBE is such an extra participant, MassDOT will examine similar transactions, particularly those in which DBEs do not participate.

#### **b. Counting Participation Toward The Contract Participation Goal**

DBE participation which serves a commercially useful function shall be counted toward the DBE participation goal in accordance with the Provisions of 49 CFR Part 26.55(a) to (h), as follows:

- (1) When a DBE participates in a construction Contract, MassDOT will count the value of the work performed by the DBE's own forces. MassDOT will count the cost of supplies and materials obtained by the DBE for the work of its contract, including supplies purchased or equipment leased by the DBE. Supplies, labor, or equipment the DBE Subcontractor uses, purchases, or leases from the Prime Contractor or any affiliate of the Prime Contractor will not be counted.

- (2) MassDOT will count the entire amount of fees or commissions charged by a DBE firm for providing bona fide services, such as professional, technical, consultant, or managerial services, or for providing bonds or insurance specifically required for the performance of a U.S. DOT assisted Contract, toward DBE participation goals, provided it is determined that the fee is reasonable and not excessive as compared with fees customarily allowed for similar services.
- (3) When a DBE performs as a participant in a joint venture, MassDOT will count toward DBE participation goals a portion of the total dollar value of the contract that is equal to the distinct, clearly defined portion of the work of the Contract that the DBE performs with its own forces.
- (4) MassDOT will use the following factors in determining whether a DBE trucking company is performing a commercially useful function:
  - (i) the DBE must be responsible for the management and supervision of the entire trucking operation for which it is responsible on a particular contract; there cannot be a contrived arrangement for the purpose of meeting DBE participation goals.
  - (ii) the DBE must itself own and operate at least one fully licensed, insured, and operational truck used on the Contract.
  - (iii) the Contractor will receive DBE credit for the total value of the transportation services the DBE provides on the Contract using trucks owned, insured, and operated by the DBE itself and using drivers the DBE employs alone.
  - (iv) the DBE may lease trucks from another DBE firm, including an owner-operator who is certified as a DBE. The Contractor who has a contract with a DBE who leases trucks from another DBE will receive credit for the total value of the transportation services of the lease.
  - (v) the DBE may also lease trucks from a non-DBE firm, including an owner-operator. The Contractor who has a Contract with a DBE who leases trucks from a non-DBE is entitled to credit for the total value of the transportation services provided by non-DBE lessees not to exceed the value of transportation services provided by DBE-owned trucks on the Contract. Additional participation by non-DBE lessees receives credit only for the fee or commission it receives as a result of the lease arrangement, fee or commission it receives as a result of the lease arrangement. The DBE does not receive credit for the total value of the transportation services provided by the lessee, since these services are not provided by a DBE.
  - (vi) the lease must indicate that the DBE has exclusive use of, and control over, the truck. This does not preclude the leased truck from working for others during the term of the lease with the consent of the DBE, so long as the lease gives the DBE absolute priority for use of the leased truck. Leased trucks must display the name and identification number of the DBE.

- (5) MassDOT will count the Prime Contractor's expenditures with DBEs for materials or supplies toward DBE participation goals as follows:
- (i) if the materials or supplies are obtained from a DBE manufacturer, as defined in Section 1 above, MassDOT will count one hundred (100%) percent of the cost of the materials or supplies toward DBE participation goals, provided the DBE meets the other requirements of the regulations.
  - (ii) if the materials or supplies are purchased from a DBE regular dealer, as defined in Section 1 above, MassDOT will count sixty (60%) percent of the cost of the materials or supplies toward the Contract participation goal, provided the DBE meets the other requirements of the regulations.
  - (iii) for materials or supplies purchased from a DBE which is neither a manufacturer nor a regular dealer, MassDOT will count the entire amount of fees or commissions charged for assistance in the procurement of the materials and supplies, or fees or transportation charges for the delivery of materials or supplies required on a job site toward the Contract participation goal, provided that MassDOT determines the fees to be reasonable and not excessive as compared with fees customarily allowed for similar services; the cost of the materials and supplies themselves will not be counted; and provided the DBE meets the other requirements of the regulations.

#### **c. Joint Check Policy**

MassDOT recognizes that the use of joint checks may be a business practice required by material suppliers and vendors in the construction industry. A joint check is a two-party check issued by a/the Prime Contractor to a DBE third party such as a regular dealer of material or supplies. The Prime Contractor issues the check as payor to the DBE and the third party jointly as payees to guarantee payment to the third party for materials or supplies obtained or to be used by the DBE. FHWA has established criteria to ensure that DBEs are in fact performing a commercially useful function ("CUF") while using a joint check arrangement. Contractors and DBEs must meet and conform to these conditions and criteria governing the use of joint checks.

In the event that a Contractor or DBE Subcontractor desires to use a joint check, MassDOT will require prior notice and will closely monitor the arrangement for compliance with FHWA regulations and guidance. MassDOT may allow a joint check arrangement and give credit to a Contractor for use of the DBE where one or more of the following conditions exist:

- The use of a joint check is in fact required by this type of vendor or supplier as a standard industry practice that applies to all Contractors (DBEs and non-DBEs); or is required by a specific vendor or supplier;
- Payment for supplies or materials would be delayed for an unreasonably extended period without the joint check arrangement;
- The DBE (or any of its Subcontractors) has a pattern or history of not paying a vendor or supplier within a reasonable time or has not established enough of a credit history with the supplier or vendor; and/or
- The presence of severe adverse economic conditions, where credit resources may be limited and such practices may be necessary or required to effect timely payments.

Other factors MassDOT may consider:

- Whether there is a requirement by the Prime Contractor that a DBE should use a specific vendor or supplier to meet their Subcontractor specifications;
- Whether there is a requirement that a DBE use the Prime Contractor's negotiated price;
- The independence of the DBE;
- Whether approval has been sought prior to use of a joint check arrangement; and
- Whether any approved joint check arrangement has exceeded a reasonable period of use;
- The operation of the joint check arrangement; and
- Whether the DBE has made an effort to establish alternate arrangements for following periods (i.e., the DBE must show it can, or has, or why it has not, established or increased a credit line with the vendor or supplier).

Even with the use of a Joint Check, both the Contractor and DBE remain responsible for compliance with all other elements under 49 CFR § 26.55 (c) (1), and must still be able to prove that a commercially useful function is being performed for the Contractor.

#### **d. Joint Check Procedure(s)**

- The DBE advises its General or Prime Contractor that it will have to use a Joint Check and provide proof of such requirement.
- The General or the Prime Contractor submits a request for approval to MassDOT, using MassDOT's approved Joint Check Request form (Document B00855) and by notification on the DBE Letter of Intent (Document B00854), and any other relevant documents. Requests that are not initiated during the bid process should be made in writing and comply with the procedure.
- The MassDOT Office of Civil Rights will review the request and render a decision as part of the approval process for DBE Schedules and Letters of Intent.
- Review and Approval will be project specific and relevant documents will be made part of the project Contract file.
- Payments should be made in the name of both the DBE and vendor or supplier. Payments should be issued and signed by the Contractor as only the guarantor for prompt payment of purchases to the vendor or supplier. The payment to the vendor or supplier should be handled by the DBE (i.e. if possible, funds or the joint check should be processed by the DBE and sent by the DBE to the vendor or supplier).
- MassDOT may request copies of cancelled checks (front and back) and transmittal information to verify any payments made to the DBE and vendor or supplier.
- MassDOT may request other information and documents, and may ask questions of the Contractor, Subcontractor and vendor or supplier prior to, during, and after the project performance to ascertain whether the Subcontractor is performing a commercially useful function and all parties are complying with DBE Program policies and procedures as part of the Subcontractor approval process.

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## 7. AWARD DOCUMENTATION AND PROCEDURES

- a. The two lowest bidders/the two bidders with the lowest price per quality score point, shall submit, by the close of business on the third (3<sup>rd</sup>) business day after the bid opening, a completed Schedule of Participation by DBEs (Document B00853) which shall list:
- (1) The full company name, address and telephone number of each DBE with whom the bidder intends to make a commitment.
  - (2) The contract item(s), by number(s) and quantity(ies), if applicable, or specific description of other business activity to be performed by each DBE as set forth in the Letters of Intent. The Bidder shall list only firms which have the capacity to perform, manage and supervise the work proposed in accordance with the requirements of 49 CFR Part 26 and Section **6.b** of these Special Provisions.
  - (3) The total dollar amount to be paid to each DBE. (Bidders are cautioned that at least one half of the participation goal must be met with construction activity work.)
  - (4) The total dollar amount to be paid to each DBE that is eligible for credit toward the DBE participation goal under the counting rules set out in Section **6.b**.
  - (5) The total creditable DBE participation as a percentage of the total bid price.
- b. All firms listed on the Schedule must be currently certified.
- c. The two lowest bidders/the two bidders with the lowest price per quality score point, shall each submit, with their Schedules of Participation, fully completed, signed Letters of Intent (Document B00854) from each of the DBEs listed on the Schedule. The Letters of Intent shall be in the form attached and shall identify specifically the contract activity the DBE proposes to perform, expressed as contract item number, if applicable, description of the activity, NAICS code, quantity, unit price and total price. In the event of discrepancy between the Schedule and the Letter of Intent, the Letter of Intent shall govern.
- d. Evidence of good faith efforts will be evaluated by MassDOT in the selection of the lowest responsible bidder.

All information requested by MassDOT for the purpose of evaluating the Contractor's efforts to achieve the participation goal must be provided within three (3) calendar days and must be accurate and complete in every detail. The apparent low bidder's attainment of the DBE participation goal or a satisfactory demonstration of good faith efforts is a prerequisite for award of the Contract.

- e. Failure to meet, or to demonstrate good faith efforts to meet, the requirements of these Special Provisions shall render a bid non-responsive. Therefore, in order to be eligible for award, the bidder (1) must list all DBE's it plans to employ on the Schedule of Participation; and provide the required Letters of Intent for, DBE participation which meets or exceeds the Contract goal in accordance with the terms of these Special Provisions or (2) must demonstrate, to the satisfaction of MassDOT, that good faith efforts were made to achieve the participation goal. MassDOT will adhere to the guidance provided in Appendix A to 49 CFR Part 26 on the determination of a Contractor's good faith efforts to meet the DBE participation goal(s) set forth in Section 2 herein.

- f.** If MassDOT finds that the percentage of DBE participation submitted by the bidder on its Schedule does not meet the Contract participation goal, or that Schedule and Letters of Intent were not timely filed, and that the bidder has not demonstrated good faith efforts to comply with these requirements, it shall propose that the bidder be declared ineligible for award. In that case, the bidder may request administrative reconsideration. Such requests must be sent in writing within three (3) calendar days of receiving notice of proposed ineligibility to: The Office of the General Counsel, Massachusetts Department of Transportation, 10 Park Plaza, Boston, MA, 02116.
- g.** If, after administrative reconsideration, MassDOT finds that the bidder has not shown that sufficient good faith efforts were made to comply with the requirements of these Special Provisions, it shall reject the bidder's proposal and may retain the proposal guaranty.
- h.** Actions which constitute evidence of good faith efforts to meet a DBE participation goal include, but are not limited to, the following examples, which are set forth in 49 CFR Part 26, Appendix A:
- (1) Soliciting through all reasonable and available means (e.g., attendance at pre-bid meetings, advertising and/or written notices) the interest of all certified DBEs who have the capability to perform the work of the Contract. The bidder must solicit this interest within sufficient time to allow the DBEs to respond to the solicitation. The bidder must determine with certainty if the DBEs are interested by taking appropriate steps to follow up initial solicitations.
  - (2) Selecting portions of the work to be performed by DBEs in order to increase the likelihood that the DBE participation goal will be achieved. This includes, where appropriate, breaking out contract work items into economically feasible units to facilitate DBE participation, even when the Prime Contractor might otherwise prefer to perform these work items with its own forces.
  - (3) Providing interested DBEs with adequate information about the plans, specifications, and requirements of the contract in a timely manner to assist them in responding to a solicitation.
  - (4) Negotiating in good faith with interested DBEs. It is the bidder's responsibility to make a portion of the work available to DBE Subcontractors and suppliers and to select those portions of the work or material needs consistent with the available DBE Subcontractors and suppliers, so as to facilitate DBE participation. Evidence of such negotiation includes the names, addresses, and telephone number of DBEs that were considered; a description of the information provided regarding the plans and specifications for the work selected for subcontracting; and evidence as to why additional agreements could not be reached for DBEs to perform the work.

A bidder using good business judgment would consider a number of factors in negotiating with Subcontractors, including DBE Subcontractors, and would take a firm's price and capabilities as well as Contract participation goals into consideration. However, the fact that there may be some additional costs involved in finding and using DBEs is not in itself sufficient reason for a bidder's failure to meet the Contract DBE participation goal, as long as such costs are reasonable. Also, the ability or desire of a Prime Contractor to perform the work of a Contract with its own organization does not relieve the bidder of the responsibility to make good faith efforts. Prime Contractors are not, however, required to accept higher quotes from DBEs if the price difference is excessive or unreasonable.



- (5) Not rejecting DBEs as being unqualified without sound reasons based on a thorough investigation of their capabilities. Contractors should be careful of adding additional requirements of performance that would in effect limit participation by DBEs or any small business. The Contractor's standing within its industry, membership in specific groups, organizations, or associations and political or social affiliations (for example union vs. nonunion employee status) are not legitimate causes for the rejection or non-solicitation of bids in the Contractor's efforts to meet the Contract participation goal.
- (6) Making efforts to assist interested DBEs in obtaining bonding, lines of credit, or insurance as required by the recipient or contractor.
- (7) Making efforts to assist interested DBEs in obtaining necessary equipment, supplies, materials, or related assistance or services.
- (8) Effectively using the services of available minority/women community organizations; minority/women contractors' groups; local, state, and federal minority/women business assistance offices; and other organizations as allowed on a case by case basis to provide assistance in the recruitment and placement of DBEs.

## 8. COMPLIANCE

- a. All activity performed by a DBE for credit toward the Contract participation goal must be performed, managed and supervised by the DBE in accordance with all commercially useful function requirements of 49 CFR Part 26. The Prime Contractor shall not enter into, or condone, any other arrangement.
- b. The Prime Contractor shall not perform with its own organization, or assign to any other business, an activity designated for the DBE(s) named on the Schedule(s) submitted by the Prime Contractor under Section 7 or under paragraph 8.f of this section, without the approval of MassDOT in accordance with the requirements of paragraphs 8.f and 8.j of this section.
- c. MassDOT may suspend payment for any activity that was not performed by the DBE to whom the activity was committed on the approved Schedule of Participation, or that was not performed in accordance with the requirements of Section 6.
- d. MassDOT retains the right to approve or disapprove of any or all Subcontractors. Requests by the Prime Contractor for approval of participation by a DBE Subcontractor for credit toward the Contract participation goal must include, in addition to any other requirements for Subcontractor approval, the following:
  - (1) A copy of the proposed subcontract. The subcontract must be for at least the dollar amount, and for the work described, in the Bidder's Schedule of Participation.
  - (2) A resume stating the qualifications and experience of the DBE Superintendent and/or foreperson who will supervise the on-site work. A new resume will be required for any change in supervisory personnel during the progress of the work.
  - (3) A Schedule of Operations indicating when the DBE is expected to perform the work.
  - (4) A list of (1) equipment owned by the DBE to be used on the Project, and (2) equipment to be leased by the DBE for use on the Project.

- (5) A list of: (1) all projects (public and private) which the DBE is currently performing; (2) all projects (public and private) to which the DBE is committed; and (3) all projects (public and private) to which the DBE intends to make a commitment. For each Contract, list the contracting organization, the name and telephone number of a contact person for the contracting organization, the dollar value of the work, a description of the work, and the DBE's work schedule for each project.
- e. If, pursuant to the Subcontractor approval process, MassDOT finds that a DBE Subcontractor does not have sufficient experience or resources to perform, manage and supervise work of the kind proposed in accordance with the requirements of 49 CFR Part 26, approval of the DBE Subcontractor may be denied. In the event of such denial, the Prime Contractor shall proceed in accordance with the requirements paragraphs **8.f** and **8.j** of this section.
- f. If, for reasons beyond its control, the Prime Contractor cannot comply with its DBE participation commitment in accordance with the Schedule of Participation submitted under Section 7, the Prime Contractor shall submit to MassDOT the reasons for its inability to comply with its obligations and shall submit, and request approval for, a revised Schedule of Participation. If approved by MassDOT, the revised Schedule shall govern the Prime Contractor's performance in meeting its obligations under these Special Provisions.
- g. A Prime Contractor's compliance with the participation goal in Section 2 shall be determined by reference to the established percentage of the total contract price, provided, however, that no decrease in the dollar amount of a bidder's commitment to any DBE shall be allowed without the approval of MassDOT.
- h. If the contract amount is increased, the Prime Contractor may be required to submit a revised Schedule of Participation in accordance with paragraphs **8.f** and **8.j** of this section.
- i. In the event of the decertification of a DBE scheduled to participate on the Contract for credit toward the participation goal, but not under subcontract, the Contractor shall proceed in accordance with paragraphs **8.f** and **8.j** of this section.
- j. The Prime Contractor shall notify MassDOT immediately of any facts that come to its attention indicating that it may or will be unable to comply with any aspect of its DBE obligation under this Contract.
- k. Any notice required by these Special Provisions shall be given in writing to: (1) the Resident Engineer; (2) the District designated Compliance Officer; and (3) the DBE Liaison Officer, MassDOT Office of Civil Rights, 10 Park Plaza, – 3rd Floor - West, Boston, MA, 02116 and cc'd to the Deputy Chief of External Programs.
- l. The Prime Contractor and its Subcontractors shall comply with MassDOT's Electronic Reporting System Requirements (MassDOT Document 00821) and submit all information required by MassDOT related to the DBE Special Provisions through the Equitable Business Opportunity Solution ("EBO"). MassDOT reserves the right to request reports in the format it deems necessary anytime during the performance of the Contract.
- m. Termination of DBE by Prime Contractor
- (1) A Prime Contractor shall not terminate a DBE Subcontractor or an approved substitute DBE firm without the prior written consent of MassDOT. This includes, but is not limited to, instances in which a Prime 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.

- (2) MassDOT may provide such written consent only if MassDOT agrees, for reasons stated in its concurrence document, that the Prime Contractor has good cause to terminate the DBE firm.
- (3) For purposes of this paragraph, good cause includes the following circumstances:
  - (i) The DBE Subcontractor fails or refuses to execute a written contract;
  - (ii) The DBE Subcontractor fails or refuses to perform the work of its subcontract in a way consistent with normal industry standards. Good cause, however, does not exist if the failure or refusal of the DBE Subcontractor to perform its work on the subcontract results from the bad faith or discriminatory action of the Prime Contractor;
  - (iii) The DBE Subcontractor fails or refuses to meet the Prime Contractor's reasonable, nondiscriminatory bond requirements.
  - (iv) The DBE Subcontractor becomes bankrupt, insolvent, or exhibits credit unworthiness;
  - (v) The DBE Subcontractor is ineligible to work on public works projects because of suspension and debarment proceedings pursuant 2 CFR Parts 180, 215 and 1,200 or applicable State law;
  - (vi) (vii) MassDOT has determined that the listed DBE Subcontractor is not a responsible contractor;
  - (vii) The listed DBE Subcontractor voluntarily withdraws from the Project and provides written notice of its withdrawal;
  - (viii) The listed DBE is ineligible to receive DBE credit for the type of work required;
  - (ix) A DBE owner dies or becomes disabled with the result that the listed DBE Contractor is unable to complete its work on the Contract;
  - (x) Other documented good cause that MassDOT determines compels the termination of the DBE Subcontractor. Good cause, however, does not exist if the Prime Contractor seeks to terminate a DBE it relied upon to obtain the Contract so that the Prime Contractor can self-perform the DBE work or substitute another DBE or non-DBE Contractor after Contract Award.
- (4) Before transmitting to MassDOT a request to terminate and/or substitute a DBE Subcontractor, the Prime Contractor must give notice in writing to the DBE Subcontractor, with a copy to MassDOT, of its intent to request to terminate and/or substitute, and the reason for the request.
- (5) The Prime Contractor must give the DBE five (5) business days to respond to the Prime Contractor's notice. The DBE must advise MassDOT and the Contractor of the reasons, if any, why it objects to the proposed termination of its subcontract and why MassDOT should not approve the Prime Contractor's action. If required in a particular case as a matter of public necessity (e.g., safety), MassDOT may provide a response period shorter than five (5) business days.
- (6) In addition to post-award terminations, the provisions of this section apply to pre-award deletions of or substitutions for DBE firms.

**n. Prompt Payment.**

Contractors are required to promptly pay Subcontractors under this Prime Contract within ten (10) business days from the receipt of each payment the Prime Contractor receives from MassDOT. Failure to comply with this requirement may result in the withholding of payment to the Prime Contractor until such time as all payments due under this provision have been received by the Subcontractor(s) and/or referral to the Prequalification Committee for action which may affect the Contractor's prequalification status.

**9. SANCTIONS**

If the Prime Contractor does not comply with the terms of these Special Provisions and cannot demonstrate to the satisfaction of MassDOT that good faith efforts were made to achieve such compliance, MassDOT may, in addition to any other remedy provided for in the Contract, and notwithstanding any other provision in the Contract:

- a.** Retain, in connection with final acceptance and final payment processing, an amount determined by multiplying the total contract amount by the percentage in Section 2, less the amount paid to approved DBE(s) for work performed under the Contract in accordance with the provisions of Section 8.
- b.** Suspend, terminate or cancel this Contract, in whole or in part, and call upon the Prime Contractor's surety to perform all terms and conditions in the Contract.
- c.** In accordance with 720 CMR 5.05(1)(f), modify or revoke the Prime Contractor's Prequalification status or recommend that the Prime Contractor not receive award of a pending Contract. The Prime Contractor may appeal the determination of the Prequalification Committee in accordance with the provisions of 720 CMR 5.06.
- d.** Initiate debarment proceedings pursuant to M.G.L. c. 29 §29F and, as applicable, 2 CFR Parts 180, 215 and 1,200.
- e.** Refer the matter to the Massachusetts Attorney General for review and prosecution, if appropriate, of any false claim or pursuant to M.G.L. c. 12, §§ 5A to 5O (the Massachusetts False Claim Act).
- f.** Refer the matter to the U.S. DOT's Office of the Inspector General or other agencies for prosecution under Title 18, U.S.C. § 1001, 49 CFR Parts 29 and 31, and other applicable laws and regulations.

**10. FURTHER INFORMATION; ENFORCEMENT, COOPERATION AND CONFIDENTIALITY.**

- a.** Any proposed DBE, bidder, or Contractor shall provide such information as is necessary in the judgment of MassDOT to ascertain its compliance with the terms of this Special Provision. Further, pursuant to 49 CFR, Part 26.107:

- (1) If you are a firm that does not meet the eligibility criteria of 49 CFR, Parts 26.61 to 26.73 (“subpart D”), that attempts to participate in a DOT- assisted program as a DBE on the basis of false, fraudulent, or deceitful statements or representations or under circumstances indicating a serious lack of business integrity or honesty, MassDOT or FHWA may initiate suspension or debarment proceedings against you under 49 CFR Part 29.
  - (2) If you are a firm that, in order to meet DBE Contract participation goals or other DBE Program requirements, uses or attempts to use, on the basis of false, fraudulent or deceitful statements or representations or under circumstances indicating a serious lack of business integrity or honesty, another firm that does not meet the eligibility criteria of subpart D, FHWA may initiate suspension or debarment proceedings against you under 49 CFR Part 29.
  - (3) In a suspension or debarment proceeding brought either under subparagraph a.(1) or b.(2) of this section, the concerned operating administration may consider the fact that a purported DBE has been certified by a recipient. Such certification does not preclude FHWA from determining that the purported DBE, or another firm that has used or attempted to use it to meet DBE participation goals, should be suspended or debarred.
  - (4) FHWA may take enforcement action under 49 CFR Part 31, Program Fraud and Civil Remedies, against any participant in the DBE Program whose conduct is subject to such action under 49 CFR Part 31.
  - (5) FHWA may refer to the Department of Justice, for prosecution under 18 U.S.C. 1001 or other applicable provisions of law, any person who makes a false or fraudulent statement in connection with participation of a DBE in any DOT-assisted program or otherwise violates applicable Federal statutes.
- b. Pursuant to 49 CFR Part 26.109, the rules governing information, confidentiality, cooperation, and intimidation or retaliation are as follows:
  - (1) Availability of records.
    - (i) In responding to requests for information concerning any aspect of the DBE Program, FHWA complies with provisions of the Federal Freedom of Information and Privacy Acts (5 U.S.C. 552 and 552a). FHWA may make available to the public any information concerning the DBE Program release of which is not prohibited by Federal law.
    - (ii) MassDOT shall safeguard from disclosure to unauthorized persons information that may reasonably be considered as confidential business information, consistent with Federal and Massachusetts General Law (M.G.L. c. 66, § 10, M.G.L. c. 4, §7 (26), 950 CMR 32.00).
  - (2) Confidentiality of information on complainants. Notwithstanding the provisions of subparagraph b.(1) of this section, the identity of complainants shall be kept confidential, at their election. If such confidentiality will hinder the investigation, proceeding or hearing, or result in a denial of appropriate administrative due process to other parties, the complainant must be advised for the purpose of waiving the privilege. Complainants are advised that, in some circumstances, failure to waive the privilege may result in the closure of the investigation or dismissal of the proceeding or hearing.

- (3) Cooperation. All participants in FHWA's DBE Program (including, but not limited to, recipients, DBE firms and applicants for DBE certification, complainants and appellants, and Contractors using DBE firms to meet Contract participation goals) are required to cooperate fully and promptly with U.S. DOT and recipient compliance reviews, certification reviews, investigations, and other requests for information. Failure to do so shall be a ground for appropriate action against the party involved (e.g., with respect to recipients, a finding of noncompliance; with respect to DBE firms, denial of certification or removal of eligibility and/or suspension and debarment; with respect to a complainant or appellant, dismissal of the complaint or appeal; with respect to a Contractor which uses DBE firms to meet participation goals, findings of non-responsibility for future Contracts and/or suspension and debarment).
- (4) Intimidation and retaliation. No recipient, Contractor, or any other participant in the program, may intimidate, threaten, coerce, or discriminate against any individual or firm for the purpose of interfering with any right or privilege secured by this part or because the individual or firm has made a complaint, testified, assisted, or participated in any manner in an investigation, proceeding, or hearing under this part. If any recipient or contractor violates this prohibition, that entity is in noncompliance with this 49 CFR Part 26.

## 11. LIST OF ADDITIONAL DOCUMENTS.

- a. The following documents shall be completed and signed by the bidder and designated DBEs in accordance with Section 7 - Award Documentation and Procedures. These documents must be returned by the bidder to MassDOT's Bid Document Distribution Center:
- Schedule of DBE Participation (Document B00853)
  - Letter of Intent (Document B00854)
  - DBE Joint Check Arrangement Approval Form (Document B00855), if Contractor and DBE plan, or if DBE is required to use a Joint Check
- b. The following document shall be signed and returned by Contractor and Subcontractors/DBEs to the MassDOT District Office overseeing the Project, as applicable:
- Contractor/Subcontractor Certification Form (Document No. 00859) (a checklist of other documents to be included with every subcontract (DBEs and non-DBEs alike)).
- c. The following document shall be provided to MassDOT's Office of Civil Rights and Prequalification Office at least fourteen (14) business days before the bid opening date, if applicable:
- Affidavit of DBE/Non-DBE Joint Venture (Document B00856)
- d. The following document shall be provided to MassDOT's District Office of Civil Rights within 30 calendar days after the work of the DBE is completed, or no later than 30 calendar days after the work of the DBE is on a completed and processed CQE. This document shall be completed and submitted by the Prime Contractor:
- Certificate of Completion by a Minority/Women or Disadvantaged Business Enterprise (M/W/DBE) (Form No. CSD-100)

**REQUIRED CONTRACT PROVISIONS  
FEDERAL-AID CONSTRUCTION CONTRACTS**

- I. General
- II. Nondiscrimination
- III. Non-segregated 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. Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion
- XI. Certification Regarding Use of Contract Funds for Lobbying
- XII. Use of United States-Flag Vessels:

**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, United States Code, as required in 23 CFR 633.102(b) (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). 23 CFR 633.102(e).

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. 23 CFR 633.102(e).

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) in accordance with 23 CFR 633.102. 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 solicitation-for-bids or request-for-proposals 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). 23 CFR 633.102(b).

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. 23 CFR 633.102(d).

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. 23 U.S.C. 114(b). The term Federal-aid highway does not include roadways functionally classified as local roads or rural minor collectors. 23 U.S.C. 101(a).

**II. NONDISCRIMINATION** (23 CFR 230.107(a); 23 CFR Part 230, Subpart A, Appendix A; EO 11246)

The provisions of this section related to 23 CFR Part 230, Subpart A, Appendix A 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 Part 60, 29 CFR Parts 1625-1627, 23 U.S.C. 140, Section 504 of the Rehabilitation Act of 1973, as amended (29 U.S.C. 794), Title VI of the Civil Rights Act of 1964, as amended (42 U.S.C. 2000d et seq.), 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 Part 60, and 29 CFR Parts 1625-1627. The contracting agency and the FHWA have the authority and the responsibility to ensure compliance with 23 U.S.C. 140, Section 504 of the Rehabilitation Act of 1973, as amended (29 U.S.C. 794), and Title VI of the Civil Rights Act of 1964, as amended (42 U.S.C. 2000d et seq.), 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 Part 230, Subpart A, 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 (see 28 CFR Part 35, 29 CFR Part 1630, 29 CFR Parts 1625-1627, 41 CFR Part 60 and 49 CFR Part 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 Part 35 and 29 CFR Part 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. 23 CFR 230.409 (g)(4) & (5).

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, sexual orientation, gender identity, 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 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 or other knowledgeable company official.

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, sexual orientation, gender identity, national origin, age or disability. The following procedures shall be followed:

a. The contractor will conduct periodic inspections of project sites to ensure 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. 23 CFR 230.409. 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, sexual orientation, gender identity, 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, sexual orientation, gender identity, 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 thereunder. 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, sexual orientation, gender identity, 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, 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. Assurances Required:

a. The requirements of 49 CFR Part 26 and the State DOT's FHWA-approved Disadvantaged Business Enterprise (DBE) program are incorporated by reference.

b. 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 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 recipient deems appropriate, which may include, but is not limited to:

- (1) Withholding monthly progress payments;
- (2) Assessing sanctions;
- (3) Liquidated damages; and/or
- (4) Disqualifying the contractor from future bidding as non-responsible.

c. The Title VI and nondiscrimination provisions of U.S. DOT Order 1050.2A at Appendixes A and E are incorporated by reference. 49 CFR Part 21.

**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 more than \$10,000. 41 CFR 60-1.5.

As prescribed by 41 CFR 60-1.8, 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, sexual orientation, gender identity, 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), in accordance with 29 CFR 5.5. The requirements apply to all projects located within the right-of-way of a roadway that is functionally classified as Federal-aid highway. 23 U.S.C. 113. This excludes roadways functionally classified as local roads or rural minor collectors, which are exempt. 23 U.S.C. 101. Where applicable law requires that projects be treated as a project on a Federal-aid highway, the provisions of this subpart will apply regardless of the location of the project. Examples include: Surface Transportation Block Grant Program projects funded under 23 U.S.C. 133 [excluding recreational trails projects], the Nationally Significant Freight and Highway

Projects funded under 23 U.S.C. 117, and National Highway Freight Program projects funded under 23 U.S.C. 167.

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 (29 CFR 5.5)**

a. *Wage rates and fringe benefits.* All laborers and mechanics employed or working upon the site of the work (or otherwise working in construction or development of the project under a development statute), 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 basic hourly 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. As provided in paragraphs (d) and (e) of 29 CFR 5.5, the appropriate wage determinations are effective by operation of law even if they have not been attached to the contract. Contributions made or costs reasonably anticipated for bona fide fringe benefits under the Davis-Bacon Act ([40 U.S.C. 3141\(2\)\(B\)](#)) on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of paragraph 1.e. 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 must be paid the appropriate wage rate and fringe benefits on the wage determination for the classification(s) of work actually performed, without regard to skill, except as provided in paragraph 4. of this section. 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 classifications and wage rates conformed under paragraph 1.c. of this section) and the Davis-Bacon poster (WH-1321) must 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. *Frequently recurring classifications.* (1) In addition to wage and fringe benefit rates that have been determined to be prevailing under the procedures set forth in [29 CFR part 1](#), a wage determination may contain, pursuant to § 1.3(f), wage and fringe benefit rates for classifications of laborers and mechanics for which conformance requests are regularly submitted pursuant to paragraph 1.c. of this section, provided that:

(i) The work performed by the classification is not performed by a classification in the wage determination for which a prevailing wage rate has been determined;

(ii) The classification is used in the area by the construction industry; and

(iii) The wage rate for the classification bears a reasonable relationship to the prevailing wage rates contained in the wage determination.

(2) The Administrator will establish wage rates for such classifications in accordance with paragraph 1.c.(1)(iii) of this section. Work performed in such a classification must be paid at no less than the wage and fringe benefit rate listed on the wage determination for such classification.

c. *Conformance.* (1) The contracting officer must 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 be classified in conformance with the wage determination. Conformance of an additional classification and wage rate and fringe benefits is appropriate 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 used 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) The conformance process may not be used to split, subdivide, or otherwise avoid application of classifications listed in the wage determination.

(3) 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 will be sent by the contracting officer by email to [DBAconformance@dol.gov](mailto:DBAconformance@dol.gov). 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.

(4) 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 will, by email to [DBAconformance@dol.gov](mailto:DBAconformance@dol.gov), refer the questions, including the views of all interested parties and the recommendation of the contracting officer, to the Administrator for determination. The 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.

(5) The contracting officer must promptly notify the contractor of the action taken by the Wage and Hour Division

under paragraphs 1.c.(3) and (4) of this section. The contractor must furnish a written copy of such determination to each affected worker or it must be posted as a part of the wage determination. The wage rate (including fringe benefits where appropriate) determined pursuant to paragraph 1.c.(3) or (4) of this section must 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.

d. *Fringe benefits not expressed as an hourly rate.* 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 may either pay the benefit as stated in the wage determination or may pay another bona fide fringe benefit or an hourly cash equivalent thereof.

e. *Unfunded plans.* 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, in accordance with the criteria set forth in § 5.28, 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.

f. *Interest.* In the event of a failure to pay all or part of the wages required by the contract, the contractor will be required to pay interest on any underpayment of wages.

## 2. Withholding (29 CFR 5.5)

a. *Withholding requirements.* The contracting agency may, upon its own action, or must, upon written request of an authorized representative of the Department of Labor, withhold or cause to be withheld from the contractor so much of the accrued payments or advances as may be considered necessary to satisfy the liabilities of the prime contractor or any subcontractor for the full amount of wages and monetary relief, including interest, required by the clauses set forth in this section for violations of this contract, or to satisfy any such liabilities required by any other Federal contract, or federally assisted contract subject to Davis-Bacon labor standards, that is held by the same prime contractor (as defined in § 5.2). The necessary funds may be withheld from the contractor under this contract, any other Federal contract with the same prime contractor, or any other federally assisted contract that is subject to Davis-Bacon labor standards requirements and is held by the same prime contractor, regardless of whether the other contract was awarded or assisted by the same agency, and such funds may be used to satisfy the contractor liability for which the funds were withheld. In the event of a contractor's failure to pay any laborer or mechanic, including any apprentice or helper working on the site of the work all or part of the wages required by the contract, or upon the contractor's failure to submit the required records as discussed in paragraph 3.d. of this section, the contracting agency may on its own initiative and 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.

b. *Priority to withheld funds.* The Department has priority to funds withheld or to be withheld in accordance with paragraph

2.a. of this section or Section V, paragraph 3.a., or both, over claims to those funds by:

- (1) A contractor's surety(ies), including without limitation performance bond sureties and payment bond sureties;
- (2) A contracting agency for its procurement costs;
- (3) A trustee(s) (either a court-appointed trustee or a U.S. trustee, or both) in bankruptcy of a contractor, or a contractor's bankruptcy estate;
- (4) A contractor's assignee(s);
- (5) A contractor's successor(s); or
- (6) A claim asserted under the Prompt Payment Act, [31 U.S.C. 3901–3907](#).

### 3. Records and certified payrolls (29 CFR 5.5)

a. *Basic record requirements (1) Length of record retention.* All regular payrolls and other basic records must be maintained by the contractor and any subcontractor during the course of the work and preserved for all laborers and mechanics working at the site of the work (or otherwise working in construction or development of the project under a development statute) for a period of at least 3 years after all the work on the prime contract is completed.

(2) *Information required.* Such records must contain the name; Social Security number; last known address, telephone number, and email address of each such worker; each worker's correct classification(s) of work actually performed; 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 [40 U.S.C. 3141\(2\)\(B\)](#) of the Davis-Bacon Act); daily and weekly number of hours actually worked in total and on each covered contract; deductions made; and actual wages paid.

(3) *Additional records relating to fringe benefits.* Whenever the Secretary of Labor has found under paragraph 1.e. of this section 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 [40 U.S.C. 3141\(2\)\(B\)](#) of the Davis-Bacon Act, the contractor must 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.

(4) *Additional records relating to apprenticeship.* Contractors with apprentices working under approved programs must maintain written evidence of the registration of apprenticeship programs, the registration of the apprentices, and the ratios and wage rates prescribed in the applicable programs.

b. *Certified payroll requirements (1) Frequency and method of submission.* The contractor or subcontractor must submit weekly, for each week in which any DBA- or Related Acts-covered work is performed, certified payrolls to the contracting

agency. The prime contractor is responsible for the submission of all certified payrolls by all subcontractors. A contracting agency or prime contractor may permit or require contractors to submit certified payrolls through an electronic system, as long as the electronic system requires a legally valid electronic signature; the system allows the contractor, the contracting agency, and the Department of Labor to access the certified payrolls upon request for at least 3 years after the work on the prime contract has been completed; and the contracting agency or prime contractor permits other methods of submission in situations where the contractor is unable or limited in its ability to use or access the electronic system.

(2) *Information required.* The certified payrolls submitted must set out accurately and completely all of the information required to be maintained under paragraph 3.a.(2) of this section, except that full Social Security numbers and last known addresses, telephone numbers, and email addresses must not be included on weekly transmittals. Instead, the certified payrolls need only include an individually identifying number for each worker ( e.g., the last four digits of the worker's Social Security number). The required weekly certified payroll information may be submitted using Optional Form WH-347 or in any other format desired. Optional Form WH-347 is available for this purpose from the Wage and Hour Division website at <https://www.dol.gov/sites/dolgov/files/WHD/legacy/files/wh347.pdf> or its successor website. It is not a violation of this section for a prime contractor to require a subcontractor to provide full Social Security numbers and last known addresses, telephone numbers, and email addresses to the prime contractor for its own records, without weekly submission by the subcontractor to the contracting agency.

(3) *Statement of Compliance.* Each certified payroll submitted must be accompanied by a "Statement of Compliance," signed by the contractor or subcontractor, or the contractor's or subcontractor's agent who pays or supervises the payment of the persons working on the contract, and must certify the following:

(i) That the certified payroll for the payroll period contains the information required to be provided under paragraph 3.b. of this section, the appropriate information and basic records are being maintained under paragraph 3.a. of this section, and such information and records are correct and complete;

(ii) That each laborer or mechanic (including each helper and apprentice) working 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 [29 CFR part 3](#); and

(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(s) of work actually performed, as specified in the applicable wage determination incorporated into the contract.

(4) *Use of Optional Form WH-347.* The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH-347 will satisfy the requirement for submission of the "Statement of Compliance" required by paragraph 3.b.(3) of this section.

(5) *Signature.* The signature by the contractor, subcontractor, or the contractor's or subcontractor's agent must be an original handwritten signature or a legally valid electronic signature.

(6) *Falsification.* The falsification of any of the above certifications may subject the contractor or subcontractor to civil or criminal prosecution under [18 U.S.C. 1001](#) and [31 U.S.C. 3729](#).

(7) *Length of certified payroll retention.* The contractor or subcontractor must preserve all certified payrolls during the course of the work and for a period of 3 years after all the work on the prime contract is completed.

c. *Contracts, subcontracts, and related documents.* The contractor or subcontractor must maintain this contract or subcontract and related documents including, without limitation, bids, proposals, amendments, modifications, and extensions. The contractor or subcontractor must preserve these contracts, subcontracts, and related documents during the course of the work and for a period of 3 years after all the work on the prime contract is completed.

d. *Required disclosures and access (1) Required record disclosures and access to workers.* The contractor or subcontractor must make the records required under paragraphs 3.a. through 3.c. of this section, and any other documents that the contracting agency, the State DOT, the FHWA, or the Department of Labor deems necessary to determine compliance with the labor standards provisions of any of the applicable statutes referenced by § 5.1, available for inspection, copying, or transcription by authorized representatives of the contracting agency, the State DOT, the FHWA, or the Department of Labor, and must permit such representatives to interview workers during working hours on the job.

(2) *Sanctions for non-compliance with records and worker access requirements.* If the contractor or subcontractor fails to submit the required records or to make them available, or refuses to permit worker interviews during working hours on the job, the Federal agency may, after written notice to the contractor, sponsor, applicant, owner, or other entity, as the case may be, that maintains such records or that employs such workers, 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, or to permit worker interviews during working hours on the job, may be grounds for debarment action pursuant to § 5.12. In addition, any contractor or other person that fails to submit the required records or make those records available to WHD within the time WHD requests that the records be produced will be precluded from introducing as evidence in an administrative proceeding under [29 CFR part 6](#) any of the required records that were not provided or made available to WHD. WHD will take into consideration a reasonable request from the contractor or person for an extension of the time for submission of records. WHD will determine the reasonableness of the request and may consider, among other things, the location of the records and the volume of production.

(3) *Required information disclosures.* Contractors and subcontractors must maintain the full Social Security number and last known address, telephone number, and email address

of each covered worker, and must provide them upon request to the contracting agency, the State DOT, the FHWA, the contractor, or the Wage and Hour Division of the Department of Labor for purposes of an investigation or other compliance action.

#### 4. Apprentices and equal employment opportunity (29 CFR 5.5)

a. *Apprentices (1) Rate of pay.* Apprentices will be permitted to work at less than the predetermined rate for the work they perform 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 (OA), or with a State Apprenticeship Agency recognized by the OA. A person who is not individually registered in the program, but who has been certified by the OA or a State Apprenticeship Agency (where appropriate) to be eligible for probationary employment as an apprentice, will be permitted to work at less than the predetermined rate for the work they perform in the first 90 days of probationary employment as an apprentice in such a program. In the event the OA or a State Apprenticeship Agency recognized by the OA withdraws approval of an apprenticeship program, the contractor will no longer be permitted to use apprentices at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(2) *Fringe benefits.* Apprentices must 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, fringe benefits must be paid in accordance with that determination.

(3) *Apprenticeship ratio.* The allowable ratio of apprentices to journeyworkers on the job site in any craft classification must not be greater than the ratio permitted to the contractor as to the entire work force under the registered program or the ratio applicable to the locality of the project pursuant to paragraph 4.a.(4) of this section. Any worker listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated in paragraph 4.a.(1) of this section, must 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 this section must be paid not less than the applicable wage rate on the wage determination for the work actually performed.

(4) *Reciprocity of ratios and wage rates.* Where a contractor is performing construction on a project in a locality other than the locality in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyworker's hourly rate) applicable within the locality in which the construction is being performed must be observed. If there is no applicable ratio or wage rate for the locality of the project, the ratio and wage rate specified in the contractor's registered program must be observed.

b. *Equal employment opportunity.* The use of apprentices and journeyworkers under this part must be in conformity with

the equal employment opportunity requirements of Executive Order 11246, as amended, and [29 CFR part 30](#).

c. 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. 23 CFR 230.111(e)(2). 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 journeyworkers 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 as provided in 29 CFR 5.5.

**6. Subcontracts.** The contractor or subcontractor must insert FHWA-1273 in any subcontracts, along with the applicable wage determination(s) and such other clauses or contract modifications as the contracting agency may by appropriate instructions require, and a clause requiring the subcontractors to include these clauses and wage determination(s) in any lower tier subcontracts. The prime contractor is responsible for the compliance by any subcontractor or lower tier subcontractor with all the contract clauses in this section. In the event of any violations of these clauses, the prime contractor and any subcontractor(s) responsible will be liable for any unpaid wages and monetary relief, including interest from the date of the underpayment or loss, due to any workers of lower-tier subcontractors, and may be subject to debarment, as appropriate. 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 as provided in 29 CFR 5.5.

**9. Disputes concerning labor standards.** As provided in 29 CFR 5.5, 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 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 [40 U.S.C. 3144\(b\)](#) or § 5.12(a).

b. No part of this contract shall be subcontracted to any person or firm ineligible for award of a Government contract by virtue of [40 U.S.C. 3144\(b\)](#) or § 5.12(a).

c. The penalty for making false statements is prescribed in the U.S. Code, Title 18 Crimes and Criminal Procedure, [18 U.S.C. 1001](#).

**11. Anti-retaliation.** It is unlawful for any person to discharge, demote, intimidate, threaten, restrain, coerce, blacklist, harass, or in any other manner discriminate against, or to cause any person to discharge, demote, intimidate, threaten, restrain, coerce, blacklist, harass, or in any other manner discriminate against, any worker or job applicant for:

a. Notifying any contractor of any conduct which the worker reasonably believes constitutes a violation of the DBA, Related Acts, this part, or [29 CFR part 1](#) or [3](#);

b. Filing any complaint, initiating or causing to be initiated any proceeding, or otherwise asserting or seeking to assert on behalf of themselves or others any right or protection under the DBA, Related Acts, this part, or [29 CFR part 1](#) or [3](#);

c. Cooperating in any investigation or other compliance action, or testifying in any proceeding under the DBA, Related Acts, this part, or [29 CFR part 1](#) or [3](#); or

d. Informing any other person about their rights under the DBA, Related Acts, this part, or [29 CFR part 1](#) or [3](#).

## V. CONTRACT WORK HOURS AND SAFETY STANDARDS ACT

Pursuant to 29 CFR 5.5(b), 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 watchpersons 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. 29 CFR 5.5.

**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 and interest from the date of the underpayment. 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 watchpersons and guards, employed in violation of the clause set forth in paragraph 1. of this section, in the sum currently provided in 29 CFR 5.5(b)(2)\* 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.

\* \$31 as of January 15, 2023 (See 88 FR 88 FR 2210) as may be adjusted annually by the Department of Labor, pursuant to the Federal Civil Penalties Inflation Adjustment Act of 1990.

### 3. Withholding for unpaid wages and liquidated damages

a. *Withholding process.* The FHWA or the contracting agency may, upon its own action, or must, upon written request of an authorized representative of the Department of Labor, withhold or cause to be withheld from the contractor so much of the accrued payments or advances as may be considered necessary to satisfy the liabilities of the prime contractor or any subcontractor for any unpaid wages; monetary relief, including interest; and liquidated damages required by the clauses set forth in this section on this contract, 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 that is held by the same prime contractor (as defined in § 5.2). The necessary funds may be withheld from the contractor under this contract, any other Federal contract with the same prime contractor, or any other federally assisted contract that is subject to the Contract Work Hours and Safety Standards Act and is held by the same prime contractor, regardless of whether the other contract was awarded or assisted by the same agency, and such funds may be used to satisfy the contractor liability for which the funds were withheld.

b. *Priority to withheld funds.* The Department has priority to funds withheld or to be withheld in accordance with Section IV paragraph 2.a. or paragraph 3.a. of this section, or both, over claims to those funds by:

- (1) A contractor's surety(ies), including without limitation performance bond sureties and payment bond sureties;
- (2) A contracting agency for its procurement costs;
- (3) A trustee(s) (either a court-appointed trustee or a U.S. trustee, or both) in bankruptcy of a contractor, or a contractor's bankruptcy estate;
- (4) A contractor's assignee(s);
- (5) A contractor's successor(s); or
- (6) A claim asserted under the Prompt Payment Act, [31 U.S.C. 3901–3907](#).

**4. Subcontracts.** The contractor or subcontractor must insert in any subcontracts the clauses set forth in paragraphs 1. through 5. of this section and a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor is responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in paragraphs 1. through 5. In the

event of any violations of these clauses, the prime contractor and any subcontractor(s) responsible will be liable for any unpaid wages and monetary relief, including interest from the date of the underpayment or loss, due to any workers of lower-tier subcontractors, and associated liquidated damages and may be subject to debarment, as appropriate.

**5. Anti-retaliation.** It is unlawful for any person to discharge, demote, intimidate, threaten, restrain, coerce, blacklist, harass, or in any other manner discriminate against, or to cause any person to discharge, demote, intimidate, threaten, restrain, coerce, blacklist, harass, or in any other manner discriminate against, any worker or job applicant for:

- a. Notifying any contractor of any conduct which the worker reasonably believes constitutes a violation of the Contract Work Hours and Safety Standards Act (CWHSSA) or its implementing regulations in this part;
- b. Filing any complaint, initiating or causing to be initiated any proceeding, or otherwise asserting or seeking to assert on behalf of themselves or others any right or protection under CWHSSA or this part;
- c. Cooperating in any investigation or other compliance action, or testifying in any proceeding under CWHSSA or this part; or
- d. Informing any other person about their rights under CWHSSA or this part.

### VI. SUBLETTING OR ASSIGNING THE CONTRACT

This provision is applicable to all Federal-aid construction contracts on the National Highway System pursuant to 23 CFR 635.116.

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" in paragraph 1 of Section VI 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: (based on longstanding interpretation)

- (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. 23 CFR 635.102.

2. Pursuant to 23 CFR 635.116(a), 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. Pursuant to 23 CFR 635.116(c), 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. (based on long-standing interpretation of 23 CFR 635.116).

5. The 30-percent self-performance requirement of paragraph (1) is not applicable to design-build contracts; however, contracting agencies may establish their own self-performance requirements. 23 CFR 635.116(d).

## 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 Part 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. 23 CFR 635.108.

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 Part 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). 29 CFR 1926.10.

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 Part 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 11, 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 (42 U.S.C. 7606; 2 CFR 200.88; EO 11738)

This provision is applicable to all Federal-aid construction contracts in excess of \$150,000 and to all related subcontracts. 48 CFR 2.101; 2 CFR 200.327.

By submission of this bid/proposal or the execution of this contract or subcontract, as appropriate, the bidder, proposer, Federal-aid construction contractor, subcontractor, supplier, or vendor agrees to comply with all applicable standards, orders or regulations issued pursuant to the Clean Air Act (42 U.S.C. 7401-7671q) and the Federal Water Pollution Control Act, as amended (33 U.S.C. 1251-1387). Violations must be reported to the Federal Highway Administration and the Regional Office of the Environmental Protection Agency. 2 CFR Part 200, Appendix II.

The contractor agrees to include or cause to be included the requirements of this Section in every subcontract, and further agrees to take such action as the contracting agency may direct as a means of enforcing such requirements. 2 CFR 200.327.

## 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. 2 CFR 180.220 and 1200.220.

### 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. 2 CFR 180.320.

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. 2 CFR 180.325.

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. 2 CFR 180.345 and 180.350.

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, Subpart I, 180.900-180.1020, and 1200. "First Tier Covered Transactions" refers to any covered transaction between a recipient or subrecipient 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 recipient or subrecipient 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. 2 CFR 180.330.

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. 2 CFR 180.220 and 180.300.

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. 2 CFR 180.300; 180.320, and 180.325. A participant is responsible for ensuring that its principals are not suspended, debarred, or otherwise ineligible to participate in covered transactions. 2 CFR 180.335. 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 System for Award Management website (<https://www.sam.gov>). 2 CFR 180.300, 180.320, and 180.325.

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 CFR 180.325.

\* \* \* \* \*

**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 CFR 180.335;

(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, 2 CFR 180.800;

(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, 2 CFR 180.700 and 180.800; 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. 2 CFR 180.335(d).

(5) Are not a corporation that has been convicted of a felony violation under any Federal law within the two-year period preceding this proposal (USDOT Order 4200.6 implementing appropriations act requirements); and

(6) Are not a corporation with any unpaid Federal tax liability that has been assessed, for which all judicial and administrative remedies have been exhausted, or have lapsed, and that is not being paid in a timely manner pursuant to an agreement with the authority responsible for collecting the tax liability (USDOT Order 4200.6 implementing appropriations act requirements).

b. Where the prospective participant is unable to certify to any of the statements in this certification, such prospective participant should attach an explanation to this proposal. 2 CFR 180.335 and 180.340.

\*\*\*\*\*

**3. 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). 2 CFR 180.220 and 1200.220.

a. By signing and submitting this proposal, the prospective lower tier participant 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. 2 CFR 180.365.

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, Subpart I, 180.900 – 180.1020, 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 recipient or subrecipient 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 recipient or subrecipient 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. 2 CFR 1200.220 and 1200.332.

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. 2 CFR 180.220 and 1200.220.

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 System for Award Management website (<https://www.sam.gov/>), which is compiled by the General Services Administration. 2 CFR 180.300, 180.320, 180.330, and 180.335.

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. 2 CFR 180.325.

\* \* \* \* \*

**4. Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion--Lower Tier Participants:**

a. The prospective lower tier participant certifies, by submission of this proposal, that neither it nor its principals:

(1) is presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participating in covered transactions by any Federal department or agency, 2 CFR 180.355;

(2) is a corporation that has been convicted of a felony violation under any Federal law within the two-year period preceding this proposal (USDOT Order 4200.6 implementing appropriations act requirements); and

(3) is a corporation with any unpaid Federal tax liability that has been assessed, for which all judicial and administrative remedies have been exhausted, or have lapsed, and that is not being paid in a timely manner pursuant to an agreement with the authority responsible for collecting the tax liability. (USDOT Order 4200.6 implementing appropriations act requirements)

b. Where the prospective lower tier participant is unable to certify to any of the statements in this certification, such prospective participant should 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 Part 20, App. A.

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.

**XII. USE OF UNITED STATES-FLAG VESSELS:**

This provision is applicable to all Federal-aid construction contracts, design-build contracts, subcontracts, lower-tier subcontracts, purchase orders, lease agreements, or any other covered transaction. 46 CFR Part 381.

This requirement applies to material or equipment that is acquired for a specific Federal-aid highway project. 46 CFR 381.7. It is not applicable to goods or materials that come into inventories independent of an FHWA funded-contract.

When oceanic shipments (or shipments across the Great Lakes) are necessary for materials or equipment acquired for a specific Federal-aid construction project, the bidder, proposer, contractor, subcontractor, or vendor agrees:

1. To utilize privately owned United States-flag commercial vessels to ship at least 50 percent of the gross tonnage (computed separately for dry bulk carriers, dry cargo liners, and tankers) involved, whenever shipping any equipment, material, or commodities pursuant to this contract, to the extent such vessels are available at fair and reasonable rates for United States-flag commercial vessels. 46 CFR 381.7.

2. To furnish within 20 days following the date of loading for shipments originating within the United States or within 30 working days following the date of loading for shipments originating outside the United States, a legible copy of a rated, 'on-board' commercial ocean bill-of-lading in English for each shipment of cargo described in paragraph (b)(1) of this section to both the Contracting Officer (through the prime contractor in the case of subcontractor bills-of-lading) and to the Office of Cargo and Commercial Sealift (MAR-620), Maritime Administration, Washington, DC 20590. (MARAD requires copies of the ocean carrier's (master) bills of lading, certified onboard, dated, with rates and charges. These bills of lading may contain business sensitive information and therefore may be submitted directly to MARAD by the Ocean Transportation Intermediary on behalf of the contractor). 46 CFR 381.7.

**ATTACHMENT A - EMPLOYMENT AND MATERIALS  
PREFERENCE FOR APPALACHIAN DEVELOPMENT  
HIGHWAY SYSTEM OR APPALACHIAN LOCAL ACCESS  
ROAD CONTRACTS (23 CFR 633, Subpart B, Appendix B)**

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.

6. The contractor shall include the provisions of Sections 1 through 4 of this Attachment A in every subcontract for work which is, or reasonably may be, done as on-site work.

DOCUMENT 00811

SPECIAL PROVISIONS  
MONTHLY PRICE ADJUSTMENT FOR HOT MIX ASPHALT (HMA) MIXTURES  
Revised: 02/03/2023

This provision applies to all projects using greater than 100 tons of hot mix asphalt (HMA) mixtures containing liquid asphalt cement as stipulated in the Notice to Contractors section of the bid documents.

Price Adjustments will be based on the variance in price, for the liquid asphalt component only, between the Base Price and the Period Price. They shall not include transportation or other charges. Price Adjustments will occur on a monthly basis.

**Base Price**

The Base Price of liquid asphalt on a project as listed in the Notice to Contractors section of the bid documents is a fixed price determined by the Department at the time of the bid using the same method as the determination of the Period Price detailed below. The Base Price shall be used in all bids.

**Period Price**

The Period Price is the price of liquid asphalt for each monthly period as determined by the Department using the average selling price per standard ton of PG64-28 paving grade (primary binder classification) asphalt, FOB manufacturer's terminal, as listed under the "East Coast Market - New England, Boston, Massachusetts area" section of the Poten & Partners, Inc. "Asphalt Weekly Monitor". This average selling price is listed in the issue having a publication date of the second Friday of the month and will be posted as the Period Price for that month. The Department will post this Period Price on its website at <https://www.mass.gov/service-details/massdot-current-contract-price-adjustments> following its receipt of the relevant issue of the "Asphalt Weekly Monitor". Poten and Partners has granted the Department the right to publish this specific asphalt price information sourced from the Asphalt Weekly Monitor.

**Price Adjustment Determination, Calculation and Payment**

The Contract Price of the HMA mixture will be paid under the respective item in the Contract. Price Adjustments, as herein provided, either upwards or downwards, will be made after the work has been performed using the monthly period price for the month during which the work was performed.

Price Adjustments will be paid only if the variance from the Base Price is 5% or more for a monthly period. The complete adjustment will be paid in all cases with no deduction of the 5% from either upward or downward adjustments.

The Price Adjustment applies only to the actual virgin liquid asphalt content in the mixture placed on the job in accordance with the approved Job Mix Formula.

Price Adjustments will be separate payment items. The pay item numbers are 999.401 for a positive price adjustment (a payment) and 999.402 for a negative price adjustment (a deduction). Price Adjustments will be calculated using the following equation:

Price Adjustment = Tons of HMA Placed X Liquid Asphalt Content % X RAP Factor X (Period Price - Base Price)

No Price Adjustment will be allowed beyond the Completion Date of this Contract, unless there is a Department-approved extension of time.

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DOCUMENT 00812

SPECIAL PROVISIONS  
MONTHLY PRICE ADJUSTMENT FOR DIESEL FUEL AND GASOLINE –  
ENGLISH UNITS  
Revised: 02/01/2021

This monthly fuel price adjustment is inserted in this contract because the national and worldwide energy situation has made the future cost of fuel unpredictable. This adjustment will provide for either additional compensation to the Contractor or repayment to the Commonwealth, depending on an increase or decrease in the average price of diesel fuel or gasoline.

This adjustment will be based on fuel usage factors for various items of work developed by the Highway Research Board in Circular 158, dated July 1974. These factors will be multiplied by the quantities of work done in each item during each monthly period and further multiplied by the variance in price from the Base Price to the Period Price.

The Base Price of Diesel Fuel and Gasoline will be the price as indicated in the Department’s web site <https://www.mass.gov/service-details/massdot-current-contract-price-adjustments> for the month in which the contract was bid, which includes State Tax.

The Period Price will be the average of prices charged to the State, including State Tax for the bulk purchases made during each month.

This adjustment will be effected only if the variance from the Base Price is 5% or more for a monthly period. The complete adjustment will be paid in all cases with no deduction of the 5% from either upward or downward adjustments.

No adjustment will be paid for work done beyond the extended completion date of any contract.

Any adjustment (increase or decrease) to estimated quantities made to each item at the time of final payment will have the fuel price adjustment figured at the average period price for the entire term of the project for the difference of quantity.

The fuel price adjustment will apply only to the following items of work at the fuel factors shown:

ITEMS COVERED	FUEL FACTORS	
	Diesel	Gasoline
Excavation: and Borrow Work: Items 120, 120.1, 121, 123, 124, 125, 127, 129.3, 140, 140.1, 141, 142, 143, 144, 150, 150.1, 151 and 151.1 (Both Factors used)	0.29 Gallons / CY.	0.15 Gallons / CY
Surfacing Work: All Items containing Hot Mix Asphalt	2.90 Gallons / Ton	Does Not Apply

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## DOCUMENT 00813

## SPECIAL PROVISIONS

## PRICE ADJUSTMENTS FOR STRUCTURAL STEEL AND REINFORCING STEEL

June 13, 2024

This special provision applies to all projects containing the use of structural steel and/or reinforcing steel as specified elsewhere in the Contract work. It applies to all structural steel and all reinforcing steel, as defined below, on the project. Compliance with this provision is mandatory, i.e., there are no “opt-in” or “opt-out” clauses. Price adjustments will be handled as described below and shall only apply to unfabricated reinforcing steel bars and unfabricated structural steel material, consisting of rolled shapes, plate steel, sheet piling, pipe piles, steel castings and steel forgings.

Price adjustments will be variances between Base Prices and Period Prices. Base Prices and Period Prices are defined below.

Price adjustments will only be made if the variances between Base Prices and Period Prices are 5% or more. A variance can result in the Period Price being either higher or lower than the Base Price. Once the 5% threshold has been achieved, the adjustment will apply to the full variance between the Base Price and the Period Price.

Price adjustments will be calculated by multiplying the number of pounds of unfabricated structural steel material or unfabricated reinforcing steel bars on a project by the index factor calculated as shown below under Example of a Period Price Calculation.

Price adjustments will *not* include guardrail panels or the costs of shop drawing preparation, handling, fabrication, coatings, transportation, storage, installation, profit, overhead, fuel costs, fuel surcharges, or other such charges not related to the cost of the unfabricated structural steel and unfabricated reinforcing steel.

The weight of steel subject to a price adjustment shall not exceed the final shipping weight of the fabricated part by more than 10%.

Base Prices and Period Prices are defined as follows:

Base Prices of unfabricated structural steel and unfabricated reinforcing steel on a project are fixed prices determined by the Department and found in the table below. While it is the intention of the Department to make this table comprehensive, some of a project’s unfabricated structural steel and/or unfabricated reinforcing steel may be inadvertently omitted. Should this occur, the Contractor shall bring the omission to the Department’s attention so that a contract alteration may be processed that adds the missing steel to the table and its price adjustments to the Contract.

The Base Price Date is the month and year of the most recent finalized period price index at the time that MassDOT opened bids for the project. The Base Price Index for this contract is the Steel PPI listed in the Notice to Contractors.

Period Prices of unfabricated structural steel and unfabricated reinforcing steel on a project are variable prices that have been calculated using the Period Price Date and an index of steel prices to adjust the Base Price.

The Period Price Date is the date the steel was delivered to the fabricator as evidenced by an official bill of lading submitted to the Department containing a description of the shipped materials, weights of the shipped materials and the date of shipment. This date is used to select the Period Price Index.

The index used for the calculation of Period Prices is the U.S. Department of Labor Bureau of Labor Statistics Producer Price Index (PPI) Series ID WPU101702 (Not Seasonally Adjusted, Group: Metals and Metal Products, Item: Semi-finished Steel Mill Products.) As this index is subject to revision for a period of up to four (4) months after its original publication, no price adjustments will be made until the index for the period is finalized, i.e., the index is no longer suffixed with a “(P)”.

Period Prices are determined as follows:

Period Price = Base Price X Index Factor

Index Factor = Period Price Index / Base Price Index

Example of a Period Price Calculation:

Calculate the Period Price for December 2009 using a Base Price from March 2009 of \$0.82/Pound for 1,000 Pounds of ASTM A709 (AASHTO M270) Grade A36 Structural Steel Plate.

The Period Price Date is December 2009. From the PPI website\*, the Period Price Index = 218.0.

The Base Price Date is March 2009. From the PPI website\*, the Base Price Index = 229.4.

Index Factor = Period Price Index / Base Price Index = 218.0 / 229.4 = 0.950

Period Price = Base Price X Index Factor = \$0.82/Pound X 0.950 = \$0.78/Pound

Since \$0.82 - \$0.78 = \$0.04 is less than 5% of \$0.82, no price adjustment is required.

If the \$0.04 difference shown above was greater than 5% of the Base Price, then the price adjustment would be 1,000 Pounds X \$0.04/Pound = \$40.00. Since the Period Price of \$0.78/Pound is less than the Base Price of \$0.82/Pound, indicating a drop in the price of steel between the bid and the delivery of material, a credit of \$40.00 would be owed to MassDOT. When the Period Price is higher than the Base Price, the price adjustment is owed to the Contractor.

\* To access the PPI website and obtain a Base Price Index or a Period Price Index, go to

<http://data.bls.gov/cgi-bin/srgate>

End of example.

The Contractor will be paid for unfabricated structural steel and unfabricated reinforcing steel under the respective contract pay items for all components constructed of either structural steel or reinforced Portland cement concrete under their respective Contract Pay Items.

Price adjustments, as herein provided for, will be paid separately as follows:

Structural Steel

Pay Item Number 999.449 for positive (+) pay adjustments (payments to the Contractor)

Pay Item Number 999.457 for negative (-) pay adjustments (credits to MassDOT Highway Division)

Reinforcing Steel

Pay Item Number 999.466 for positive (+) pay adjustments (payments to the Contractor)

Pay Item Number 999.467 for negative (-) pay adjustments (credits to MassDOT Highway Division)

No price adjustment will be made for price changes after the Contract Completion Date, unless the MassDOT Highway Division has approved an extension of Contract Time for the Contract.

TABLE

Steel Type	Price per Pound	
1	ASTM A615/A615M Grade 60 (AASHTO M31 Grade 60 or 420) Reinforcing Steel	\$0.66
2	ASTM A27 (AASHTO M103) Steel Castings, H-Pile Points & Pipe Pile Shoes (See Note below.)	\$0.91
3	ASTM A668 / A668M (AASHTO M102) Steel Forgings	\$0.91
4	ASTM A108 (AASHTO M169) Steel Forgings for Shear Studs	\$0.94
5	ASTM A709/A709M Grade 36 / AASHTO M270M/M270 Grade 36 or 250 Structural Steel Plate	\$1.01
6	ASTM A709/A709M Grade 36 / AASHTO M270M/M270 Grade 36 or 250 Structural Steel Shapes	\$0.93
7	ASTM A709/A709M Grade 50 / AASHTO M270M/M270 Grade 50 or 345 Structural Steel Plate	\$1.01
8	ASTM A709/A709M Grade 50 / AASHTO M270M/M270 Grade 50 or 345 Structural Steel Shapes	\$0.93
9	ASTM A709/A709M Grade 50WT / AASHTO M270M/M270 Grade 50WT or 345WT Structural Steel Plate	\$1.05
10	ASTM A709/A709M Grade 50WT / AASHTO M270M/M270 Grade 50WT or 345WT Structural Steel Shapes	\$0.94
11	ASTM A709/A709M Grade 50W / AASHTO M270M/M270 Grade 50W 345W Structural Steel Plate	\$1.05
12	ASTM A709/A709M Grade 50W / AASHTO M270M/M270 Grade 50W or 345W Structural Steel Shapes	\$0.94
13	ASTM A709/A709M Grade HPS 50W / AASHTO M270M/M270 Grade HPS 50W or 345W Structural Steel Plate	\$1.10
14	ASTM A709/A709M Grade HPS 70W / AASHTO M270M/M270 Grade HPS 70W or 485W Structural Steel Plate	\$1.17
15	ASTM A514/A514M-05 Grade HPS 100W / AASHTO M270M/M270 Grade HPS 100W or 690W Structural Steel Plate	\$1.79
16	ASTM A992/A992M Grade 50S / AASHTO M270M/M270 Grade 50S or 345S Structural Steel Plate	\$1.05
17	ASTM A992/A992M Grade 50S / AASHTO M270M/M270 Grade 50S or 345S Structural Steel Shapes	\$0.94
18	ASTM A276 Type 316 Stainless Steel	\$5.33
19	ASTM A240 Type 316 Stainless Steel	\$5.33
20	ASTM A148 Grade 80/50 Steel Castings (See Note below.)	\$1.84
21	ASTM A53 Grade B Structural Steel Pipe	\$1.17
22	ASTM A500 Grades A, B, 36 & 50 Structural Steel Pipe	\$1.17
23	ASTM A252, Grades 240 (36 KSI) & 414 (60 KSI) Pipe Pile	\$0.92
24	ASTM 252, Grade 2 Permanent Steel Casing	\$0.92
25	ASTM A36 (AASHTO M183) for H-piles, steel supports and sign supports	\$0.99
26	ASTM A328 / A328M, Grade 50 (AASHTO M202) Steel Sheetpiling	\$1.76
27	ASTM A572 / A572M, Grade 50 Sheetpiling	\$1.76
28	ASTM A36/36M, Grade 50	\$1.01
29	ASTM A570, Grade 50	\$0.99
30	ASTM A572 (AASHTO M223), Grade 50 H-Piles	\$1.01
31	ASTM A1085 Grade A (50 KSI) Steel Hollow Structural Sections (HSS), heat-treated per ASTM A1085 Supplement S1	\$1.17
32	AREA 140 LB Rail and Track Accessories	\$0.60

**NOTE:** Steel Castings are generally used only on moveable bridges. Cast iron frames, grates and pipe are not "steel" castings and will not be considered for price adjustments.

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DOCUMENT 00814

SPECIAL PROVISIONS  
PRICE ADJUSTMENT FOR PORTLAND CEMENT CONCRETE MIXES

January 12, 2009

This provision applies to all projects using greater than 100 Cubic Yards (76 Cubic Meters) of Portland cement concrete containing Portland cement as stipulated in the Notice to Contractors section of the Bid Documents. This Price Adjustment will occur on a monthly basis.

The Price Adjustment will be based on the variance in price for the Portland cement component only from the Base Price to the Period Price. It shall not include transportation or other charges.

The Base Price of Portland cement on a project is a fixed price determined at the time of bid by the Department by using the same method as for the determination of the Period Price (see below) and found in the Notice to Contractors.

The Period Price of Portland cement will be determined by using the latest published price, in dollars per ton (U.S.), for Portland cement (Type I) quoted for Boston, U.S.A. in the **Construction Economics** section of *ENR Engineering News-Record* magazine or at the ENR website <http://www.enr.com> under **Construction Economics**. The Period Price will be posted on the MassDOT website the Wednesday immediately following the publishing of the monthly price in ENR, which is normally the first week of the month.

The Contract Price of the Portland cement concrete mix will be paid under the respective item in the Contract. The price adjustment, as herein provided, upwards or downwards, will be made after the work has been performed, using the monthly period price for the month during which the work was performed.

The price adjustment applies only to the actual Portland cement content in the mix placed on the job in accordance with the Standard Specifications for Highways and Bridges, Division III, Section M4.02.01. No adjustments will be made for any cement replacement materials such as fly ash or ground granulated blast furnace slag.

The Price Adjustment will be a separate payment item. It will be determined by multiplying the number of cubic yards of Portland cement concrete placed during each monthly period times the Portland cement content percentage times the variance in price between the Base Price and Period Price of Portland cement.

This Price Adjustment will be paid only if the variance from the Base Price is 5% or more for a monthly period. The complete adjustment will be paid in all cases with no deduction of the 5% from either upward or downward adjustments.

No Price Adjustment will be allowed beyond the Completion Date of this Contract, unless there is a Department-approved extension of time.

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DOCUMENT 00820

**THE COMMONWEALTH OF MASSACHUSETTS  
SUPPLEMENTAL EQUAL EMPLOYMENT OPPORTUNITY,  
NON-DISCRIMINATION AND AFFIRMATIVE ACTION PROGRAM**

I. Definitions

For purposes of this contract,

"Minority" means a person who meets one or more of the following definitions:

- (a) American Indian or Native American means: all persons having origins in any of the original peoples of North America and who are recognized as an Indian by a tribe or tribal organization.
- (b) Asian means: All persons having origins in any of the original peoples of the Far East, Southeast Asia, the Indian sub-continent, or the Pacific Islands, including, but Not limited to China, Japan, Korea, Samoa, India, and the Philippine Islands.
- (c) Black means: All persons having origins in any of the Black racial groups of Africa, including, but not limited to, African-Americans, and all persons having origins in any of the original peoples of the Cape Verdean Islands.
- (d) Eskimo or Aleut means: All persons having origins in any of the peoples of Northern Canada, Greenland, Alaska, and Eastern Siberia.
- (e) Hispanic means: All persons having their origins in any of the Spanish-speaking peoples of Mexico, Puerto Rico, Cuba, Central or South America, or the Caribbean Islands.

"State construction contract" means a contract for the construction, reconstruction, installation, demolition, maintenance or repair of a building or capital facility, or a contract for the construction, reconstruction, alteration, remodeling or repair of a public work undertaken by a department, agency, board, or commission of the commonwealth.

"State assisted construction contract" means a contract for the construction, reconstruction, installation, demolition, maintenance or repair of a building or capital facility undertaken by a political subdivision of the commonwealth, or two or more political subdivisions thereof, an authority, or other instrumentality and whose costs of the contract are paid for, reimbursed, grant funded, or otherwise supported, in whole or in part, by the commonwealth.

II. Equal Opportunity, Non-Discrimination and Affirmative Action

During the performance of this Contract, the Contractor and all subcontractors (hereinafter collectively referred to as "the Contractor") for a state construction contract or a state assisted construction contract, for him/herself, his/her assignees and successors in interest, agree to comply with all applicable equal employment opportunity, non-discrimination and affirmative action requirements, including but not limited to the following:

In connection with the performance of work under this contract, the Contractor shall not discriminate against any employee or applicant for employment because of race, color, religious creed, national origin, sex, sexual orientation, genetic information, military service, age, ancestry or disability, shall not discriminate in the selection or retention of subcontractors, and shall not discriminate in the procurement of materials and rentals of equipment.

The aforesaid provision shall include, but not be limited to, the following: employment upgrading, demotion, or transfer; recruitment advertising, layoff or termination; rates of pay or other forms of compensation; conditions or privileges of employment; and selection for apprenticeship or on-the-job training opportunity. The Contractor shall comply with the provisions of chapter 151B of the Massachusetts General Laws, as amended, and all other applicable anti-discrimination and equal opportunity laws, all of which are herein incorporated by reference and made a part of this Contract.

The Contractor shall post hereafter in conspicuous places, available for employees and applicants for employment, notices to be provided by the Massachusetts Commission Against Discrimination setting forth the provisions of the Fair Employment Practices Law of the Commonwealth (Massachusetts General Laws Chapter 151 B).

In connection with the performance of work under this contract, the Contractor shall undertake, in good faith, affirmative action measures to eliminate any discriminatory barriers in the terms and conditions of employment on the grounds of race, color, religious creed, national origin, sex, sexual orientation, genetic information, military service, age, ancestry or disability. Such affirmative action measures shall entail positive and aggressive measures to ensure nondiscrimination and to promote equal opportunity in the areas of hiring, upgrading, demotion or transfer, recruitment, layoff or termination, rate of compensation, apprenticeship and on-the-job training programs. A list of positive and aggressive measures shall include, but not be limited to, advertising employment opportunities in minority and other community news media; notifying minority, women and other community-based organizations of employment opportunities; validating all job specifications, selection requirements, and tests; maintaining a file of names and addresses of each worker referred to the Contractor and what action was taken concerning such worker; and notifying the administering agency in writing when a union with whom the Contractor has a collective bargaining agreement has failed to refer a minority or woman worker. These and other affirmative action measures shall include all actions required to guarantee equal employment opportunity for all persons, regardless of race, color, religious creed, national origin, sex, sexual orientation, genetic information, military service, age, ancestry or disability. One purpose of this provision is to ensure to the fullest extent possible an adequate supply of skilled tradesmen for this and future Commonwealth public construction projects.

### III. Minority and Women Workforce Participation

Pursuant to his/her obligations under the preceding section, the Contractor shall strive to achieve on this project the labor participation goals contained herein. Said participation goals shall apply in each job category on this project including but not limited to bricklayers, carpenters, cement masons, electricians, ironworkers, operating engineers and those classes of work enumerated in Section 44F of Chapter 149 of the Massachusetts General Laws. The participation goals for this project shall be 15.3% for minorities and 6.9% for women. The participation goals, as set forth herein, shall not be construed as quotas or set-asides; rather, such participation goals will be used to measure the progress of the Commonwealth's equal opportunity, non-discrimination and affirmative action program. Additionally, the participation goals contained herein should not be seen or treated as a floor or as a ceiling for the employment of particular individuals or group of individuals.



#### IV. Liaison Committee

At the discretion of the agency that administers the contract for the construction project there may be established for the life of the contract a body to be known as the Liaison Committee. The Liaison Committee shall be composed of one representative each from the agency or agencies administering the contract for the construction project, hereinafter called the administering agency, a representative from the Office of Affirmative action, and such other representatives as may be designated by the administering agency. The Contractor (or his/her agent, if any, designated by him/her as the on-site equal employment opportunity officer) shall recognize the Liaison Committee as an affirmative action body, and shall establish a continuing working relationship with the Liaison Committee, consulting with the Liaison Committee on all matters related to minority recruitment, referral, employment and training.

#### V. Reports and Records

The Contractor shall prepare projected workforce tables on a quarterly basis when required by the administering agency. These shall be broken down into projections, by week, of workers required in each trade. Copies shall be furnished one week in advance of the commencement of the period covered, and also, when updated, to the administering agency and the Liaison Committee when required.

The Contractor shall prepare weekly reports in a form approved by the administering agency, unless information required is required to be reported electronically by the administering agency, the number of hours worked in each trade by each employee, identified as woman, minority, or non-minority. Copies of these shall be provided at the end of each such week to the administering agency and the Liaison Committee.

Records of employment referral orders, prepared by the Contractor, shall be made available to the administering agency on request.

The Contractor will provide all information and reports required by the administering agency on instructions issued by the administering agency and will permit access to its facilities and any books, records, accounts and other sources of information which may be determined by the administering agency to effect the employment of personnel. This provision shall apply only to information pertinent to the Commonwealth's supplementary non-discrimination, equal opportunity and access and opportunity contract requirements. Where information required is in the exclusive possession of another who fails or refuses to furnish this information, the Contractor shall so certify to the administering agency and shall set forth what efforts he has made to obtain the information.

#### VI. Access to Work Site

A designee of the administering agency and a designee of the Liaison Committee shall each have a right to access the work site.

#### VII. Solicitations for Subcontracts, and for the Procurement of Materials and Equipment

In all solicitations either by competitive bidding or negotiation made by the Contractor either for work to be performed under a subcontract or for the procurement of materials or equipment, each potential subcontractor or supplier shall be notified in writing by the Contractor of the Contractor's obligations under this contract relative to non-discrimination and equal opportunity.

## VIII. Sanctions

Whenever the administering agency believes the General or Prime Contractor or any subcontractor may not be operating in compliance with the provisions of the Fair Employment Practices Law of the Commonwealth (Massachusetts General Laws Chapter 151B), the administering agency may refer the matter to the Massachusetts Commission Against Discrimination ("Commission") for investigation.

Following the referral of a matter by the administering agency to the Massachusetts Commission Against Discrimination, and while the matter is pending before the MCAD, the administering agency may withhold payments from contractors and subcontractors when it has documentation that the contractor or subcontractor has violated the Fair Employment Practices Law with respect to its activities on the Project, or if the administering agency determines that the contractor has materially failed to comply with its obligations and the requirements of this Section. The amount withheld shall not exceed a withhold of payment to the General or Prime Contractor of 1/100 or 1% of the contract award price or \$5,000, whichever sum is greater, or, if a subcontractor is in non-compliance, a withhold by the administering agency from the General Contractor, to be assessed by the General Contractor as a charge against the subcontractor, of 1/100 or 1% of the subcontractor price, or \$1,000 whichever sum is greater, for each violation of the applicable law or contract requirements. The total withheld from anyone General or Prime Contractor or subcontractor on a Project shall not exceed \$20,000 overall. No withhold of payments or investigation by the Commission or its agent shall be initiated without the administering agency providing prior notice to the Contractor.

If, after investigation, the Massachusetts Commission Against Discrimination finds that a General or Prime Contractor or subcontractor, in commission of a state construction contract or state-assisted construction contract, violated the provisions of the Fair Employment Practices Law, the administering agency may convert the amount withheld as set forth above into a permanent sanction, as a permanent deduct from payments to the General or Prime Contractor or subcontractor, which sanction will be in addition to any such sanctions, fines or penalties imposed by the Massachusetts Commission Against Discrimination.

No sanction enumerated under this Section shall be imposed by the administering agency except after notice to the General or Prime Contractor or subcontractor and an adjudicatory proceeding, as that term is used, under Massachusetts General Laws Chapter 30A, has been conducted.

## IX. Severability

The provisions of this section are severable, and if any of these provisions shall be held unconstitutional by any court of competent jurisdiction, the decision of such court shall not affect or impair any of the remaining provisions.

X. Contractor's Certification

After award and prior to the execution of any contract for a state construction contract or a state assisted construction contract, the Prime or General Contractor shall certify that it will comply with all provisions of this Document 00820 Supplemental Equal Employment Opportunity, Non-Discrimination and Affirmative Action Program, by executing Document 00859 Contractor/Subcontractor Certification Form.

XI. Subcontractor Requirements

Prior to the award of any subcontract for a state construction contract or a state assisted construction contract, the Prime or General Contractor shall provide all prospective subcontractors with a complete copy of this Document 00820 entitled "Supplemental Equal Employment Opportunity, Non-Discrimination and Affirmative Action Program" and will incorporate the provisions of this Document 00820 into any and all contracts or work orders for all subcontractors providing work on the Project. In order to ensure that the said subcontractor's certification becomes a part of all subcontracts under the prime contract, the Prime or General Contractor shall certify in writing to the administering agency that it has complied with the requirements as set forth in the preceding paragraph by executing Document 00859 Contractor/Subcontractor Certification Form.

*Rev'd 03/07/14*

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DOCUMENT 00821

ELECTRONIC REPORTING REQUIREMENTS  
CIVIL RIGHTS PROGRAMS AND CERTIFIED PAYROLL

Implemented on March 2, 2009

Revised June 04, 2019

The Massachusetts Department Of Transportation (MassDOT) has replaced the CHAMP reporting system with Equitable Business Opportunity Solution (EBO), a new web-based civil rights reporting software system. This system is capable of handling both civil rights reporting requirements and certified payrolls. The program's functions include the administration of Equal Employment Opportunity (EEO) requirements, On-The-Job Training requirements (OJT), Disadvantage Business Enterprise (DBE) and/or Minority / Women's Business Enterprise (M/WBE) subcontracting requirements, and the electronic collection of certified payrolls associated with MassDOT projects. In addition, this system is used to generate various data required as part of the American Recovery and Reinvestment Act (ARRA). Contractors are responsible for all coordination with all sub-contractors to ensure timely and accurate electronic submission of all required data.

#### Contractor and Sub-Contractor EBO User Certification

All contractors and sub-contractors must use the EBO software system. The software vendor, Internet Government Solutions (IGS), has developed an online EBO Training Module that is available to contractors and sub-contractors. This module is a self-tutorial which allows all users in the company to access the training, complete the tutorial, and become certified as EBO users for a one time fee of \$75.00. This is the only cost to contractors and sub-contractors associated with the EBO software system. The online EBO Training Module can be accessed at [www.ebotraining.com](http://www.ebotraining.com). Click the "Register My Company" button on the login page to begin your training registration. Questions regarding EBO online training should be directed to Gerry Anguilano, IGS at (440) 238-1684.

MassDOT will track contractors and sub-contractors who have successfully completed the on-line training module. All persons performing civil rights program and/or certified payroll functions should be EBO certified.

#### Vetting of Firms and Designated Firm Individuals

Contractors must authorize a Primary Log-In ID Holder who has completed EBO on-line training to have access to the EBO system by completing and submitting the "Request For EBO System Log-In/Password Form" located on the MassDOT website at: <https://www.mass.gov/how-to/how-to-get-an-ebo-login>. Contractors must also agree to comply with the EBO system user agreement located on the MassDOT website.

All subcontracts entered into on a project must include language that identifies the submission and training requirements that the sub-contractor must perform. Sub-contractors will be approved by the respective District Office of MassDOT through the existing approval process. When new sub-contractors, who have not previously worked for MassDOT, are initially selected by a general contractor, the new sub-contractor must be approved by the District before taking the EBO on-line training module.

#### Interim Reporting Requirements

Until MassDOT is satisfied that the EBO system is fully operational and functioning as designed, contractors and sub-contractors will be required to submit certified payrolls manually. There will be a transition period where dual reporting, through manual and electronic submission, will be required. MassDOT, however, will notify contractors and sub-contractors when they may cease manual submission of certified payrolls.

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DOCUMENT 00859

**CONTRACTOR/SUBCONTRACTOR CERTIFICATION FORM ‡**

*The contractor shall submit this completed document 00859 to MassDOT for each subcontract.*

\_\_\_\_\_ (Contractor) Date: \_\_\_\_\_

\_\_\_\_\_ (Subcontractor)  District Approved Subcontractor

Contract No: 126697 Project No. 608433 Federal Aid No.: HSI/STP/CMQ-0033(039)X

Location: WEBSTER

Project Description: Intersection Improvements at I-395 Ramps (Exit 3) at Route 16 (East Main Street) and Sutton Road

**PART 1 CONTRACTOR CERTIFICATION:** I hereby certify, as an authorized official of this company, that to the best of my knowledge, information and belief, the company is in compliance with all applicable federal and state laws, rules, and regulations governing fair labor and employment practices, that the company will not discriminate in their employment practices, that the company will make good faith efforts to comply with the minority employee and women employee workforce participation ratio goals and specific affirmative action steps contained in Contract Document 00820 The Commonwealth of Massachusetts Supplemental Equal Employment Opportunity, Non-Discrimination and Affirmative Action Program, and that the company will comply with the special provisions and documentation indicated below (as checked).

I further hereby certify, as an authorized official of this company, that the special provisions and documentation indicated below (as checked) have been or are included in, and made part of, the Subcontractor Agreement entered into with the firm named above.

**This is not a Federally-aided construction project**

**Document #**

- 00718 –Participation By Minority Or Women's Business Enterprises and SDVOBE†
- 00761 –Certification Regarding Debarment, Suspension, Ineligibility, and Voluntary Exclusion
- 00820 – MA Supplemental Equal Employment Opportunity, Non-Discrimination, and Affirmative Action Program
- 00821 – Electronic Reporting Requirements, Civil Rights Programs, and Certified Payroll
- 00859 – Contractor/Subcontractor Certification Form (this document)
- 00860 – MA Employment Laws
- 00861 – Applicable State Wage Rates in the Contract Proposal\*\*
- B00842 – MA Schedule of Participation By Minority or Women Business Enterprises (M/WBEs)†
- B00843 – MA Letter of Intent – M/WBEs†
  - \*\* Does not apply to Material Suppliers, unless performing work on-site
  - † Applies only if Subcontractor is a M/WBE; only include these forms for the particular M/WBE Entity
- B00844 - Schedule of Participation By SDVOBE
- B00845 - Letter of Intent – SDVOBE
- B00846 – M/WBE or SDVOBE Joint Check Arrangement Approval Form
- B00847 – Joint Venture Affidavit

**This is a Federally-aided construction project (Federal Aid Number is present)**

**Document #**

- 00719 – Special Provisions for Participation by Disadvantaged Business Enterprises†
- 00760 - Form FHWA 1273 - Required Contract Provisions for Federal-Aid Construction Contracts
- 00820 – MA Supplemental Equal Employment Opportunity, Non-Discrimination and Affirmative Action Program
- 00821 – Electronic Reporting Requirements, Civil Rights Programs and Certified Payroll
- 00859 – Contractor/Subcontractor Certification Form (this document)
- 00860 – MA Employment Laws
- 00870 – Standard Federal Equal Employment Opportunity Construction Contract Specifications Executive Order 11246, (41 CFR Parts 60-4.2 and 60-4.3 (Solicitations and Equal Opportunity Clauses)\*
- 00875 – Federal Trainee Special Provisions



- B00853 – Schedule of Participation by Disadvantaged Business Enterprise†
- B00854 – Letter of Intent – DBEs†
- B00855 – DBE Joint Check Arrangement Approval Form
- B00856 – Joint Venture Affidavit
- 00861/00880 - Applicable state and federal wage rates from Contract Proposal\*\*

\*Applicable only to Contracts or Subcontracts in excess of \$10,000

\*\*Does not apply to Material Suppliers, unless performing work on-site

† Applies only if Subcontractor is a DBE; only include these forms for the particular DBE Entity

Signed this \_\_\_\_\_ Day of \_\_\_\_\_, 20\_\_\_\_ Under The Pains And Penalties Of Perjury.

(Print Name and Title)

(Authorized Signature)

**PART 2**

**PART 2. SUBCONTRACTOR CERTIFICATION:** I hereby certify, as an authorized official of this company, that the required documents in Part 1 above were physically incorporated in our Agreement/Subcontract with the Contractor and give assurance that this company will fully comply or make every good faith effort to comply with the same. I further certify that:

1. This company recognizes that if this is a Federal-Aid Project, then this Contract is covered by the equal employment opportunity laws administered and enforced by the United States Department of Labor (“USDOL”), Office of Federal Contract Compliance Programs (“OFCCP”). By signing below, we acknowledge that this company has certain reporting obligations to the OFCCP, as specified by 41 CFR Part 60-4.2.
2. This company further acknowledges that any contractor with fifty (50) or more employees on a Federal-aid Contract with a value of fifty-thousand (\$50,000) dollars or more must annually file an EEO-1 Report (SF 100) to the EEOC, Joint Reporting Committee, on or before September 30th, each year, as specified by 41 CFR Part 60-1.7a.
3. For more information regarding the federal reporting requirements, please contact the USDOL, OFCCP Regional Office, at 1-646-264-3170 or EEO-1, Joint Reporting Committee at 1-866-286-6440. You may also find guidance at: <http://www.dol.gov/ofccp/TAGuides/consttag.pdf> or <http://www.wdol.gov/dba.aspx#0>.
4. This company  has,  has not, participated in a previous contract or subcontract subject to the Equal Opportunity clauses set forth in 41 CFR Part 60-4 and Executive Order 11246, and where required, has filed with the Joint Reporting Committee, the Director of the Office of Federal Contract Compliance Programs or the EEO Commission all reports due under the applicable filing requirements.
5. This company is in full compliance with applicable Federal and Commonwealth of Massachusetts laws, rules, and regulations and is not currently debarred or disqualified from bidding on or participating in construction contracts in any jurisdiction of the United States. See : <https://www.mass.gov/service-details/contractors-and-vendors-suspended-or-debarred-by-massdot>
6. This company is properly registered and in good standing with the Office of the Secretary of the Commonwealth.

Signed this \_\_\_\_\_ Day of \_\_\_\_\_, 20\_\_\_\_, Under The Pains And Penalties Of Perjury.

Firm: \_\_\_\_\_

Address: \_\_\_\_\_

(Print Name and Title)

Telephone Number: \_\_\_\_\_

Federal I.D. Number: \_\_\_\_\_

(Authorized Signature)

Estimated Start Date: \_\_\_\_\_

Estimated Completion Date: \_\_\_\_\_

Estimated Dollar Amount: \_\_\_\_\_

(Date)



DOCUMENT 00860

**COMMONWEALTH OF MASSACHUSETTS PUBLIC EMPLOYMENT LAWS**

Revised February 20, 2019

The Contractor's attention is directed to Massachusetts General Laws, Chapter 149, Sections 26 through 27H, and 150A. This contract is considered to fall within the ambit of that law, which provides that in general, the Prevailing Rate or Total Rate must be paid to employees working on projects funded by the Commonwealth of Massachusetts or any political subdivision including Massachusetts Department of Transportation (MassDOT).

A Federal Aid project is also subject to the Federal Minimum Wage Rate law for construction. When comparing a state minimum wage rate, monitored by the Massachusetts Attorney General, versus federal minimum wage rate, monitored by the U.S. Department of Labor Wage and Hour Division, for a particular job classification the higher wage is at all times to be paid to the affected employee.

Every contractor or subcontractor engaged in this contract to which sections twenty-seven and twenty-seven A apply will keep a true and accurate record of all mechanics and apprentices, teamsters, chauffeurs and laborers employed thereon, showing the name, address and occupational classification of each such employee on this contract, and the hours worked by, and the wages paid to, each such employee, and shall furnish to the MassDOT's Resident Engineer, on a weekly basis, a copy of said record, in a form approved by MassDOT and in accordance with M.G.L. c. 149, § 27B, signed by the employer or his/her authorized agent under the penalties of perjury.

Each such contractor or subcontractor shall preserve its payroll records for a period of three years from the date of completion of the contract.

The Prevailing Wage Rate generally includes the following:

Minimum Hourly Wage + Employer Contributions to Benefit Plans = Prevailing Wage Rate or Total Rate

Any employer who does not make contributions to Benefit Plans must pay the total Prevailing Wage Rate directly to the employee.

Any deduction from the Prevailing Wage Rate or Total Rate for contributions to benefit plans can only be for a Health & Welfare, Pension, or Supplementary Unemployment plan meeting the requirements of the Employee Retirement Income Security Act (ERISA) of 1974. The maximum allowable deduction for these benefits from the prevailing wage rate cannot be greater than the amount allowed by Executive Office of Labor (EOL) for the specified benefits. Any additional expense of providing benefits to the employees is to be borne by the employer and cannot be deducted from the Minimum Hourly Wage. If the employer's benefit expense is less than that so provided by EOL the difference will be paid directly to the employee. The rate established must be paid to all employees who perform work on the project.

When an employer makes deductions from the Minimum Hourly Wage for an employee's contribution to social security, state taxes, federal taxes, and/or other contribution programs, allowed by law, the employer shall furnish each employee a suitable pay slip, check stub or envelope notifying the employee of the amount of the deductions.

No contractor or subcontractor contracting for any part of the contract week shall require or permit any laborer or mechanic to be employed on such work in excess of forty hours in any workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times his basic rate of pay for all hours worked in excess of forty hours in such workweek, whichever is the greater number of overtime hours.

Apprentice Rates are permitted only when there is an Apprentice Agreement registered with the Massachusetts Division of Apprentice Training in accordance with M.G.L. c. 23, § 11E-11L.

The Prevailing Wage Rates issued for each project shall be the rates paid for the entire project. The Prevailing Wage Rates must be posted on the job site at all times and be visible from a public way.

In addition, each such contractor and subcontractor shall furnish to the MassDOT's Resident Engineer, within fifteen days after completion of its portion of the work, a statement, executed by the contractor or subcontractor or by any authorized officer or employee of the contractor or subcontractor who supervises the payment of wages, in the following form:

STATEMENT OF COMPLIANCE

Date: \_\_\_\_\_

I, \_\_\_\_\_ do hereby state:  
(Name of signatory party) (Title)

That I pay or supervise the payment of the persons employed by:

\_\_\_\_\_  
(Contractor or Subcontractor)

on the \_\_\_\_\_  
(MassDOT Project Location and Contract Number)

and that all mechanics and apprentices, teamsters, chauffeurs and laborers employed on said project have been paid in accordance with wages determined under the provisions of sections twenty-six and twenty-seven of chapter one hundred and forty-nine of the General Laws.

Signature \_\_\_\_\_

Title \_\_\_\_\_

The above-mentioned copies of payroll records and statements of compliance shall be available for inspection by any interested party filing a written request to the MassDOT's Resident Engineer for such inspection and copying.

Massachusetts General Laws c. 149, §27, requires annual updates to prevailing wage schedules for all public construction contracts lasting longer than one year. MassDOT will request the required updates and furnish them to the Contractor. The Contractor is required to pay no less than the wage rates indicated on the annual updated wage schedules.

MassDOT will request the updates no later that two week before the anniversary of the Notice to Proceed date of the contract to allow for adequate processing by the Department of Labor Standards (DLS). The effective date for the new rates will be the anniversary date of the contract (i.e. the notice to proceed date), regardless of the date of issuance on the schedule from DLS.

All bidders are cautioned that the aforementioned laws require that employers pay to covered employees no less than the applicable minimum wages. In addition, the same laws require that the applicable prevailing wages become incorporated as part of this contract. The prevailing minimum wage law establishes serious civil and criminal penalties for violations, including imprisonment and exclusion from future public contracts. Bidders are cautioned to carefully read the relevant sections of the Massachusetts General Laws.

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DOCUMENT 00861

# **STATE PREVAILING WAGE RATES**

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MAURA HEALEY  
Governor

KIM DRISCOLL  
Lt. Governor

THE COMMONWEALTH OF MASSACHUSETTS  
EXECUTIVE OFFICE OF LABOR AND WORKFORCE DEVELOPMENT  
DEPARTMENT OF LABOR STANDARDS

**Prevailing Wage Rates**

As determined by the Director under the provisions of the  
Massachusetts General Laws, Chapter 149, Sections 26 to 27H

LAUREN JONES  
Secretary

MICHAEL FLANAGAN  
Director

**Awarding Authority:** MassDOT Highway  
**Contract Number:** 126697 **City/Town:** WEBSTER  
**Description of Work:** WEBSTER: Federal Aid Project No. HSI/STP/CMQ-0033(039)X Intersection Improvements at I-395 Ramps (Exit 3) at Route 16 (East Main Street) and Sutton Road  
**Job Location:** -395 (Exit 3) at Route 16 (East Main St)

**Information about Prevailing Wage Schedules for Awarding Authorities and Contractors**

- **The wage rates will remain in effect for the duration of the project, except in the case of multi-year public construction projects. For construction projects lasting longer than one year, awarding authorities must request an updated wage schedule no later than two weeks before the anniversary of the date the contract was executed by the awarding authority and the general contractor.** For multi-year CM AT RISK projects, the awarding authority must request an annual update no later than two weeks before the anniversary date, determined as the earlier of: (a) the execution date of the GMP Amendment, or (b) the execution date of the first amendment to permit procurement of construction services. The annual update requirement is not applicable to 27F "rental of equipment" contracts. **The updated wage schedule must be provided to all contractors, including general and sub-contractors, working on the construction project.**
- This wage schedule applies only to the specific project referenced at the top of this page and uniquely identified by the "Wage Request Number" on all pages of this schedule.
- An Awarding Authority must request an updated wage schedule if it has not opened bids or selected a contractor within 90 days of the date of issuance of the wage schedule. For CM AT RISK projects (bid pursuant to G.L. c.149A), the earlier of: (a) the execution date of the GMP Amendment, or (b) the bid for the first construction scope of work must be within 90-days of the wage schedule issuance date.
- The wage schedule shall be incorporated in any advertisement or call for bids for the project as required by M.G.L. c. 149, § 27. The wage schedule shall be made a part of the contract awarded for the project. The wage schedule must be posted in a conspicuous place at the work site for the life of the project in accordance with M.G.L. c. 149 § 27. The wages listed on the wage schedule must be paid to employees performing construction work on the project whether they are employed by the prime contractor, a filed sub-bidder, or a sub-contractor.
- Apprentices working on the project are required to be registered with the Massachusetts Division of Apprentice Standards (DAS). Apprentices must keep their apprentice identification card on their persons during all work hours on the project. An apprentice registered with DAS may be paid the lower apprentice wage rate at the applicable step as provided on the prevailing wage schedule. **Any apprentice not registered with DAS regardless of whether they are registered with another federal, state, local, or private agency must be paid the journeyworker's rate.**
- Every contractor or subcontractor working on the construction project must submit weekly payroll reports and a Statement of Compliance directly to the awarding authority by mail or email and keep them on file for three years. Each weekly payroll report must contain: the employee's name, address, occupational classification, hours worked, and wages paid. Do not submit weekly payroll reports to DLS. For a sample payroll reporting form go to <http://www.mass.gov/dols/pw>.
- Contractors with questions about the wage rates or classifications included on the wage schedule have an affirmative obligation to inquire with DLS at (617) 626-6953.
- Contractors must obtain the wage schedules from awarding authorities. Failure of a contractor or subcontractor to pay the prevailing wage rates listed on the wage schedule to all employees who perform construction work on the project is a violation of the law and subjects the contractor or subcontractor to civil and criminal penalties.
- Employees not receiving the prevailing wage rate set forth on the wage schedule may file a complaint with the Fair Labor Division of the office of the Attorney General at (617) 727-3465.

**Issue Date:** 07/08/2024

**Wage Request Number:** 20240705-043

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
<b>Construction</b>						
(2 AXLE) DRIVER - EQUIPMENT <i>TEAMSTERS JOINT COUNCIL NO. 10 ZONE B</i>	06/01/2024	\$39.95	\$15.07	\$18.67	\$0.00	\$73.69
	12/01/2024	\$39.95	\$15.07	\$20.17	\$0.00	\$75.19
	01/01/2025	\$39.95	\$15.57	\$20.17	\$0.00	\$75.69
	06/01/2025	\$40.95	\$15.57	\$20.17	\$0.00	\$76.69
	12/01/2025	\$40.95	\$15.57	\$21.78	\$0.00	\$78.30
	01/01/2026	\$40.95	\$16.17	\$21.78	\$0.00	\$78.90
	06/01/2026	\$41.95	\$16.17	\$21.78	\$0.00	\$79.90
	12/01/2026	\$41.95	\$16.17	\$23.52	\$0.00	\$81.64
	01/01/2027	\$41.95	\$16.77	\$23.52	\$0.00	\$82.24
(3 AXLE) DRIVER - EQUIPMENT <i>TEAMSTERS JOINT COUNCIL NO. 10 ZONE B</i>	06/01/2024	\$40.02	\$15.07	\$18.67	\$0.00	\$73.76
	12/01/2024	\$40.02	\$15.07	\$20.17	\$0.00	\$75.26
	01/01/2025	\$40.02	\$15.57	\$20.17	\$0.00	\$75.76
	06/01/2025	\$41.02	\$15.57	\$20.17	\$0.00	\$76.76
	12/01/2025	\$41.02	\$15.57	\$21.78	\$0.00	\$78.37
	01/01/2026	\$41.02	\$16.17	\$21.78	\$0.00	\$78.97
	06/01/2026	\$42.02	\$16.17	\$21.78	\$0.00	\$79.97
	12/01/2026	\$42.02	\$16.17	\$23.52	\$0.00	\$81.71
	01/01/2027	\$42.02	\$16.77	\$23.52	\$0.00	\$82.31
(4 & 5 AXLE) DRIVER - EQUIPMENT <i>TEAMSTERS JOINT COUNCIL NO. 10 ZONE B</i>	06/01/2024	\$40.14	\$15.07	\$18.67	\$0.00	\$73.88
	12/01/2024	\$40.14	\$15.07	\$20.17	\$0.00	\$75.38
	01/01/2025	\$40.14	\$15.57	\$20.17	\$0.00	\$75.88
	06/01/2025	\$41.14	\$15.57	\$20.17	\$0.00	\$76.88
	12/01/2025	\$41.14	\$15.57	\$21.78	\$0.00	\$78.49
	01/01/2026	\$41.14	\$16.17	\$21.78	\$0.00	\$79.09
	06/01/2026	\$42.14	\$16.17	\$21.78	\$0.00	\$80.09
	12/01/2026	\$42.14	\$16.17	\$23.52	\$0.00	\$81.83
	01/01/2027	\$42.14	\$16.77	\$23.52	\$0.00	\$82.43
ADS/SUBMERSIBLE PILOT <i>PILE DRIVER LOCAL 56 (ZONE 2)</i>	08/01/2020	\$103.05	\$9.40	\$23.12	\$0.00	\$135.57
For apprentice rates see "Apprentice- PILE DRIVER"						
AIR TRACK OPERATOR <i>LABORERS - ZONE 2</i>	12/01/2023	\$38.61	\$9.65	\$17.14	\$0.00	\$65.40
For apprentice rates see "Apprentice- LABORER"						
AIR TRACK OPERATOR (HEAVY & HIGHWAY) <i>LABORERS - ZONE 2 (HEAVY &amp; HIGHWAY)</i>	06/01/2024	\$39.28	\$9.65	\$17.80	\$0.00	\$66.73
	12/01/2024	\$40.61	\$9.65	\$17.80	\$0.00	\$68.06
	06/01/2025	\$42.00	\$9.65	\$17.80	\$0.00	\$69.45
	12/01/2025	\$43.38	\$9.65	\$17.80	\$0.00	\$70.83
	06/01/2026	\$44.82	\$9.65	\$17.80	\$0.00	\$72.27
	12/01/2026	\$46.26	\$9.65	\$17.80	\$0.00	\$73.71
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"						
ASBESTOS WORKER (PIPES & TANKS) <i>HEAT &amp; FROST INSULATORS LOCAL 6 (WORCESTER)</i>	06/01/2024	\$41.80	\$14.50	\$11.05	\$0.00	\$67.35
	12/01/2024	\$42.80	\$14.50	\$11.05	\$0.00	\$68.35
	06/01/2025	\$43.80	\$14.50	\$11.05	\$0.00	\$69.35
	12/01/2025	\$44.80	\$14.50	\$11.05	\$0.00	\$70.35

Proposal No. 608433 - 126697

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
ASPHALT RAKER <i>LABORERS - ZONE 2</i>	12/01/2023	\$38.11	\$9.65	\$17.14	\$0.00	\$64.90
For apprentice rates see "Apprentice- LABORER"						
ASPHALT RAKER (HEAVY & HIGHWAY) <i>LABORERS - ZONE 2 (HEAVY &amp; HIGHWAY)</i>	06/01/2024	\$38.78	\$9.65	\$17.80	\$0.00	\$66.23
	12/01/2024	\$40.11	\$9.65	\$17.80	\$0.00	\$67.56
	06/01/2025	\$41.50	\$9.65	\$17.80	\$0.00	\$68.95
	12/01/2025	\$42.88	\$9.65	\$17.80	\$0.00	\$70.33
	06/01/2026	\$44.32	\$9.65	\$17.80	\$0.00	\$71.77
	12/01/2026	\$45.76	\$9.65	\$17.80	\$0.00	\$73.21
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"						
ASPHALT/CONCRETE/CRUSHER PLANT-ON SITE <i>OPERATING ENGINEERS LOCAL 4</i>	06/01/2024	\$56.03	\$15.30	\$16.40	\$0.00	\$87.73
	12/01/2024	\$57.48	\$15.30	\$16.40	\$0.00	\$89.18
	06/01/2025	\$58.78	\$15.30	\$16.40	\$0.00	\$90.48
	12/01/2025	\$60.23	\$15.30	\$16.40	\$0.00	\$91.93
	06/01/2026	\$61.53	\$15.30	\$16.40	\$0.00	\$93.23
	12/01/2026	\$62.98	\$15.30	\$16.40	\$0.00	\$94.68
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
BACKHOE/FRONT-END LOADER <i>OPERATING ENGINEERS LOCAL 4</i>	06/01/2024	\$56.03	\$15.30	\$16.40	\$0.00	\$87.73
	12/01/2024	\$57.48	\$15.30	\$16.40	\$0.00	\$89.18
	06/01/2025	\$58.78	\$15.30	\$16.40	\$0.00	\$90.48
	12/01/2025	\$60.23	\$15.30	\$16.40	\$0.00	\$91.93
	06/01/2026	\$61.53	\$15.30	\$16.40	\$0.00	\$93.23
	12/01/2026	\$62.98	\$15.30	\$16.40	\$0.00	\$94.68
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
BARCO-TYPE JUMPING TAMPER <i>LABORERS - ZONE 2</i>	12/01/2023	\$38.11	\$9.65	\$17.14	\$0.00	\$64.90
For apprentice rates see "Apprentice- LABORER"						
BLOCK PAVER, RAMMER / CURB SETTER <i>LABORERS - ZONE 2</i>	12/01/2023	\$38.61	\$9.65	\$17.14	\$0.00	\$65.40
For apprentice rates see "Apprentice- LABORER"						
BLOCK PAVER, RAMMER / CURB SETTER (HEAVY & HIGHWAY) <i>LABORERS - ZONE 2 (HEAVY &amp; HIGHWAY)</i>	06/01/2024	\$39.28	\$9.65	\$17.80	\$0.00	\$66.73
	12/01/2024	\$40.61	\$9.65	\$17.80	\$0.00	\$68.06
	06/01/2025	\$42.00	\$9.65	\$17.80	\$0.00	\$69.45
	12/01/2025	\$43.38	\$9.65	\$17.80	\$0.00	\$70.83
	06/01/2026	\$44.82	\$9.65	\$17.80	\$0.00	\$72.27
	12/01/2026	\$46.26	\$9.65	\$17.80	\$0.00	\$73.71
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"						
BOILER MAKER <i>BOILERMAKERS LOCAL 29</i>	01/01/2024	\$48.12	\$7.07	\$20.60	\$0.00	\$75.79

**Classification**

**Effective Date    Base Wage    Health    Pension    Supplemental Unemployment    Total Rate**

**Apprentice - BOILERMAKER - Local 29**

**Effective Date - 01/01/2024**

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	65	\$31.28	\$7.07	\$13.22	\$0.00	\$51.57
2	65	\$31.28	\$7.07	\$13.22	\$0.00	\$51.57
3	70	\$33.68	\$7.07	\$14.23	\$0.00	\$54.98
4	75	\$36.09	\$7.07	\$15.24	\$0.00	\$58.40
5	80	\$38.50	\$7.07	\$16.25	\$0.00	\$61.82
6	85	\$40.90	\$7.07	\$17.28	\$0.00	\$65.25
7	90	\$43.31	\$7.07	\$18.28	\$0.00	\$68.66
8	95	\$45.71	\$7.07	\$19.32	\$0.00	\$72.10

**Notes:**

**Apprentice to Journeyworker Ratio:1:4**

BRICK/STONE/ARTIFICIAL MASONRY (INCL. MASONRY WATERPROOFING)	02/01/2024	\$60.26	\$11.49	\$22.90	\$0.00	\$94.65
BRICKLAYERS LOCAL 3 (WORCESTER)	08/01/2024	\$62.36	\$11.49	\$22.90	\$0.00	\$96.75
	02/01/2025	\$63.66	\$11.49	\$22.90	\$0.00	\$98.05
	08/01/2025	\$65.81	\$11.49	\$22.90	\$0.00	\$100.20
	02/01/2026	\$67.16	\$11.49	\$22.90	\$0.00	\$101.55
	08/01/2026	\$69.36	\$11.49	\$22.90	\$0.00	\$103.75
	02/01/2027	\$70.76	\$11.49	\$22.90	\$0.00	\$105.15



<b>Classification</b>	<b>Effective Date</b>	<b>Base Wage</b>	<b>Health</b>	<b>Pension</b>	<b>Supplemental Unemployment</b>	<b>Total Rate</b>
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**Apprentice - BRICK/PLASTER/CEMENT MASON - Local 3 Worcester**

**Effective Date - 02/01/2024**

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$30.13	\$11.49	\$22.90	\$0.00	\$64.52
2	60	\$36.16	\$11.49	\$22.90	\$0.00	\$70.55
3	70	\$42.18	\$11.49	\$22.90	\$0.00	\$76.57
4	80	\$48.21	\$11.49	\$22.90	\$0.00	\$82.60
5	90	\$54.23	\$11.49	\$22.90	\$0.00	\$88.62

**Effective Date - 08/01/2024**

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$31.18	\$11.49	\$22.90	\$0.00	\$65.57
2	60	\$37.42	\$11.49	\$22.90	\$0.00	\$71.81
3	70	\$43.65	\$11.49	\$22.90	\$0.00	\$78.04
4	80	\$49.89	\$11.49	\$22.90	\$0.00	\$84.28
5	90	\$56.12	\$11.49	\$22.90	\$0.00	\$90.51

**Notes:**

**Apprentice to Journeyworker Ratio:1:5**

<b>BULLDOZER/GRADER/SCRAPER</b> <i>OPERATING ENGINEERS LOCAL 4</i>	06/01/2024	\$55.41	\$15.30	\$16.40	\$0.00	\$87.11
	12/01/2024	\$56.85	\$15.30	\$16.40	\$0.00	\$88.55
	06/01/2025	\$58.13	\$15.30	\$16.40	\$0.00	\$89.83
	12/01/2025	\$59.57	\$15.30	\$16.40	\$0.00	\$91.27
	06/01/2026	\$60.85	\$15.30	\$16.40	\$0.00	\$92.55
	12/01/2026	\$62.29	\$15.30	\$16.40	\$0.00	\$93.99

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

<b>CAISSON &amp; UNDERPINNING BOTTOM MAN</b> <i>LABORERS - FOUNDATION AND MARINE</i>	06/01/2024	\$46.63	\$9.65	\$18.22	\$0.00	\$74.50
	12/01/2024	\$48.10	\$9.65	\$18.22	\$0.00	\$75.97
	06/01/2025	\$49.60	\$9.65	\$18.22	\$0.00	\$77.47
	12/01/2025	\$51.10	\$9.65	\$18.22	\$0.00	\$78.97
	06/01/2026	\$52.65	\$9.65	\$18.22	\$0.00	\$80.52
	12/01/2026	\$54.15	\$9.65	\$18.22	\$0.00	\$82.02

For apprentice rates see "Apprentice- LABORER"

<b>CAISSON &amp; UNDERPINNING LABORER</b> <i>LABORERS - FOUNDATION AND MARINE</i>	06/01/2024	\$45.48	\$9.65	\$18.22	\$0.00	\$73.35
	12/01/2024	\$46.95	\$9.65	\$18.22	\$0.00	\$74.82
	06/01/2025	\$48.45	\$9.65	\$18.22	\$0.00	\$76.32
	12/01/2025	\$49.95	\$9.65	\$18.22	\$0.00	\$77.82
	06/01/2026	\$51.50	\$9.65	\$18.22	\$0.00	\$79.37
	12/01/2026	\$53.00	\$9.65	\$18.22	\$0.00	\$80.87

For apprentice rates see "Apprentice- LABORER"

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
CAISSON & UNDERPINNING TOP MAN <i>LABORERS - FOUNDATION AND MARINE</i>	06/01/2024	\$45.81	\$9.65	\$18.22	\$0.00	\$73.68
	12/01/2024	\$47.28	\$9.65	\$18.22	\$0.00	\$75.15
	06/01/2025	\$48.78	\$9.65	\$18.22	\$0.00	\$76.65
	12/01/2025	\$50.28	\$9.65	\$18.22	\$0.00	\$78.15
	06/01/2026	\$51.83	\$9.65	\$18.22	\$0.00	\$79.70
	12/01/2026	\$53.33	\$9.65	\$18.22	\$0.00	\$81.20
For apprentice rates see "Apprentice- LABORER"						

CARBIDE CORE DRILL OPERATOR <i>LABORERS - ZONE 2</i>	12/01/2023	\$38.11	\$9.65	\$17.14	\$0.00	\$64.90
For apprentice rates see "Apprentice- LABORER"						

CARPENTER <i>CARPENTERS -ZONE 2 (Eastern Massachusetts)</i>	03/01/2024	\$47.12	\$9.83	\$19.97	\$0.00	\$76.92
	09/01/2024	\$48.37	\$9.83	\$19.97	\$0.00	\$78.17
	03/01/2025	\$49.62	\$9.83	\$19.97	\$0.00	\$79.42
	09/01/2025	\$50.87	\$9.83	\$19.97	\$0.00	\$80.67
	03/01/2026	\$52.12	\$9.83	\$19.97	\$0.00	\$81.92
	09/01/2026	\$53.37	\$9.83	\$19.97	\$0.00	\$83.17
	03/01/2027	\$54.62	\$9.83	\$19.97	\$0.00	\$84.42

**Apprentice - CARPENTER - Zone 2 Eastern MA**

**Effective Date - 03/01/2024**

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	45	\$21.20	\$9.83	\$1.73	\$0.00	\$32.76
2	45	\$21.20	\$9.83	\$1.73	\$0.00	\$32.76
3	55	\$25.92	\$9.83	\$3.40	\$0.00	\$39.15
4	55	\$25.92	\$9.83	\$3.40	\$0.00	\$39.15
5	70	\$32.98	\$9.83	\$16.51	\$0.00	\$59.32
6	70	\$32.98	\$9.83	\$16.51	\$0.00	\$59.32
7	80	\$37.70	\$9.83	\$18.24	\$0.00	\$65.77
8	80	\$37.70	\$9.83	\$18.24	\$0.00	\$65.77

**Effective Date - 09/01/2024**

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	45	\$21.77	\$9.83	\$1.73	\$0.00	\$33.33
2	45	\$21.77	\$9.83	\$1.73	\$0.00	\$33.33
3	55	\$26.60	\$9.83	\$3.40	\$0.00	\$39.83
4	55	\$26.60	\$9.83	\$3.40	\$0.00	\$39.83
5	70	\$33.86	\$9.83	\$16.51	\$0.00	\$60.20
6	70	\$33.86	\$9.83	\$16.51	\$0.00	\$60.20
7	80	\$38.70	\$9.83	\$18.24	\$0.00	\$66.77
8	80	\$38.70	\$9.83	\$18.24	\$0.00	\$66.77

**Notes:**

**Apprentice to Journeyworker Ratio:1:5**

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
CARPENTER WOOD FRAME	10/01/2023	\$25.55	\$7.02	\$4.80	\$0.00	\$37.37
<i>CARPENTERS-ZONE 3 (Wood Frame)</i>	10/01/2024	\$26.65	\$7.02	\$4.80	\$0.00	\$38.47
	10/01/2025	\$27.75	\$7.02	\$4.80	\$0.00	\$39.57
	10/01/2026	\$28.85	\$7.02	\$4.80	\$0.00	\$40.67

All Aspects of New Wood Frame Work

**Apprentice - CARPENTER (Wood Frame) - Zone 3**

**Effective Date - 10/01/2023**

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	\$15.33	\$7.02	\$0.00	\$0.00	\$22.35
2	60	\$15.33	\$7.02	\$0.00	\$0.00	\$22.35
3	65	\$16.61	\$7.02	\$1.00	\$0.00	\$24.63
4	70	\$17.89	\$7.02	\$1.00	\$0.00	\$25.91
5	75	\$19.16	\$7.02	\$4.80	\$0.00	\$30.98
6	80	\$20.44	\$7.02	\$4.80	\$0.00	\$32.26
7	85	\$21.72	\$7.02	\$4.80	\$0.00	\$33.54
8	90	\$23.00	\$7.02	\$4.80	\$0.00	\$34.82

**Effective Date - 10/01/2024**

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	\$15.99	\$7.02	\$0.00	\$0.00	\$23.01
2	60	\$15.99	\$7.02	\$0.00	\$0.00	\$23.01
3	65	\$17.32	\$7.02	\$1.00	\$0.00	\$25.34
4	70	\$18.66	\$7.02	\$1.00	\$0.00	\$26.68
5	75	\$19.99	\$7.02	\$4.80	\$0.00	\$31.81
6	80	\$21.32	\$7.02	\$4.80	\$0.00	\$33.14
7	85	\$22.65	\$7.02	\$4.80	\$0.00	\$34.47
8	90	\$23.99	\$7.02	\$4.80	\$0.00	\$35.81

**Notes:**

% Indentured After 10/1/17; 45/45/55/55/70/70/80/80  
 Step 1&2 \$18.52/ 3&4 \$21.07/ 5&6 \$28.70/ 7&8 \$31.26

**Apprentice to Journeyworker Ratio:1:5**

CEMENT MASONRY/PLASTERING	01/01/2024	\$49.33	\$13.00	\$23.57	\$1.30	\$87.20
<i>BRICKLAYERS LOCAL 3 (WORCESTER)</i>						

<b>Classification</b>	<b>Effective Date</b>	<b>Base Wage</b>	<b>Health</b>	<b>Pension</b>	<b>Supplemental Unemployment</b>	<b>Total Rate</b>
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**Apprentice - CEMENT MASONRY/PLASTERING - Worcester**

**Effective Date - 01/01/2024**

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$24.67	\$13.00	\$15.93	\$0.00	\$53.60
2	60	\$29.60	\$13.00	\$18.57	\$1.30	\$62.47
3	65	\$32.06	\$13.00	\$19.57	\$1.30	\$65.93
4	70	\$34.53	\$13.00	\$20.57	\$1.30	\$69.40
5	75	\$37.00	\$13.00	\$21.57	\$1.30	\$72.87
6	80	\$39.46	\$13.00	\$22.57	\$1.30	\$76.33
7	90	\$44.40	\$13.00	\$23.57	\$1.30	\$82.27

**Notes:**

Steps 3,4 are 500 hrs. All other steps are 1,000 hrs.

**Apprentice to Journeyworker Ratio:1:3**

CHAIN SAW OPERATOR <i>LABORERS - ZONE 2</i>	12/01/2023	\$38.11	\$9.65	\$17.14	\$0.00	\$64.90
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For apprentice rates see "Apprentice- LABORER"

CLAM SHELLS/SLURRY BUCKETS/HEADING MACHINES <i>OPERATING ENGINEERS LOCAL 4</i>	06/01/2024	\$57.15	\$15.30	\$16.40	\$0.00	\$88.85
	12/01/2024	\$58.63	\$15.30	\$16.40	\$0.00	\$90.33
	06/01/2025	\$59.96	\$15.30	\$16.40	\$0.00	\$91.66
	12/01/2025	\$61.43	\$15.30	\$16.40	\$0.00	\$93.13
	06/01/2026	\$62.76	\$15.30	\$16.40	\$0.00	\$94.46
	12/01/2026	\$64.24	\$15.30	\$16.40	\$0.00	\$95.94

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

COMPRESSOR OPERATOR <i>OPERATING ENGINEERS LOCAL 4</i>	06/01/2024	\$36.17	\$15.30	\$16.40	\$0.00	\$67.87
	12/01/2024	\$37.12	\$15.30	\$16.40	\$0.00	\$68.82
	06/01/2025	\$37.97	\$15.30	\$16.40	\$0.00	\$69.67
	12/01/2025	\$38.92	\$15.30	\$16.40	\$0.00	\$70.62
	06/01/2026	\$39.78	\$15.30	\$16.40	\$0.00	\$71.48
	12/01/2026	\$40.73	\$15.30	\$16.40	\$0.00	\$72.43

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

DELEADER (BRIDGE) <i>PAINTERS LOCAL 35 - ZONE 2</i>	07/01/2024	\$57.26	\$9.95	\$23.95	\$0.00	\$91.16
	01/01/2025	\$58.46	\$9.95	\$23.95	\$0.00	\$92.36

<b>Classification</b>	<b>Effective Date</b>	<b>Base Wage</b>	<b>Health</b>	<b>Pension</b>	<b>Supplemental Unemployment</b>	<b>Total Rate</b>
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**Apprentice - PAINTER Local 35 - BRIDGES/TANKS**

**Effective Date - 07/01/2024**

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$28.63	\$9.95	\$0.00	\$0.00	\$38.58
2	55	\$31.49	\$9.95	\$6.66	\$0.00	\$48.10
3	60	\$34.36	\$9.95	\$7.26	\$0.00	\$51.57
4	65	\$37.22	\$9.95	\$7.87	\$0.00	\$55.04
5	70	\$40.08	\$9.95	\$20.32	\$0.00	\$70.35
6	75	\$42.95	\$9.95	\$20.93	\$0.00	\$73.83
7	80	\$45.81	\$9.95	\$21.53	\$0.00	\$77.29
8	90	\$51.53	\$9.95	\$22.74	\$0.00	\$84.22

**Effective Date - 01/01/2025**

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$29.23	\$9.95	\$0.00	\$0.00	\$39.18
2	55	\$32.15	\$9.95	\$6.66	\$0.00	\$48.76
3	60	\$35.08	\$9.95	\$7.26	\$0.00	\$52.29
4	65	\$38.00	\$9.95	\$7.87	\$0.00	\$55.82
5	70	\$40.92	\$9.95	\$20.32	\$0.00	\$71.19
6	75	\$43.85	\$9.95	\$20.93	\$0.00	\$74.73
7	80	\$46.77	\$9.95	\$21.53	\$0.00	\$78.25
8	90	\$52.61	\$9.95	\$22.74	\$0.00	\$85.30

**Notes:**

Steps are 750 hrs.

**Apprentice to Journeyworker Ratio:1:1**

DEMO: ADZEMAN LABORERS - ZONE 2	12/01/2023	\$44.48	\$9.65	\$18.07	\$0.00	\$72.20
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For apprentice rates see "Apprentice- LABORER"

DEMO: BACKHOE/LOADER/HAMMER OPERATOR LABORERS - ZONE 2	12/01/2023	\$45.48	\$9.65	\$18.07	\$0.00	\$73.20
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For apprentice rates see "Apprentice- LABORER"

DEMO: BURNERS LABORERS - ZONE 2	12/01/2023	\$45.23	\$9.65	\$18.07	\$0.00	\$72.95
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For apprentice rates see "Apprentice- LABORER"

DEMO: CONCRETE CUTTER/SAWYER LABORERS - ZONE 2	12/01/2023	\$45.48	\$9.65	\$18.07	\$0.00	\$73.20
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For apprentice rates see "Apprentice- LABORER"

DEMO: JACKHAMMER OPERATOR LABORERS - ZONE 2	12/01/2023	\$45.23	\$9.65	\$18.07	\$0.00	\$72.95
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For apprentice rates see "Apprentice- LABORER"

DEMO: WRECKING LABORER LABORERS - ZONE 2	12/01/2023	\$44.48	\$9.65	\$18.07	\$0.00	\$72.20
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For apprentice rates see "Apprentice- LABORER"

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
DIRECTIONAL DRILL MACHINE OPERATOR <i>OPERATING ENGINEERS LOCAL 4</i>	06/01/2024	\$55.41	\$15.30	\$16.40	\$0.00	\$87.11
	12/01/2024	\$56.85	\$15.30	\$16.40	\$0.00	\$88.55
	06/01/2025	\$58.13	\$15.30	\$16.40	\$0.00	\$89.83
	12/01/2025	\$59.57	\$15.30	\$16.40	\$0.00	\$91.27
	06/01/2026	\$60.85	\$15.30	\$16.40	\$0.00	\$92.55
	12/01/2026	\$62.29	\$15.30	\$16.40	\$0.00	\$93.99
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
DIVER <i>PILE DRIVER LOCAL 56 (ZONE 2)</i>	08/01/2020	\$68.70	\$9.40	\$23.12	\$0.00	\$101.22
For apprentice rates see "Apprentice- PILE DRIVER"						
DIVER TENDER <i>PILE DRIVER LOCAL 56 (ZONE 2)</i>	08/01/2020	\$49.07	\$9.40	\$23.12	\$0.00	\$81.59
For apprentice rates see "Apprentice- PILE DRIVER"						
DIVER TENDER (EFFLUENT) <i>PILE DRIVER LOCAL 56 (ZONE 2)</i>	08/01/2020	\$73.60	\$9.40	\$23.12	\$0.00	\$106.12
For apprentice rates see "Apprentice- PILE DRIVER"						
DIVER/SLURRY (EFFLUENT) <i>PILE DRIVER LOCAL 56 (ZONE 2)</i>	08/01/2020	\$103.05	\$9.40	\$23.12	\$0.00	\$135.57
For apprentice rates see "Apprentice- PILE DRIVER"						
DRAWBRIDGE OPERATOR (Construction) <i>DRAWBRIDGE - SEIU LOCAL 888</i>	07/01/2020	\$26.77	\$6.67	\$3.93	\$0.16	\$37.53
ELECTRICIAN <i>ELECTRICIANS LOCAL 96</i>	09/03/2023	\$45.99	\$13.00	\$18.84	\$0.00	\$77.83
	09/01/2024	\$47.05	\$13.99	\$19.22	\$0.00	\$80.26
	09/07/2025	\$48.16	\$14.98	\$19.60	\$0.00	\$82.74
	09/06/2026	\$49.38	\$15.96	\$20.00	\$0.00	\$85.34

**Classification**

**Effective Date    Base Wage    Health    Pension    Supplemental Unemployment    Total Rate**

**Apprentice - ELECTRICIAN - Local 96**

**Effective Date - 09/03/2023**

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	\$18.40	\$13.00	\$0.55	\$0.00	\$31.95
2	45	\$20.70	\$13.00	\$0.62	\$0.00	\$34.32
3	48	\$22.08	\$13.00	\$15.49	\$0.00	\$50.57
4	55	\$25.29	\$13.00	\$15.94	\$0.00	\$54.23
5	65	\$29.89	\$13.00	\$16.59	\$0.00	\$59.48
6	80	\$36.79	\$13.00	\$17.55	\$0.00	\$67.34

**Effective Date - 09/01/2024**

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	\$18.82	\$13.99	\$0.56	\$0.00	\$33.37
2	45	\$21.17	\$13.99	\$0.64	\$0.00	\$35.80
3	48	\$22.58	\$13.99	\$15.79	\$0.00	\$52.36
4	55	\$25.88	\$13.99	\$16.26	\$0.00	\$56.13
5	65	\$30.58	\$13.99	\$16.91	\$0.00	\$61.48
6	80	\$37.64	\$13.99	\$17.90	\$0.00	\$69.53

**Notes:**

Steps 1-2 are 1000 hrs; Steps 3-6 are 1500 hrs.

**Apprentice to Journeyworker Ratio:2:3\*\*\***

ELEVATOR CONSTRUCTOR	01/01/2024	\$61.98	\$16.18	\$20.96	\$0.00	\$99.12
ELEVATOR CONSTRUCTORS LOCAL 41	01/01/2025	\$62.83	\$16.28	\$21.36	\$0.00	\$100.47
	01/01/2026	\$63.68	\$16.38	\$21.76	\$0.00	\$101.82
	01/01/2027	\$64.53	\$16.48	\$22.16	\$0.00	\$103.17

Classification

Effective Date Base Wage Health Pension Supplemental Unemployment Total Rate

Apprentice - ELEVATOR CONSTRUCTOR - Local 41

Effective Date - 01/01/2024

Table with 7 columns: Step, percent, Apprentice Base Wage, Health, Pension, Supplemental Unemployment, Total Rate. Rows for steps 1-5 with percentages 50, 55, 65, 70, 80.

Effective Date - 01/01/2025

Table with 7 columns: Step, percent, Apprentice Base Wage, Health, Pension, Supplemental Unemployment, Total Rate. Rows for steps 1-5 with percentages 50, 55, 65, 70, 80.

Notes:

Steps 1-2 are 6 mos.; Steps 3-5 are 1 year

Apprentice to Journeyworker Ratio:1:1

Table listing rates for ELEVATOR CONSTRUCTOR HELPER from 01/01/2024 to 01/01/2027.

For apprentice rates see "Apprentice - ELEVATOR CONSTRUCTOR"

Table listing rates for FENCE & GUARD RAIL ERECTOR (HEAVY & HIGHWAY) from 06/01/2024 to 12/01/2026.

For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"

Table listing rates for FIELD ENG.INST.PERSON-BLDG,SITE,HVY/HWY from 05/01/2024 to 05/01/2027.

For apprentice rates see "Apprentice- OPERATING ENGINEERS"



Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
FIELD ENG.PARTY CHIEF-BLDG,SITE,HVY/HWY <i>OPERATING ENGINEERS LOCAL 4</i>	05/01/2024	\$52.37	\$15.00	\$16.40	\$0.00	\$83.77
	11/01/2024	\$53.67	\$15.00	\$16.40	\$0.00	\$85.07
	05/01/2025	\$55.12	\$15.00	\$16.40	\$0.00	\$86.52
	11/01/2025	\$56.42	\$15.00	\$16.40	\$0.00	\$87.82
	05/01/2026	\$57.87	\$15.00	\$16.40	\$0.00	\$89.27
	11/01/2026	\$59.17	\$15.00	\$16.40	\$0.00	\$90.57
	05/01/2027	\$60.62	\$15.00	\$16.40	\$0.00	\$92.02
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
FIELD ENG.ROD PERSON-BLDG,SITE,HVY/HWY <i>OPERATING ENGINEERS LOCAL 4</i>	05/01/2024	\$24.91	\$15.00	\$16.40	\$0.00	\$56.31
	11/01/2024	\$25.67	\$15.00	\$16.40	\$0.00	\$57.07
	05/01/2025	\$26.52	\$15.00	\$16.40	\$0.00	\$57.92
	11/01/2025	\$27.28	\$15.00	\$16.40	\$0.00	\$58.68
	05/01/2026	\$28.13	\$15.00	\$16.40	\$0.00	\$59.53
	11/01/2026	\$28.89	\$15.00	\$16.40	\$0.00	\$60.29
	05/01/2027	\$29.74	\$15.00	\$16.40	\$0.00	\$61.14
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
FIRE ALARM INSTALLER <i>ELECTRICIANS LOCAL 96</i>	09/03/2023	\$45.99	\$13.00	\$18.84	\$0.00	\$77.83
	09/01/2024	\$47.05	\$13.99	\$19.22	\$0.00	\$80.26
	09/07/2025	\$48.16	\$14.98	\$19.60	\$0.00	\$82.74
	09/06/2026	\$49.38	\$15.96	\$20.00	\$0.00	\$85.34
For apprentice rates see "Apprentice- ELECTRICIAN"						
FIRE ALARM REPAIR / MAINT/COMMISSIONING <i>ELECTRICIANS LOCAL 96</i>	09/03/2023	\$45.99	\$13.00	\$18.84	\$0.00	\$77.83
	09/01/2024	\$47.05	\$13.99	\$19.22	\$0.00	\$80.26
	09/07/2025	\$48.16	\$14.98	\$19.60	\$0.00	\$82.74
	09/06/2026	\$49.38	\$15.96	\$20.00	\$0.00	\$85.34
For apprentice rates see "Apprentice- ELECTRICIAN"						
FIREMAN (ASST. ENGINEER) <i>OPERATING ENGINEERS LOCAL 4</i>	06/01/2024	\$45.23	\$15.30	\$16.40	\$0.00	\$76.93
	12/01/2024	\$46.41	\$15.30	\$16.40	\$0.00	\$78.11
	06/01/2025	\$47.47	\$15.30	\$16.40	\$0.00	\$79.17
	12/01/2025	\$48.64	\$15.30	\$16.40	\$0.00	\$80.34
	06/01/2026	\$49.70	\$15.30	\$16.40	\$0.00	\$81.40
	12/01/2026	\$50.88	\$15.30	\$16.40	\$0.00	\$82.58
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
FLAGGER & SIGNALER (HEAVY & HIGHWAY) <i>LABORERS - ZONE 2 (HEAVY &amp; HIGHWAY)</i>	06/01/2024	\$27.01	\$9.65	\$17.80	\$0.00	\$54.46
	12/01/2024	\$27.01	\$9.65	\$17.80	\$0.00	\$54.46
	06/01/2025	\$28.09	\$9.65	\$17.80	\$0.00	\$55.54
	12/01/2025	\$28.09	\$9.65	\$17.80	\$0.00	\$55.54
	06/01/2026	\$29.21	\$9.65	\$17.80	\$0.00	\$56.66
	12/01/2026	\$29.21	\$9.65	\$17.80	\$0.00	\$56.66
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"						
FLOORCOVERER <i>FLOORCOVERERS LOCAL 2168 ZONE II</i>	03/01/2024	\$49.47	\$8.83	\$20.27	\$0.00	\$78.57

<b>Classification</b>	<b>Effective Date</b>	<b>Base Wage</b>	<b>Health</b>	<b>Pension</b>	<b>Supplemental Unemployment</b>	<b>Total Rate</b>
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**Apprentice - FLOORCOVERER - Local 2168 Zone II**

**Effective Date - 03/01/2024**

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$24.74	\$8.83	\$1.76	\$0.00	\$35.33
2	55	\$27.21	\$8.83	\$1.76	\$0.00	\$37.80
3	60	\$29.68	\$8.83	\$3.52	\$0.00	\$42.03
4	65	\$32.16	\$8.83	\$3.52	\$0.00	\$44.51
5	70	\$34.63	\$8.83	\$16.75	\$0.00	\$60.21
6	75	\$37.10	\$8.83	\$16.75	\$0.00	\$62.68
7	80	\$39.58	\$8.83	\$18.51	\$0.00	\$66.92
8	85	\$42.05	\$8.83	\$18.51	\$0.00	\$69.39

**Notes:** Steps are 750 hrs.  
 % After 10/1/17; 45/45/55/55/70/70/80/80 (1500hr Steps)  
 Step 1&2 \$32.63/ 3&4 \$39.28/ 5&6 \$59.86/ 7&8 \$66.52

**Apprentice to Journeyworker Ratio:1:1**

<b>FORK LIFT/CHERRY PICKER</b> <i>OPERATING ENGINEERS LOCAL 4</i>	06/01/2024	\$56.03	\$15.30	\$16.40	\$0.00	\$87.73
	12/01/2024	\$57.48	\$15.30	\$16.40	\$0.00	\$89.18
	06/01/2025	\$58.78	\$15.30	\$16.40	\$0.00	\$90.48
	12/01/2025	\$60.23	\$15.30	\$16.40	\$0.00	\$91.93
	06/01/2026	\$61.53	\$15.30	\$16.40	\$0.00	\$93.23
	12/01/2026	\$62.98	\$15.30	\$16.40	\$0.00	\$94.68

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

<b>GENERATOR/LIGHTING PLANT/HEATERS</b> <i>OPERATING ENGINEERS LOCAL 4</i>	06/01/2024	\$36.17	\$15.30	\$16.40	\$0.00	\$67.87
	12/01/2024	\$37.12	\$15.30	\$16.40	\$0.00	\$68.82
	06/01/2025	\$37.97	\$15.30	\$16.40	\$0.00	\$69.67
	12/01/2025	\$38.92	\$15.30	\$16.40	\$0.00	\$70.62
	06/01/2026	\$39.78	\$15.30	\$16.40	\$0.00	\$71.48
	12/01/2026	\$40.73	\$15.30	\$16.40	\$0.00	\$72.43

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

<b>GLAZIER (GLASS PLANK/AIR BARRIER/INTERIOR SYSTEMS)</b> <i>GLAZIERS LOCAL 35 (ZONE 2)</i>	07/01/2024	\$46.76	\$9.95	\$23.95	\$0.00	\$80.66
	01/01/2025	\$47.96	\$9.95	\$23.95	\$0.00	\$81.86

**Classification**

**Effective Date    Base Wage    Health    Pension    Supplemental Unemployment    Total Rate**

**Apprentice - GLAZIER - Local 35 Zone 2**

**Effective Date - 07/01/2024**

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$23.38	\$9.95	\$0.00	\$0.00	\$33.33
2	55	\$25.72	\$9.95	\$6.66	\$0.00	\$42.33
3	60	\$28.06	\$9.95	\$7.26	\$0.00	\$45.27
4	65	\$30.39	\$9.95	\$7.87	\$0.00	\$48.21
5	70	\$32.73	\$9.95	\$20.32	\$0.00	\$63.00
6	75	\$35.07	\$9.95	\$20.93	\$0.00	\$65.95
7	80	\$37.41	\$9.95	\$21.53	\$0.00	\$68.89
8	90	\$42.08	\$9.95	\$22.74	\$0.00	\$74.77

**Effective Date - 01/01/2025**

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$23.98	\$9.95	\$0.00	\$0.00	\$33.93
2	55	\$26.38	\$9.95	\$6.66	\$0.00	\$42.99
3	60	\$28.78	\$9.95	\$7.26	\$0.00	\$45.99
4	65	\$31.17	\$9.95	\$7.87	\$0.00	\$48.99
5	70	\$33.57	\$9.95	\$20.32	\$0.00	\$63.84
6	75	\$35.97	\$9.95	\$20.93	\$0.00	\$66.85
7	80	\$38.37	\$9.95	\$21.53	\$0.00	\$69.85
8	90	\$43.16	\$9.95	\$22.74	\$0.00	\$75.85

**Notes:**

Steps are 750 hrs.

**Apprentice to Journeyworker Ratio:1:1**

HOISTING ENGINEER/CRANES/GRADALLS	06/01/2024	\$56.03	\$15.30	\$16.40	\$0.00	\$87.73
OPERATING ENGINEERS LOCAL 4	12/01/2024	\$57.48	\$15.30	\$16.40	\$0.00	\$89.18
	06/01/2025	\$58.78	\$15.30	\$16.40	\$0.00	\$90.48
	12/01/2025	\$60.23	\$15.30	\$16.40	\$0.00	\$91.93
	06/01/2026	\$61.53	\$15.30	\$16.40	\$0.00	\$93.23
	12/01/2026	\$62.98	\$15.30	\$16.40	\$0.00	\$94.68

**Classification** **Effective Date** **Base Wage** **Health** **Pension** **Supplemental Unemployment** **Total Rate**

**Apprentice - OPERATING ENGINEERS - Local 4**

**Effective Date - 06/01/2024**

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	55	\$30.82	\$15.30	\$0.00	\$0.00	\$46.12
2	60	\$33.62	\$15.30	\$16.40	\$0.00	\$65.32
3	65	\$36.42	\$15.30	\$16.40	\$0.00	\$68.12
4	70	\$39.22	\$15.30	\$16.40	\$0.00	\$70.92
5	75	\$42.02	\$15.30	\$16.40	\$0.00	\$73.72
6	80	\$44.82	\$15.30	\$16.40	\$0.00	\$76.52
7	85	\$47.63	\$15.30	\$16.40	\$0.00	\$79.33
8	90	\$50.43	\$15.30	\$16.40	\$0.00	\$82.13

**Effective Date - 12/01/2024**

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	55	\$31.61	\$0.00	\$0.00	\$0.00	\$31.61
2	60	\$34.49	\$15.30	\$16.40	\$0.00	\$66.19
3	65	\$37.36	\$15.30	\$16.40	\$0.00	\$69.06
4	70	\$40.24	\$15.30	\$16.40	\$0.00	\$71.94
5	75	\$43.11	\$15.30	\$16.40	\$0.00	\$74.81
6	80	\$45.98	\$15.30	\$16.40	\$0.00	\$77.68
7	85	\$48.86	\$15.30	\$16.40	\$0.00	\$80.56
8	90	\$51.73	\$15.30	\$16.40	\$0.00	\$83.43

**Notes:**

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**Apprentice to Journeyworker Ratio:1:6**

HVAC (DUCTWORK) <i>SHEETMETAL WORKERS LOCAL 63</i>	07/01/2024	\$40.98	\$12.20	\$18.74	\$2.13	\$74.05
	01/01/2025	\$42.23	\$12.20	\$18.74	\$2.13	\$75.30

For apprentice rates see "Apprentice- SHEET METAL WORKER"

HVAC (ELECTRICAL CONTROLS) <i>ELECTRICIANS LOCAL 96</i>	09/03/2023	\$45.99	\$13.00	\$18.84	\$0.00	\$77.83
	09/01/2024	\$47.05	\$13.99	\$19.22	\$0.00	\$80.26
	09/07/2025	\$48.16	\$14.98	\$19.60	\$0.00	\$82.74
	09/06/2026	\$49.38	\$15.96	\$20.00	\$0.00	\$85.34

For apprentice rates see "Apprentice- ELECTRICIAN"

HVAC (TESTING AND BALANCING - AIR) <i>SHEETMETAL WORKERS LOCAL 63</i>	07/01/2024	\$40.98	\$12.20	\$18.74	\$2.13	\$74.05
	01/01/2025	\$42.23	\$12.20	\$18.74	\$2.13	\$75.30

For apprentice rates see "Apprentice- SHEET METAL WORKER"

HVAC (TESTING AND BALANCING -WATER) <i>PLUMBERS LOCAL 4</i>	03/01/2024	\$53.95	\$9.90	\$17.42	\$0.00	\$81.27
	09/01/2024	\$55.35	\$9.90	\$17.42	\$0.00	\$82.67
	03/01/2025	\$56.75	\$9.90	\$17.42	\$0.00	\$84.07
	09/01/2025	\$58.15	\$9.90	\$17.42	\$0.00	\$85.47
	03/01/2026	\$59.55	\$9.90	\$17.42	\$0.00	\$86.87

For apprentice rates see "Apprentice- PIPEFITTER" or "PLUMBER/PIPEFITTER"

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
HVAC MECHANIC <i>PLUMBERS LOCAL 4</i>	03/01/2024	\$53.95	\$9.90	\$17.42	\$0.00	\$81.27
	09/01/2024	\$55.35	\$9.90	\$17.42	\$0.00	\$82.67
	03/01/2025	\$56.75	\$9.90	\$17.42	\$0.00	\$84.07
	09/01/2025	\$58.15	\$9.90	\$17.42	\$0.00	\$85.47
	03/01/2026	\$59.55	\$9.90	\$17.42	\$0.00	\$86.87
For apprentice rates see "Apprentice- PIPEFITTER" or "PLUMBER/PIPEFITTER"						
HYDRAULIC DRILLS <i>LABORERS - ZONE 2</i>	12/01/2023	\$38.61	\$9.65	\$17.14	\$0.00	\$65.40
For apprentice rates see "Apprentice- LABORER"						
HYDRAULIC DRILLS (HEAVY & HIGHWAY) <i>LABORERS - ZONE 2 (HEAVY &amp; HIGHWAY)</i>	06/01/2024	\$39.28	\$9.65	\$17.80	\$0.00	\$66.73
	12/01/2024	\$40.61	\$9.65	\$17.80	\$0.00	\$68.06
	06/01/2025	\$42.00	\$9.65	\$17.80	\$0.00	\$69.45
	12/01/2025	\$43.38	\$9.65	\$17.80	\$0.00	\$70.83
	06/01/2026	\$44.82	\$9.65	\$17.80	\$0.00	\$72.27
	12/01/2026	\$46.26	\$9.65	\$17.80	\$0.00	\$73.71
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"						
INSULATOR (PIPES & TANKS) <i>HEAT &amp; FROST INSULATORS LOCAL 6 (WORCESTER)</i>	09/01/2023	\$48.15	\$14.75	\$19.61	\$0.00	\$82.51
	09/01/2024	\$51.23	\$14.75	\$19.61	\$0.00	\$85.59
	09/01/2025	\$54.31	\$14.75	\$19.61	\$0.00	\$88.67
	09/01/2026	\$57.38	\$14.75	\$19.61	\$0.00	\$91.74

**Apprentice - ASBESTOS INSULATOR (Pipes & Tanks) - Local 6 Worcester**

**Effective Date - 09/01/2023**

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$24.08	\$14.75	\$14.32	\$0.00	\$53.15
2	60	\$28.89	\$14.75	\$15.37	\$0.00	\$59.01
3	70	\$33.71	\$14.75	\$16.43	\$0.00	\$64.89
4	80	\$38.52	\$14.75	\$17.49	\$0.00	\$70.76

**Effective Date - 09/01/2024**

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$25.62	\$14.75	\$14.32	\$0.00	\$54.69
2	60	\$30.74	\$14.75	\$15.37	\$0.00	\$60.86
3	70	\$35.86	\$14.75	\$16.43	\$0.00	\$67.04
4	80	\$40.98	\$14.75	\$17.49	\$0.00	\$73.22

**Notes:**

Steps are 1 year

**Apprentice to Journeyworker Ratio:1:4**

IRONWORKER/WELDER <i>IRONWORKERS LOCAL 7 (WORCESTER AREA)</i>	03/16/2024	\$53.67	\$8.35	\$26.70	\$0.00	\$88.72
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Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
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**Apprentice - IRONWORKER - Local 7 Worcester**

**Effective Date - 03/16/2024**

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	\$32.20	\$8.35	\$26.70	\$0.00	\$67.25
2	70	\$37.57	\$8.35	\$26.70	\$0.00	\$72.62
3	75	\$40.25	\$8.35	\$26.70	\$0.00	\$75.30
4	80	\$42.94	\$8.35	\$26.70	\$0.00	\$77.99
5	85	\$45.62	\$8.35	\$26.70	\$0.00	\$80.67
6	90	\$48.30	\$8.35	\$26.70	\$0.00	\$83.35

**Notes:**

**Apprentice to Journeyworker Ratio:1:4**

JACKHAMMER & PAVING BREAKER OPERATOR LABORERS - ZONE 2	12/01/2023	\$38.11	\$9.65	\$17.14	\$0.00	\$64.90
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For apprentice rates see "Apprentice- LABORER"

LABORER LABORERS - ZONE 2	12/01/2023	\$37.86	\$9.65	\$17.14	\$0.00	\$64.65
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**Apprentice - LABORER - Zone 2**

**Effective Date - 12/01/2023**

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	\$22.72	\$9.65	\$16.89	\$0.00	\$49.26
2	70	\$26.50	\$9.65	\$16.89	\$0.00	\$53.04
3	80	\$30.29	\$9.65	\$16.89	\$0.00	\$56.83
4	90	\$34.07	\$9.65	\$16.89	\$0.00	\$60.61

**Notes:**

**Apprentice to Journeyworker Ratio:1:5**

LABORER (HEAVY & HIGHWAY) LABORERS - ZONE 2 (HEAVY & HIGHWAY)	06/01/2024	\$38.53	\$9.65	\$17.80	\$0.00	\$65.98
	12/01/2024	\$39.86	\$9.65	\$17.80	\$0.00	\$67.31
	06/01/2025	\$41.25	\$9.65	\$17.80	\$0.00	\$68.70
	12/01/2025	\$42.63	\$9.65	\$17.80	\$0.00	\$70.08
	06/01/2026	\$44.07	\$9.65	\$17.80	\$0.00	\$71.52
	12/01/2026	\$45.51	\$9.65	\$17.80	\$0.00	\$72.96

<b>Classification</b>	<b>Effective Date</b>	<b>Base Wage</b>	<b>Health</b>	<b>Pension</b>	<b>Supplemental Unemployment</b>	<b>Total Rate</b>
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**Apprentice - LABORER (Heavy & Highway) - Zone 2**

**Effective Date - 06/01/2024**

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	\$23.12	\$9.65	\$17.80	\$0.00	\$50.57
2	70	\$26.97	\$9.65	\$17.80	\$0.00	\$54.42
3	80	\$30.82	\$9.65	\$17.80	\$0.00	\$58.27
4	90	\$34.68	\$9.65	\$17.80	\$0.00	\$62.13

**Effective Date - 12/01/2024**

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	\$23.92	\$9.65	\$17.80	\$0.00	\$51.37
2	70	\$27.90	\$9.65	\$17.80	\$0.00	\$55.35
3	80	\$31.89	\$9.65	\$17.80	\$0.00	\$59.34
4	90	\$35.87	\$9.65	\$17.80	\$0.00	\$63.32

**Notes:**

**Apprentice to Journeyworker Ratio:1:5**

<b>LABORER: CARPENTER TENDER</b> <i>LABORERS - ZONE 2</i>	12/01/2023	\$37.86	\$9.65	\$17.14	\$0.00	\$64.65
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For apprentice rates see "Apprentice- LABORER"

<b>LABORER: CEMENT FINISHER TENDER</b> <i>LABORERS - ZONE 2</i>	12/01/2023	\$38.36	\$9.40	\$16.89	\$0.00	\$64.65
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For apprentice rates see "Apprentice- LABORER"

<b>LABORER: HAZARDOUS WASTE/ASBESTOS REMOVER</b> <i>LABORERS - ZONE 2</i>	12/01/2023	\$37.95	\$9.65	\$17.20	\$0.00	\$64.80
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For apprentice rates see "Apprentice- LABORER"

<b>LABORER: MASON TENDER</b> <i>LABORERS - ZONE 2</i>	12/01/2023	\$38.11	\$9.65	\$17.14	\$0.00	\$64.90
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For apprentice rates see "Apprentice- LABORER"

<b>LABORER: MASON TENDER (HEAVY &amp; HIGHWAY)</b> <i>LABORERS - ZONE 2 (HEAVY &amp; HIGHWAY)</i>	06/01/2024	\$38.78	\$9.65	\$17.80	\$0.00	\$66.23
	12/01/2024	\$40.11	\$9.65	\$17.80	\$0.00	\$67.56
	06/01/2025	\$41.50	\$9.65	\$17.80	\$0.00	\$68.95
	12/01/2025	\$42.88	\$9.65	\$17.80	\$0.00	\$70.33
	06/01/2026	\$44.32	\$9.65	\$17.80	\$0.00	\$71.77
	12/01/2026	\$45.76	\$9.65	\$17.80	\$0.00	\$73.21

For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"

<b>LABORER: MULTI-TRADE TENDER</b> <i>LABORERS - ZONE 2</i>	12/01/2023	\$37.86	\$9.65	\$17.14	\$0.00	\$64.65
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For apprentice rates see "Apprentice- LABORER"

<b>LABORER: TREE REMOVER</b> <i>LABORERS - ZONE 2</i>	12/01/2023	\$37.86	\$9.65	\$17.14	\$0.00	\$64.65
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This classification applies to the removal of standing trees, and the trimming and removal of branches and limbs when related to public works construction or site clearance incidental to construction . For apprentice rates see "Apprentice- LABORER"

<b>LASER BEAM OPERATOR</b> <i>LABORERS - ZONE 2</i>	12/01/2023	\$38.11	\$9.65	\$17.14	\$0.00	\$64.90
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For apprentice rates see "Apprentice- LABORER"

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
LASER BEAM OPERATOR (HEAVY & HIGHWAY) <i>LABORERS - ZONE 2 (HEAVY &amp; HIGHWAY)</i>	06/01/2024	\$38.78	\$9.65	\$17.80	\$0.00	\$66.23
	12/01/2024	\$40.11	\$9.65	\$17.80	\$0.00	\$67.56
	06/01/2025	\$41.50	\$9.65	\$17.80	\$0.00	\$68.95
	12/01/2025	\$42.88	\$9.65	\$17.80	\$0.00	\$70.33
	06/01/2026	\$44.32	\$9.65	\$17.80	\$0.00	\$71.77
	12/01/2026	\$45.76	\$9.65	\$17.80	\$0.00	\$73.21

For apprentice rates see "Apprentice- LABORER (Heavy and Highway)

MARBLE & TILE FINISHERS <i>BRICKLAYERS LOCAL 3 - MARBLE &amp; TILE</i>	02/01/2024	\$47.89	\$11.49	\$21.37	\$0.00	\$80.75
	08/01/2024	\$49.57	\$11.49	\$21.37	\$0.00	\$82.43
	02/01/2025	\$50.61	\$11.49	\$21.37	\$0.00	\$83.47
	08/01/2025	\$52.33	\$11.49	\$21.37	\$0.00	\$85.19
	02/01/2026	\$53.41	\$11.49	\$21.37	\$0.00	\$86.27
	08/01/2026	\$55.17	\$11.49	\$21.37	\$0.00	\$88.03
	02/01/2027	\$56.29	\$11.49	\$21.37	\$0.00	\$89.15

**Apprentice - MARBLE & TILE FINISHER - Local 3 Marble & Tile**

**Effective Date - 02/01/2024**

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$23.95	\$11.49	\$21.37	\$0.00	\$56.81
2	60	\$28.73	\$11.49	\$21.37	\$0.00	\$61.59
3	70	\$33.52	\$11.49	\$21.37	\$0.00	\$66.38
4	80	\$38.31	\$11.49	\$21.37	\$0.00	\$71.17
5	90	\$43.10	\$11.49	\$21.37	\$0.00	\$75.96

**Effective Date - 08/01/2024**

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$24.79	\$11.49	\$21.37	\$0.00	\$57.65
2	60	\$29.74	\$11.49	\$21.37	\$0.00	\$62.60
3	70	\$34.70	\$11.49	\$21.37	\$0.00	\$67.56
4	80	\$39.66	\$11.49	\$21.37	\$0.00	\$72.52
5	90	\$44.61	\$11.49	\$21.37	\$0.00	\$77.47

**Notes:**

**Apprentice to Journeyworker Ratio:1:3**

MARBLE MASONS, TILELAYERS & TERRAZZO MECH <i>BRICKLAYERS LOCAL 3 - MARBLE &amp; TILE</i>	02/01/2024	\$62.42	\$11.49	\$23.56	\$0.00	\$97.47
	08/01/2024	\$64.52	\$11.49	\$23.56	\$0.00	\$99.57
	02/01/2025	\$65.82	\$11.49	\$23.56	\$0.00	\$100.87
	08/01/2025	\$67.97	\$11.49	\$23.56	\$0.00	\$103.02
	02/01/2026	\$69.32	\$11.49	\$23.56	\$0.00	\$104.37
	08/01/2026	\$71.52	\$11.49	\$23.56	\$0.00	\$106.57
	02/01/2027	\$72.92	\$11.49	\$23.56	\$0.00	\$107.97



**Classification** **Effective Date** **Base Wage** **Health** **Pension** **Supplemental Unemployment** **Total Rate**

**Apprentice - MARBLE-TILE-TERRAZZO MECHANIC - Local 3 Marble & Tile**

**Effective Date - 02/01/2024**

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$31.21	\$11.49	\$23.56	\$0.00	\$66.26
2	60	\$37.45	\$11.49	\$23.56	\$0.00	\$72.50
3	70	\$43.69	\$11.49	\$23.56	\$0.00	\$78.74
4	80	\$49.94	\$11.49	\$23.56	\$0.00	\$84.99
5	90	\$56.18	\$11.49	\$23.56	\$0.00	\$91.23

**Effective Date - 08/01/2024**

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$32.26	\$11.49	\$23.56	\$0.00	\$67.31
2	60	\$38.71	\$11.49	\$23.56	\$0.00	\$73.76
3	70	\$45.16	\$11.49	\$23.56	\$0.00	\$80.21
4	80	\$51.62	\$11.49	\$23.56	\$0.00	\$86.67
5	90	\$58.07	\$11.49	\$23.56	\$0.00	\$93.12

**Notes:**

**Apprentice to Journeyworker Ratio:1:5**

MECH. SWEEPER OPERATOR (ON CONST. SITES) <i>OPERATING ENGINEERS LOCAL 4</i>	06/01/2024	\$55.41	\$15.30	\$16.40	\$0.00	\$87.11
	12/01/2024	\$56.85	\$15.30	\$16.40	\$0.00	\$88.55
	06/01/2025	\$58.13	\$15.30	\$16.40	\$0.00	\$89.83
	12/01/2025	\$59.57	\$15.30	\$16.40	\$0.00	\$91.27
	06/01/2026	\$60.85	\$15.30	\$16.40	\$0.00	\$92.55
	12/01/2026	\$62.29	\$15.30	\$16.40	\$0.00	\$93.99

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

MECHANICS MAINTENANCE <i>OPERATING ENGINEERS LOCAL 4</i>	06/01/2024	\$55.41	\$15.30	\$16.40	\$0.00	\$87.11
	12/01/2024	\$56.85	\$15.30	\$16.40	\$0.00	\$88.55
	06/01/2025	\$58.13	\$15.30	\$16.40	\$0.00	\$89.83
	12/01/2025	\$59.57	\$15.30	\$16.40	\$0.00	\$91.27
	06/01/2026	\$60.85	\$15.30	\$16.40	\$0.00	\$92.55
	12/01/2026	\$62.29	\$15.30	\$16.40	\$0.00	\$93.99

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

MILLWRIGHT (Zone 3) <i>MILLWRIGHTS LOCAL 1121 - Zone 3</i>	01/01/2024	\$41.20	\$10.08	\$21.22	\$0.00	\$72.50
	01/06/2025	\$43.48	\$10.08	\$21.22	\$0.00	\$74.78
	01/05/2026	\$45.76	\$10.08	\$21.22	\$0.00	\$77.06

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
<b>Apprentice - MILLWRIGHT - Local 1121 Zone 3</b>						
<b>Effective Date - 01/01/2024</b>						
Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	55	\$22.66	\$10.08	\$5.36	\$0.00	\$38.10
2	65	\$26.78	\$10.08	\$6.34	\$0.00	\$43.20
3	75	\$30.90	\$10.08	\$18.78	\$0.00	\$59.76
4	85	\$35.02	\$10.08	\$19.76	\$0.00	\$64.86
<b>Effective Date - 01/06/2025</b>						
Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	55	\$23.91	\$10.08	\$5.36	\$0.00	\$39.35
2	65	\$28.26	\$10.08	\$6.34	\$0.00	\$44.68
3	75	\$32.61	\$10.08	\$18.78	\$0.00	\$61.47
4	85	\$36.96	\$10.08	\$19.76	\$0.00	\$66.80
<b>Notes:</b> Step 1&2 Appr. indentured after 1/6/2020 receive no pension, but do receive annuity. (Step 1 \$5.72, Step 2 \$6.66) Steps are 2,000 hours						
<b>Apprentice to Journeyworker Ratio:1:4</b>						

MORTAR MIXER LABORERS - ZONE 2	12/01/2023	\$38.11	\$9.65	\$17.14	\$0.00	\$64.90
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For apprentice rates see "Apprentice- LABORER"

OILER (OTHER THAN TRUCK CRANES,GRADALLS) OPERATING ENGINEERS LOCAL 4	06/01/2024	\$24.71	\$15.30	\$16.40	\$0.00	\$56.41
	12/01/2024	\$25.37	\$15.30	\$16.40	\$0.00	\$57.07
	06/01/2025	\$25.97	\$15.30	\$16.40	\$0.00	\$57.67
	12/01/2025	\$26.63	\$15.30	\$16.40	\$0.00	\$58.33
	06/01/2026	\$27.22	\$15.30	\$16.40	\$0.00	\$58.92
	12/01/2026	\$27.89	\$15.30	\$16.40	\$0.00	\$59.59

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

OILER (TRUCK CRANES, GRADALLS) OPERATING ENGINEERS LOCAL 4	06/01/2024	\$30.28	\$15.30	\$16.40	\$0.00	\$61.98
	12/01/2024	\$31.08	\$15.30	\$16.40	\$0.00	\$62.78
	06/01/2025	\$31.80	\$15.30	\$16.40	\$0.00	\$63.50
	12/01/2025	\$32.60	\$15.30	\$16.40	\$0.00	\$64.30
	06/01/2026	\$33.32	\$15.30	\$16.40	\$0.00	\$65.02
	12/01/2026	\$34.12	\$15.30	\$16.40	\$0.00	\$65.82

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

OTHER POWER DRIVEN EQUIPMENT - CLASS II OPERATING ENGINEERS LOCAL 4	06/01/2024	\$55.41	\$15.30	\$16.40	\$0.00	\$87.11
	12/01/2024	\$56.85	\$15.30	\$16.40	\$0.00	\$88.55
	06/01/2025	\$58.13	\$15.30	\$16.40	\$0.00	\$89.83
	12/01/2025	\$59.57	\$15.30	\$16.40	\$0.00	\$91.27
	06/01/2026	\$60.85	\$15.30	\$16.40	\$0.00	\$92.55
	12/01/2026	\$62.29	\$15.30	\$16.40	\$0.00	\$93.99

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

PAINTER (BRIDGES/TANKS) PAINTERS LOCAL 35 - ZONE 2	07/01/2024	\$57.26	\$9.95	\$23.95	\$0.00	\$91.16
	01/01/2025	\$58.46	\$9.95	\$23.95	\$0.00	\$92.36

**Classification**

**Effective Date    Base Wage    Health    Pension    Supplemental Unemployment    Total Rate**

**Apprentice - PAINTER Local 35 - BRIDGES/TANKS**

**Effective Date - 07/01/2024**

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$28.63	\$9.95	\$0.00	\$0.00	\$38.58
2	55	\$31.49	\$9.95	\$6.66	\$0.00	\$48.10
3	60	\$34.36	\$9.95	\$7.26	\$0.00	\$51.57
4	65	\$37.22	\$9.95	\$7.87	\$0.00	\$55.04
5	70	\$40.08	\$9.95	\$20.32	\$0.00	\$70.35
6	75	\$42.95	\$9.95	\$20.93	\$0.00	\$73.83
7	80	\$45.81	\$9.95	\$21.53	\$0.00	\$77.29
8	90	\$51.53	\$9.95	\$22.74	\$0.00	\$84.22

**Effective Date - 01/01/2025**

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$29.23	\$9.95	\$0.00	\$0.00	\$39.18
2	55	\$32.15	\$9.95	\$6.66	\$0.00	\$48.76
3	60	\$35.08	\$9.95	\$7.26	\$0.00	\$52.29
4	65	\$38.00	\$9.95	\$7.87	\$0.00	\$55.82
5	70	\$40.92	\$9.95	\$20.32	\$0.00	\$71.19
6	75	\$43.85	\$9.95	\$20.93	\$0.00	\$74.73
7	80	\$46.77	\$9.95	\$21.53	\$0.00	\$78.25
8	90	\$52.61	\$9.95	\$22.74	\$0.00	\$85.30

**Notes:**

Steps are 750 hrs.

**Apprentice to Journeyworker Ratio:1:1**

PAINTER (SPRAY OR SANDBLAST, NEW) *	07/01/2024	\$48.16	\$9.95	\$23.95	\$0.00	\$82.06
* If 30% or more of surfaces to be painted are new construction, NEW paint rate shall be used. PAINTERS LOCAL 35 - ZONE 2	01/01/2025	\$49.36	\$9.95	\$23.95	\$0.00	\$83.26

**Classification**

**Effective Date    Base Wage    Health    Pension    Supplemental Unemployment    Total Rate**

**Apprentice - PAINTER Local 35 Zone 2 - Spray/Sandblast - New**

**Effective Date - 07/01/2024**

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$24.08	\$9.95	\$0.00	\$0.00	\$34.03
2	55	\$26.49	\$9.95	\$6.66	\$0.00	\$43.10
3	60	\$28.90	\$9.95	\$7.26	\$0.00	\$46.11
4	65	\$31.30	\$9.95	\$7.87	\$0.00	\$49.12
5	70	\$33.71	\$9.95	\$20.32	\$0.00	\$63.98
6	75	\$36.12	\$9.95	\$20.93	\$0.00	\$67.00
7	80	\$38.53	\$9.95	\$21.53	\$0.00	\$70.01
8	90	\$43.34	\$9.95	\$22.74	\$0.00	\$76.03

**Effective Date - 01/01/2025**

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$24.68	\$9.95	\$0.00	\$0.00	\$34.63
2	55	\$27.15	\$9.95	\$6.66	\$0.00	\$43.76
3	60	\$29.62	\$9.95	\$7.26	\$0.00	\$46.83
4	65	\$32.08	\$9.95	\$7.87	\$0.00	\$49.90
5	70	\$34.55	\$9.95	\$20.32	\$0.00	\$64.82
6	75	\$37.02	\$9.95	\$20.93	\$0.00	\$67.90
7	80	\$39.49	\$9.95	\$21.53	\$0.00	\$70.97
8	90	\$44.42	\$9.95	\$22.74	\$0.00	\$77.11

**Notes:**

Steps are 750 hrs.

**Apprentice to Journeyworker Ratio:1:1**

PAINTER (SPRAY OR SANDBLAST, REPAINT)	07/01/2024	\$46.22	\$9.95	\$23.95	\$0.00	\$80.12
PAINTERS LOCAL 35 - ZONE 2	01/01/2025	\$47.42	\$9.95	\$23.95	\$0.00	\$81.32

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
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**Apprentice - PAINTER Local 35 Zone 2 - Spray/Sandblast - Repaint**

**Effective Date - 07/01/2024**

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$23.11	\$9.95	\$0.00	\$0.00	\$33.06
2	55	\$25.42	\$9.95	\$6.66	\$0.00	\$42.03
3	60	\$27.73	\$9.95	\$7.26	\$0.00	\$44.94
4	65	\$30.04	\$9.95	\$7.87	\$0.00	\$47.86
5	70	\$32.35	\$9.95	\$20.32	\$0.00	\$62.62
6	75	\$34.67	\$9.95	\$20.93	\$0.00	\$65.55
7	80	\$36.98	\$9.95	\$21.53	\$0.00	\$68.46
8	90	\$41.60	\$9.95	\$22.74	\$0.00	\$74.29

**Effective Date - 01/01/2025**

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$23.71	\$9.95	\$0.00	\$0.00	\$33.66
2	55	\$26.08	\$9.95	\$6.66	\$0.00	\$42.69
3	60	\$28.45	\$9.95	\$7.26	\$0.00	\$45.66
4	65	\$30.82	\$9.95	\$7.87	\$0.00	\$48.64
5	70	\$33.19	\$9.95	\$20.32	\$0.00	\$63.46
6	75	\$35.57	\$9.95	\$20.93	\$0.00	\$66.45
7	80	\$37.94	\$9.95	\$21.53	\$0.00	\$69.42
8	90	\$42.68	\$9.95	\$22.74	\$0.00	\$75.37

**Notes:**

Steps are 750 hrs.

**Apprentice to Journeyworker Ratio:1:1**

PAINTER / TAPER (BRUSH, NEW) *	07/01/2024	\$46.76	\$9.95	\$23.95	\$0.00	\$80.66
* If 30% or more of surfaces to be painted are new construction, NEW paint rate shall be used. <i>PAINTERS LOCAL 35 - ZONE 2</i>	01/01/2025	\$47.96	\$9.95	\$23.95	\$0.00	\$81.86

Classification

Effective Date    Base Wage    Health    Pension    Supplemental Unemployment    Total Rate

**Apprentice - PAINTER - Local 35 Zone 2 - BRUSH NEW**

**Effective Date - 07/01/2024**

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$23.38	\$9.95	\$0.00	\$0.00	\$33.33
2	55	\$25.72	\$9.95	\$6.66	\$0.00	\$42.33
3	60	\$28.06	\$9.95	\$7.26	\$0.00	\$45.27
4	65	\$30.39	\$9.95	\$7.87	\$0.00	\$48.21
5	70	\$32.73	\$9.95	\$20.32	\$0.00	\$63.00
6	75	\$35.07	\$9.95	\$20.93	\$0.00	\$65.95
7	80	\$37.41	\$9.95	\$21.53	\$0.00	\$68.89
8	90	\$42.08	\$9.95	\$22.74	\$0.00	\$74.77

**Effective Date - 01/01/2025**

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$23.98	\$9.95	\$0.00	\$0.00	\$33.93
2	55	\$26.38	\$9.95	\$6.66	\$0.00	\$42.99
3	60	\$28.78	\$9.95	\$7.26	\$0.00	\$45.99
4	65	\$31.17	\$9.95	\$7.87	\$0.00	\$48.99
5	70	\$33.57	\$9.95	\$20.32	\$0.00	\$63.84
6	75	\$35.97	\$9.95	\$20.93	\$0.00	\$66.85
7	80	\$38.37	\$9.95	\$21.53	\$0.00	\$69.85
8	90	\$43.16	\$9.95	\$22.74	\$0.00	\$75.85

**Notes:**

Steps are 750 hrs.

**Apprentice to Journeyworker Ratio:1:1**

PAINTER / TAPER (BRUSH, REPAINT)	07/01/2024	\$44.82	\$9.95	\$23.95	\$0.00	\$78.72
PAINTERS LOCAL 35 - ZONE 2	01/01/2025	\$46.02	\$9.95	\$23.95	\$0.00	\$79.92

**Classification**

**Effective Date    Base Wage    Health    Pension    Supplemental Unemployment    Total Rate**

**Apprentice - PAINTER Local 35 Zone 2 - BRUSH REPAINT**

**Effective Date - 07/01/2024**

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$22.41	\$9.95	\$0.00	\$0.00	\$32.36
2	55	\$24.65	\$9.95	\$6.66	\$0.00	\$41.26
3	60	\$26.89	\$9.95	\$7.26	\$0.00	\$44.10
4	65	\$29.13	\$9.95	\$7.87	\$0.00	\$46.95
5	70	\$31.37	\$9.95	\$20.32	\$0.00	\$61.64
6	75	\$33.62	\$9.95	\$20.93	\$0.00	\$64.50
7	80	\$35.86	\$9.95	\$21.53	\$0.00	\$67.34
8	90	\$40.34	\$9.95	\$22.74	\$0.00	\$73.03

**Effective Date - 01/01/2025**

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$23.01	\$9.95	\$0.00	\$0.00	\$32.96
2	55	\$25.31	\$9.95	\$6.66	\$0.00	\$41.92
3	60	\$27.61	\$9.95	\$7.26	\$0.00	\$44.82
4	65	\$29.91	\$9.95	\$7.87	\$0.00	\$47.73
5	70	\$32.21	\$9.95	\$20.32	\$0.00	\$62.48
6	75	\$34.52	\$9.95	\$20.93	\$0.00	\$65.40
7	80	\$36.82	\$9.95	\$21.53	\$0.00	\$68.30
8	90	\$41.42	\$9.95	\$22.74	\$0.00	\$74.11

**Notes:**  
Steps are 750 hrs.

**Apprentice to Journeyworker Ratio:1:1**

PAINTER TRAFFIC MARKINGS (HEAVY/HIGHWAY)	06/01/2024	\$38.53	\$9.65	\$17.80	\$0.00	\$65.98
LABORERS - ZONE 2 (HEAVY & HIGHWAY)	12/01/2024	\$39.86	\$9.65	\$17.80	\$0.00	\$67.31
	06/01/2025	\$41.25	\$9.65	\$17.80	\$0.00	\$68.70
	12/01/2025	\$42.63	\$9.65	\$17.80	\$0.00	\$70.08
	06/01/2026	\$44.07	\$9.65	\$17.80	\$0.00	\$71.52
	12/01/2026	\$45.51	\$9.65	\$17.80	\$0.00	\$72.96

For apprentice rates see "Apprentice- LABORER (Heavy and Highway)

PANEL & PICKUP TRUCKS DRIVER	06/01/2024	\$39.78	\$15.07	\$18.67	\$0.00	\$73.52
TEAMSTERS JOINT COUNCIL NO. 10 ZONE B	12/01/2024	\$39.78	\$15.07	\$20.17	\$0.00	\$75.02
	01/01/2025	\$39.78	\$15.57	\$20.17	\$0.00	\$75.52
	06/01/2025	\$40.78	\$15.57	\$20.17	\$0.00	\$76.52
	12/01/2025	\$40.78	\$15.57	\$21.78	\$0.00	\$78.13
	01/01/2026	\$40.78	\$16.17	\$21.78	\$0.00	\$78.73
	06/01/2026	\$41.78	\$16.17	\$21.78	\$0.00	\$79.73
	12/01/2026	\$41.78	\$16.17	\$23.52	\$0.00	\$81.47
	01/01/2027	\$41.78	\$16.77	\$23.52	\$0.00	\$82.07

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
PIER AND DOCK CONSTRUCTOR (UNDERPINNING AND DECK) <i>PILE DRIVER LOCAL 56 (ZONE 2)</i> For apprentice rates see "Apprentice- PILE DRIVER"	08/01/2020	\$46.11	\$9.40	\$23.12	\$0.00	\$78.63
PILE DRIVER <i>PILE DRIVER LOCAL 56 (ZONE 2)</i>	08/01/2020	\$46.11	\$9.40	\$23.12	\$0.00	\$78.63

**Apprentice - PILE DRIVER - Local 56 Zone 2**

**Effective Date - 08/01/2020**

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	0	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00

**Notes:** Apprentice wages shall be no less than the following Steps;

(Same as set in Zone 1)

1\$57.06/2\$61.96/3\$66.87/4\$69.32/5\$71.78/6\$71.78/7\$76.68/8\$76.68

**Apprentice to Journeyworker Ratio:1:5**

PIPELAYER <i>LABORERS - ZONE 2</i> For apprentice rates see "Apprentice- LABORER"	12/01/2023	\$38.11	\$9.65	\$17.14	\$0.00	\$64.90
PIPELAYER (HEAVY & HIGHWAY) <i>LABORERS - ZONE 2 (HEAVY &amp; HIGHWAY)</i>	06/01/2024	\$38.78	\$9.65	\$17.80	\$0.00	\$66.23
	12/01/2024	\$40.11	\$9.65	\$17.80	\$0.00	\$67.56
	06/01/2025	\$41.50	\$9.65	\$17.80	\$0.00	\$68.95
	12/01/2025	\$42.88	\$9.65	\$17.80	\$0.00	\$70.33
	06/01/2026	\$44.32	\$9.65	\$17.80	\$0.00	\$71.77
	12/01/2026	\$45.76	\$9.65	\$17.80	\$0.00	\$73.21
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"						
PLUMBER & PIPEFITTER <i>PLUMBERS LOCAL 4</i>	03/01/2024	\$53.95	\$9.90	\$17.42	\$0.00	\$81.27
	09/01/2024	\$55.35	\$9.90	\$17.42	\$0.00	\$82.67
	03/01/2025	\$56.75	\$9.90	\$17.42	\$0.00	\$84.07
	09/01/2025	\$58.15	\$9.90	\$17.42	\$0.00	\$85.47
	03/01/2026	\$59.55	\$9.90	\$17.42	\$0.00	\$86.87



<b>Classification</b>	<b>Effective Date</b>	<b>Base Wage</b>	<b>Health</b>	<b>Pension</b>	<b>Supplemental Unemployment</b>	<b>Total Rate</b>
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**Apprentice - PLUMBER/PIPEFITTER - Local 4**

**Effective Date - 03/01/2024**

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	\$21.58	\$9.90	\$0.00	\$0.00	\$31.48
2	50	\$26.98	\$9.90	\$0.00	\$0.00	\$36.88
3	60	\$32.37	\$9.90	\$0.00	\$0.00	\$42.27
4	70	\$37.77	\$9.90	\$7.71	\$0.00	\$55.38
5	80	\$43.16	\$9.90	\$7.71	\$0.00	\$60.77

**Effective Date - 09/01/2024**

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	\$22.14	\$9.90	\$0.00	\$0.00	\$32.04
2	50	\$27.68	\$9.90	\$0.00	\$0.00	\$37.58
3	60	\$33.21	\$9.90	\$0.00	\$0.00	\$43.11
4	70	\$38.75	\$9.90	\$7.71	\$0.00	\$56.36
5	80	\$44.28	\$9.90	\$7.71	\$0.00	\$61.89

**Notes:**

Steps - 2000 hrs; Step 4 w/lic 75%, Step 5 w/lic 85%  
 Step 4 w/lic \$52.59, Step 5 w/lic \$57.44

**Apprentice to Journeyworker Ratio:1:3**

PNEUMATIC CONTROLS (TEMP.) <i>PLUMBERS LOCAL 4</i>	03/01/2024	\$53.95	\$9.90	\$17.42	\$0.00	\$81.27
	09/01/2024	\$55.35	\$9.90	\$17.42	\$0.00	\$82.67
	03/01/2025	\$56.75	\$9.90	\$17.42	\$0.00	\$84.07
	09/01/2025	\$58.15	\$9.90	\$17.42	\$0.00	\$85.47
	03/01/2026	\$59.55	\$9.90	\$17.42	\$0.00	\$86.87

For apprentice rates see "Apprentice- PIPEFITTER" or "PLUMBER/PIPEFITTER"

PNEUMATIC DRILL/TOOL OPERATOR <i>LABORERS - ZONE 2</i>	12/01/2023	\$38.11	\$9.65	\$17.14	\$0.00	\$64.90
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For apprentice rates see "Apprentice- LABORER"

PNEUMATIC DRILL/TOOL OPERATOR (HEAVY & HIGHWAY) <i>LABORERS - ZONE 2 (HEAVY &amp; HIGHWAY)</i>	06/01/2024	\$38.78	\$9.65	\$17.80	\$0.00	\$66.23
	12/01/2024	\$40.11	\$9.65	\$17.80	\$0.00	\$67.56
	06/01/2025	\$41.50	\$9.65	\$17.80	\$0.00	\$68.95
	12/01/2025	\$42.88	\$9.65	\$17.80	\$0.00	\$70.33
	06/01/2026	\$44.32	\$9.65	\$17.80	\$0.00	\$71.77
	12/01/2026	\$45.76	\$9.65	\$17.80	\$0.00	\$73.21

For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"

POWDERMAN & BLASTER <i>LABORERS - ZONE 2</i>	12/01/2023	\$38.86	\$9.65	\$17.14	\$0.00	\$65.65
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For apprentice rates see "Apprentice- LABORER"

POWDERMAN & BLASTER (HEAVY & HIGHWAY) <i>LABORERS - ZONE 2 (HEAVY &amp; HIGHWAY)</i>	06/01/2024	\$39.53	\$9.40	\$17.55	\$0.00	\$66.48
	12/01/2024	\$40.86	\$9.40	\$17.55	\$0.00	\$67.81
	06/01/2025	\$42.25	\$9.40	\$17.55	\$0.00	\$69.20
	12/01/2025	\$43.63	\$9.40	\$17.55	\$0.00	\$70.58
	06/01/2026	\$45.07	\$9.40	\$17.55	\$0.00	\$72.02
	12/01/2026	\$46.51	\$9.40	\$17.55	\$0.00	\$73.46

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)						
POWER SHOVEL/DERRICK/TRENCHING MACHINE <i>OPERATING ENGINEERS LOCAL 4</i>	06/01/2024	\$56.03	\$15.30	\$16.40	\$0.00	\$87.73
	12/01/2024	\$57.48	\$15.30	\$16.40	\$0.00	\$89.18
	06/01/2025	\$58.78	\$15.30	\$16.40	\$0.00	\$90.48
	12/01/2025	\$60.23	\$15.30	\$16.40	\$0.00	\$91.93
	06/01/2026	\$61.53	\$15.30	\$16.40	\$0.00	\$93.23
	12/01/2026	\$62.98	\$15.30	\$16.40	\$0.00	\$94.68
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
PUMP OPERATOR (CONCRETE) <i>OPERATING ENGINEERS LOCAL 4</i>	06/01/2024	\$55.41	\$15.30	\$16.40	\$0.00	\$87.11
	12/01/2024	\$56.85	\$15.30	\$16.40	\$0.00	\$88.55
	06/01/2025	\$58.13	\$15.30	\$16.40	\$0.00	\$89.83
	12/01/2025	\$59.57	\$15.30	\$16.40	\$0.00	\$91.27
	06/01/2026	\$60.85	\$15.30	\$16.40	\$0.00	\$92.55
	12/01/2026	\$62.29	\$15.30	\$16.40	\$0.00	\$93.99
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
PUMP OPERATOR (DEWATERING, OTHER) <i>OPERATING ENGINEERS LOCAL 4</i>	06/01/2024	\$36.17	\$15.30	\$16.40	\$0.00	\$67.87
	12/01/2024	\$37.12	\$15.30	\$16.40	\$0.00	\$68.82
	06/01/2025	\$37.97	\$15.30	\$16.40	\$0.00	\$69.67
	12/01/2025	\$38.92	\$15.30	\$16.40	\$0.00	\$70.62
	06/01/2026	\$39.78	\$15.30	\$16.40	\$0.00	\$71.48
	12/01/2026	\$40.73	\$15.30	\$16.40	\$0.00	\$72.43
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
READY-MIX CONCRETE DRIVER <i>TEAMSTERS 170 - Dauphinais (Bellingham)</i>	01/01/2024	\$27.00	\$10.76	\$5.45	\$0.00	\$43.21
	12/01/2024	\$27.60	\$11.26	\$6.15	\$0.00	\$45.01
	01/01/2025	\$27.60	\$11.26	\$6.15	\$0.00	\$45.01
RECLAIMERS <i>OPERATING ENGINEERS LOCAL 4</i>	06/01/2024	\$55.41	\$15.30	\$16.40	\$0.00	\$87.11
	12/01/2024	\$56.85	\$15.30	\$16.40	\$0.00	\$88.55
	06/01/2025	\$58.13	\$15.30	\$16.40	\$0.00	\$89.83
	12/01/2025	\$59.57	\$15.30	\$16.40	\$0.00	\$91.27
	06/01/2026	\$60.85	\$15.30	\$16.40	\$0.00	\$92.55
	12/01/2026	\$62.29	\$15.30	\$16.40	\$0.00	\$93.99
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
RIDE-ON MOTORIZED BUGGY OPERATOR <i>LABORERS - ZONE 2</i>	12/01/2023	\$38.11	\$9.65	\$17.14	\$0.00	\$64.90
For apprentice rates see "Apprentice- LABORER"						
ROLLER/SPREADER/MULCHING MACHINE <i>OPERATING ENGINEERS LOCAL 4</i>	06/01/2024	\$55.41	\$15.30	\$16.40	\$0.00	\$87.11
	12/01/2024	\$56.85	\$15.30	\$16.40	\$0.00	\$88.55
	06/01/2025	\$58.13	\$15.30	\$16.40	\$0.00	\$89.83
	12/01/2025	\$59.57	\$15.30	\$16.40	\$0.00	\$91.27
	06/01/2026	\$60.85	\$15.30	\$16.40	\$0.00	\$92.55
	12/01/2026	\$62.29	\$15.30	\$16.40	\$0.00	\$93.99
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
ROOFER (Inc.Roofers Waterproofing &Roofers Damproofg) <i>ROOFERS LOCAL 33</i>	02/01/2024	\$50.03	\$12.78	\$21.45	\$0.00	\$84.26
	08/01/2024	\$51.53	\$12.78	\$21.45	\$0.00	\$85.76
	02/01/2025	\$52.78	\$12.78	\$21.45	\$0.00	\$87.01
	08/01/2025	\$54.28	\$12.78	\$21.45	\$0.00	\$88.51
	02/01/2026	\$55.53	\$12.78	\$21.45	\$0.00	\$89.76

<b>Classification</b>	<b>Effective Date</b>	<b>Base Wage</b>	<b>Health</b>	<b>Pension</b>	<b>Supplemental Unemployment</b>	<b>Total Rate</b>
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**Apprentice - ROOFER - Local 33**

**Effective Date - 02/01/2024**

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$25.02	\$12.78	\$6.21	\$0.00	\$44.01
2	60	\$30.02	\$12.78	\$21.45	\$0.00	\$64.25
3	65	\$32.52	\$12.78	\$21.45	\$0.00	\$66.75
4	75	\$37.52	\$12.78	\$21.45	\$0.00	\$71.75
5	85	\$42.53	\$12.78	\$21.45	\$0.00	\$76.76

**Effective Date - 08/01/2024**

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$25.77	\$12.78	\$6.21	\$0.00	\$44.76
2	60	\$30.92	\$12.78	\$21.45	\$0.00	\$65.15
3	65	\$33.49	\$12.78	\$21.45	\$0.00	\$67.72
4	75	\$38.65	\$12.78	\$21.45	\$0.00	\$72.88
5	85	\$43.80	\$12.78	\$21.45	\$0.00	\$78.03

**Notes:** \*\* 1:5, 2:6-10, the 1:10; Reroofing: 1:4, then 1:1  
 Step 1 is 2000 hrs.; Steps 2-5 are 1000 hrs.  
 (Hot Pitch Mechanics' receive \$1.00 hr. above ROOFER)

**Apprentice to Journeyworker Ratio:\*\***

ROOFER SLATE / TILE / PRECAST CONCRETE	02/01/2024	\$50.28	\$12.78	\$21.45	\$0.00	\$84.51
ROOFERS LOCAL 33	08/01/2024	\$51.78	\$12.78	\$21.45	\$0.00	\$86.01
	02/01/2025	\$53.03	\$12.78	\$21.45	\$0.00	\$87.26
	08/01/2025	\$54.53	\$12.78	\$21.45	\$0.00	\$88.76
	02/01/2026	\$55.78	\$12.78	\$21.45	\$0.00	\$90.01
For apprentice rates see "Apprentice- ROOFER"						
SHEETMETAL WORKER	07/01/2024	\$40.98	\$12.20	\$18.74	\$2.13	\$74.05
SHEETMETAL WORKERS LOCAL 63	01/01/2025	\$42.23	\$12.20	\$18.74	\$2.13	\$75.30

Classification

Effective Date Base Wage Health Pension Supplemental Unemployment Total Rate

**Apprentice - SHEET METAL WORKER - Local 63**

**Effective Date - 07/01/2024**

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	45	\$18.44	\$5.49	\$4.86	\$0.85	\$29.64
2	50	\$20.49	\$6.10	\$5.40	\$0.94	\$32.93
3	55	\$22.54	\$6.71	\$9.71	\$1.15	\$40.11
4	60	\$24.59	\$7.32	\$9.71	\$1.23	\$42.85
5	65	\$26.64	\$7.93	\$9.71	\$1.31	\$45.59
6	70	\$28.69	\$8.54	\$9.71	\$1.39	\$48.33
7	75	\$30.74	\$9.15	\$9.71	\$1.47	\$51.07
8	80	\$32.78	\$9.76	\$17.66	\$1.78	\$61.98
9	85	\$34.83	\$10.37	\$17.66	\$1.86	\$64.72
10	90	\$36.88	\$10.98	\$17.66	\$1.94	\$67.46

**Effective Date - 01/01/2025**

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	45	\$19.00	\$5.49	\$4.86	\$0.85	\$30.20
2	50	\$21.12	\$6.10	\$5.40	\$0.94	\$33.56
3	55	\$23.23	\$6.71	\$9.71	\$1.15	\$40.80
4	60	\$25.34	\$7.32	\$9.71	\$1.23	\$43.60
5	65	\$27.45	\$7.93	\$9.71	\$1.31	\$46.40
6	70	\$29.56	\$8.54	\$9.71	\$1.39	\$49.20
7	75	\$31.67	\$9.15	\$9.71	\$1.47	\$52.00
8	80	\$33.78	\$9.76	\$17.66	\$1.78	\$62.98
9	85	\$35.90	\$10.37	\$17.66	\$1.86	\$65.79
10	90	\$38.01	\$10.98	\$17.66	\$1.94	\$68.59

**Notes:**

**Apprentice to Journeyworker Ratio:1:3**

SPECIALIZED EARTH MOVING EQUIP < 35 TONS	06/01/2024	\$40.24	\$15.07	\$18.67	\$0.00	\$73.98
TEAMSTERS JOINT COUNCIL NO. 10 ZONE B	12/01/2024	\$40.24	\$15.07	\$20.17	\$0.00	\$75.48
	01/01/2025	\$40.24	\$15.57	\$20.17	\$0.00	\$75.98
	06/01/2025	\$41.24	\$15.57	\$20.17	\$0.00	\$76.98
	12/01/2025	\$41.24	\$15.57	\$21.78	\$0.00	\$78.59
	01/01/2026	\$41.24	\$16.17	\$21.78	\$0.00	\$79.19
	06/01/2026	\$42.24	\$16.17	\$21.78	\$0.00	\$80.19
	12/01/2026	\$42.24	\$16.17	\$23.52	\$0.00	\$81.93
	01/01/2027	\$42.24	\$16.77	\$23.52	\$0.00	\$82.53

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
SPECIALIZED EARTH MOVING EQUIP > 35 TONS <i>TEAMSTERS JOINT COUNCIL NO. 10 ZONE B</i>	06/01/2024	\$40.53	\$15.07	\$18.67	\$0.00	\$74.27
	12/01/2024	\$40.53	\$15.07	\$20.17	\$0.00	\$75.77
	01/01/2025	\$40.53	\$15.57	\$20.17	\$0.00	\$76.27
	06/01/2025	\$41.53	\$15.57	\$20.17	\$0.00	\$77.27
	12/01/2025	\$41.53	\$15.57	\$21.78	\$0.00	\$78.88
	01/01/2026	\$41.53	\$16.17	\$21.78	\$0.00	\$79.48
	06/01/2026	\$42.53	\$16.17	\$21.78	\$0.00	\$80.48
	12/01/2026	\$42.53	\$16.17	\$23.52	\$0.00	\$82.22
	01/01/2027	\$42.53	\$16.77	\$23.52	\$0.00	\$82.82
SPRINKLER FITTER <i>SPRINKLER FITTERS LOCAL 669</i>	04/01/2023	\$47.43	\$11.45	\$16.61	\$0.00	\$75.49

**Apprentice - SPRINKLER FITTER - Local 669**

Effective Date - 04/01/2023

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	45	\$21.34	\$8.22	\$0.00	\$0.00	\$29.56
2	50	\$23.72	\$8.22	\$0.00	\$0.00	\$31.94
3	55	\$26.09	\$11.45	\$7.20	\$0.00	\$44.74
4	60	\$28.46	\$11.45	\$8.35	\$0.00	\$48.26
5	65	\$30.83	\$11.45	\$8.35	\$0.00	\$50.63
6	70	\$33.20	\$11.45	\$8.60	\$0.00	\$53.25
7	75	\$35.57	\$11.45	\$8.60	\$0.00	\$55.62
8	80	\$37.94	\$11.45	\$8.60	\$0.00	\$57.99
9	85	\$40.32	\$11.45	\$8.60	\$0.00	\$60.37
10	90	\$42.69	\$11.45	\$8.60	\$0.00	\$62.74

Notes:

Apprentice to Journeyworker Ratio:1:1

STEAM BOILER OPERATOR <i>OPERATING ENGINEERS LOCAL 4</i>	06/01/2024	\$55.41	\$15.30	\$16.40	\$0.00	\$87.11
	12/01/2024	\$56.85	\$15.30	\$16.40	\$0.00	\$88.55
	06/01/2025	\$58.13	\$15.30	\$16.40	\$0.00	\$89.83
	12/01/2025	\$59.57	\$15.30	\$16.40	\$0.00	\$91.27
	06/01/2026	\$60.85	\$15.30	\$16.40	\$0.00	\$92.55
	12/01/2026	\$62.29	\$15.30	\$16.40	\$0.00	\$93.99

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

TAMPERS, SELF-PROPELLED OR TRACTOR DRAWN <i>OPERATING ENGINEERS LOCAL 4</i>	06/01/2024	\$55.41	\$15.30	\$16.40	\$0.00	\$87.11
	12/01/2024	\$56.85	\$15.30	\$16.40	\$0.00	\$88.55
	06/01/2025	\$58.13	\$15.30	\$16.40	\$0.00	\$89.83
	12/01/2025	\$59.57	\$15.30	\$16.40	\$0.00	\$91.27
	06/01/2026	\$60.85	\$15.30	\$16.40	\$0.00	\$92.55
	12/01/2026	\$62.29	\$15.30	\$16.40	\$0.00	\$93.99

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
TERRAZZO FINISHERS <i>BRICKLAYERS LOCAL 3 - MARBLE &amp; TILE</i>	02/01/2024	\$61.34	\$11.49	\$23.59	\$0.00	\$96.42
	08/01/2024	\$63.44	\$11.49	\$23.59	\$0.00	\$98.52
	02/01/2025	\$64.74	\$11.49	\$23.59	\$0.00	\$99.82
	08/01/2025	\$66.89	\$11.49	\$23.59	\$0.00	\$101.97
	02/01/2026	\$68.24	\$11.49	\$23.59	\$0.00	\$103.32
	08/01/2026	\$70.44	\$11.49	\$23.59	\$0.00	\$105.52
	02/01/2027	\$71.84	\$11.49	\$23.59	\$0.00	\$106.92

**Apprentice - TERRAZZO FINISHER - Local 3 Marble & Tile**

**Effective Date - 02/01/2024**

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$30.67	\$11.49	\$23.59	\$0.00	\$65.75
2	60	\$36.80	\$11.49	\$23.59	\$0.00	\$71.88
3	70	\$42.94	\$11.49	\$23.59	\$0.00	\$78.02
4	80	\$49.07	\$11.49	\$23.59	\$0.00	\$84.15
5	90	\$55.21	\$11.49	\$23.59	\$0.00	\$90.29

**Effective Date - 08/01/2024**

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$31.72	\$11.49	\$23.59	\$0.00	\$66.80
2	60	\$38.06	\$11.49	\$23.59	\$0.00	\$73.14
3	70	\$44.41	\$11.49	\$23.59	\$0.00	\$79.49
4	80	\$50.75	\$11.49	\$23.59	\$0.00	\$85.83
5	90	\$57.10	\$11.49	\$23.59	\$0.00	\$92.18

**Notes:**

**Apprentice to Journeyworker Ratio:1:3**

TEST BORING DRILLER <i>LABORERS - FOUNDATION AND MARINE</i>	06/01/2024	\$49.81	\$9.65	\$18.22	\$0.00	\$77.68
	12/01/2024	\$51.28	\$9.65	\$18.22	\$0.00	\$79.15
	06/01/2025	\$52.78	\$9.65	\$18.22	\$0.00	\$80.65
	12/01/2025	\$54.28	\$9.65	\$18.22	\$0.00	\$82.15
	06/01/2026	\$55.83	\$9.65	\$18.22	\$0.00	\$83.70
	12/01/2026	\$57.33	\$9.65	\$18.22	\$0.00	\$85.20

For apprentice rates see "Apprentice- LABORER"

TEST BORING DRILLER HELPER <i>LABORERS - FOUNDATION AND MARINE</i>	06/01/2024	\$45.60	\$9.65	\$18.22	\$0.00	\$73.47
	12/01/2024	\$47.07	\$9.65	\$18.22	\$0.00	\$74.94
	06/01/2025	\$48.57	\$9.65	\$18.22	\$0.00	\$76.44
	12/01/2025	\$50.07	\$9.65	\$18.22	\$0.00	\$77.94
	06/01/2026	\$51.62	\$9.65	\$18.22	\$0.00	\$79.49
	12/01/2026	\$53.12	\$9.65	\$18.22	\$0.00	\$80.99

For apprentice rates see "Apprentice- LABORER"

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
TEST BORING LABORER <i>LABORERS - FOUNDATION AND MARINE</i>	06/01/2024	\$45.48	\$9.65	\$18.22	\$0.00	\$73.35
	12/01/2024	\$46.95	\$9.65	\$18.22	\$0.00	\$74.82
	06/01/2025	\$48.45	\$9.65	\$18.22	\$0.00	\$76.32
	12/01/2025	\$49.95	\$9.65	\$18.22	\$0.00	\$77.82
	06/01/2026	\$51.50	\$9.65	\$18.22	\$0.00	\$79.37
	12/01/2026	\$53.00	\$9.65	\$18.22	\$0.00	\$80.87
For apprentice rates see "Apprentice- LABORER"						
TRACTORS/PORTABLE STEAM GENERATORS <i>OPERATING ENGINEERS LOCAL 4</i>	06/01/2024	\$55.41	\$15.30	\$16.40	\$0.00	\$87.11
	12/01/2024	\$56.85	\$15.30	\$16.40	\$0.00	\$88.55
	06/01/2025	\$58.13	\$15.30	\$16.40	\$0.00	\$89.83
	12/01/2025	\$59.57	\$15.30	\$16.40	\$0.00	\$91.27
	06/01/2026	\$60.85	\$15.30	\$16.40	\$0.00	\$92.55
	12/01/2026	\$62.29	\$15.30	\$16.40	\$0.00	\$93.99
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
TRAILERS FOR EARTH MOVING EQUIPMENT <i>TEAMSTERS JOINT COUNCIL NO. 10 ZONE B</i>	06/01/2024	\$40.82	\$15.07	\$18.67	\$0.00	\$74.56
	12/01/2024	\$40.82	\$15.07	\$20.17	\$0.00	\$76.06
	01/01/2025	\$40.82	\$15.57	\$20.17	\$0.00	\$76.56
	06/01/2025	\$41.82	\$15.57	\$20.17	\$0.00	\$77.56
	12/01/2025	\$41.82	\$15.57	\$21.78	\$0.00	\$79.17
	01/01/2026	\$41.82	\$16.17	\$21.78	\$0.00	\$79.77
	06/01/2026	\$42.82	\$16.17	\$21.78	\$0.00	\$80.77
	12/01/2026	\$42.82	\$16.17	\$23.52	\$0.00	\$82.51
01/01/2027	\$42.82	\$16.77	\$23.52	\$0.00	\$83.11	
TUNNEL WORK - COMPRESSED AIR <i>LABORERS (COMPRESSED AIR)</i>	06/01/2024	\$57.71	\$9.65	\$19.00	\$0.00	\$86.36
	12/01/2024	\$59.18	\$9.65	\$19.00	\$0.00	\$87.83
	06/01/2025	\$60.68	\$9.65	\$19.00	\$0.00	\$89.33
	12/01/2025	\$62.18	\$9.65	\$19.00	\$0.00	\$90.83
	06/01/2026	\$63.73	\$9.65	\$19.00	\$0.00	\$92.38
	12/01/2026	\$65.23	\$9.65	\$19.00	\$0.00	\$93.88
For apprentice rates see "Apprentice- LABORER"						
TUNNEL WORK - COMPRESSED AIR (HAZ. WASTE) <i>LABORERS (COMPRESSED AIR)</i>	06/01/2024	\$59.71	\$9.65	\$19.00	\$0.00	\$88.36
	12/01/2024	\$61.18	\$9.65	\$19.00	\$0.00	\$89.83
	06/01/2025	\$62.68	\$9.65	\$19.00	\$0.00	\$91.33
	12/01/2025	\$64.18	\$9.65	\$19.00	\$0.00	\$92.83
	06/01/2026	\$65.73	\$9.65	\$19.00	\$0.00	\$94.38
	12/01/2026	\$67.23	\$9.65	\$19.00	\$0.00	\$95.88
For apprentice rates see "Apprentice- LABORER"						
TUNNEL WORK - FREE AIR <i>LABORERS (FREE AIR TUNNEL)</i>	06/01/2024	\$49.78	\$9.65	\$19.00	\$0.00	\$78.43
	12/01/2024	\$51.25	\$9.65	\$19.00	\$0.00	\$79.90
	06/01/2025	\$52.75	\$9.65	\$19.00	\$0.00	\$81.40
	12/01/2025	\$54.25	\$9.65	\$19.00	\$0.00	\$82.90
	06/01/2026	\$55.80	\$9.65	\$19.00	\$0.00	\$84.45
	12/01/2026	\$57.30	\$9.65	\$19.00	\$0.00	\$85.95
For apprentice rates see "Apprentice- LABORER"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
TUNNEL WORK - FREE AIR (HAZ. WASTE) <i>LABORERS (FREE AIR TUNNEL)</i>	06/01/2024	\$51.78	\$9.65	\$19.00	\$0.00	\$80.43
	12/01/2024	\$53.25	\$9.65	\$19.00	\$0.00	\$81.90
	06/01/2025	\$54.75	\$9.65	\$19.00	\$0.00	\$83.40
	12/01/2025	\$56.25	\$9.65	\$19.00	\$0.00	\$84.90
	06/01/2026	\$57.80	\$9.65	\$19.00	\$0.00	\$86.45
	12/01/2026	\$59.30	\$9.65	\$19.00	\$0.00	\$87.95
For apprentice rates see "Apprentice- LABORER"						
VAC-HAUL <i>TEAMSTERS JOINT COUNCIL NO. 10 ZONE B</i>	06/01/2024	\$40.24	\$15.07	\$18.67	\$0.00	\$73.98
	12/01/2024	\$40.24	\$15.07	\$20.17	\$0.00	\$75.48
	01/01/2025	\$40.24	\$15.57	\$20.17	\$0.00	\$75.98
	06/01/2025	\$41.24	\$15.57	\$20.17	\$0.00	\$76.98
	12/01/2025	\$41.24	\$15.57	\$21.78	\$0.00	\$78.59
	01/01/2026	\$41.24	\$16.17	\$21.78	\$0.00	\$79.19
	06/01/2026	\$42.24	\$16.17	\$21.78	\$0.00	\$80.19
	12/01/2026	\$42.24	\$16.17	\$23.52	\$0.00	\$81.93
01/01/2027	\$42.24	\$16.77	\$23.52	\$0.00	\$82.53	
VOICE-DATA-VIDEO TECHNICIAN <i>ELECTRICIANS LOCAL 96</i>	09/03/2023	\$34.49	\$13.00	\$17.22	\$0.00	\$64.71
	09/01/2024	\$35.29	\$13.99	\$17.57	\$0.00	\$66.85
	09/07/2025	\$36.12	\$14.98	\$17.91	\$0.00	\$69.01
	09/06/2026	\$37.04	\$15.96	\$18.27	\$0.00	\$71.27



<b>Classification</b>	<b>Effective Date</b>	<b>Base Wage</b>	<b>Health</b>	<b>Pension</b>	<b>Supplemental Unemployment</b>	<b>Total Rate</b>
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**Apprentice - VOICE-DATA-VIDEO TECHNICIAN - Local 96**

**Effective Date - 09/03/2023**

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$17.25	\$13.00	\$4.31	\$0.00	\$34.56
2	55	\$18.97	\$13.00	\$4.36	\$0.00	\$36.33
3	60	\$20.69	\$13.00	\$16.81	\$0.00	\$50.50
4	65	\$22.42	\$13.00	\$16.86	\$0.00	\$52.28
5	70	\$24.14	\$13.00	\$16.91	\$0.00	\$54.05
6	75	\$25.87	\$13.00	\$16.97	\$0.00	\$55.84
7	80	\$27.59	\$13.00	\$17.02	\$0.00	\$57.61
8	85	\$29.32	\$13.00	\$17.07	\$0.00	\$59.39

**Effective Date - 09/01/2024**

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$17.65	\$13.99	\$4.41	\$0.00	\$36.05
2	55	\$19.41	\$13.99	\$4.46	\$0.00	\$37.86
3	60	\$21.17	\$13.99	\$17.15	\$0.00	\$52.31
4	65	\$22.94	\$13.99	\$17.20	\$0.00	\$54.13
5	70	\$24.70	\$13.99	\$17.25	\$0.00	\$55.94
6	75	\$26.47	\$13.99	\$17.30	\$0.00	\$57.76
7	80	\$28.23	\$13.99	\$17.36	\$0.00	\$59.58
8	85	\$30.00	\$13.99	\$17.41	\$0.00	\$61.40

**Notes:**

**Apprentice to Journeyworker Ratio:1:1**

WAGON DRILL OPERATOR <i>LABORERS - ZONE 2</i>	12/01/2023	\$38.11	\$9.65	\$17.14	\$0.00	\$64.90
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For apprentice rates see "Apprentice- LABORER"

WAGON DRILL OPERATOR (HEAVY & HIGHWAY) <i>LABORERS - ZONE 2 (HEAVY &amp; HIGHWAY)</i>	06/01/2024	\$38.78	\$9.65	\$17.80	\$0.00	\$66.23
	12/01/2024	\$40.11	\$9.65	\$17.80	\$0.00	\$67.56
	06/01/2025	\$41.50	\$9.65	\$17.80	\$0.00	\$68.95
	12/01/2025	\$42.88	\$9.65	\$17.80	\$0.00	\$70.33
	06/01/2026	\$44.32	\$9.65	\$17.80	\$0.00	\$71.77
	12/01/2026	\$45.76	\$9.65	\$17.80	\$0.00	\$73.21

For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"

WASTE WATER PUMP OPERATOR <i>OPERATING ENGINEERS LOCAL 4</i>	06/01/2024	\$56.03	\$15.30	\$16.40	\$0.00	\$87.73
	12/01/2024	\$57.48	\$15.30	\$16.40	\$0.00	\$89.18
	06/01/2025	\$58.78	\$15.30	\$16.40	\$0.00	\$90.48
	12/01/2025	\$60.23	\$15.30	\$16.40	\$0.00	\$91.93
	06/01/2026	\$61.53	\$15.30	\$16.40	\$0.00	\$93.23
	12/01/2026	\$62.98	\$15.30	\$16.40	\$0.00	\$94.68

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
WATER METER INSTALLER <i>PLUMBERS LOCAL 4</i>	03/01/2024	\$53.95	\$9.90	\$17.42	\$0.00	\$81.27
	09/01/2024	\$55.35	\$9.90	\$17.42	\$0.00	\$82.67
	03/01/2025	\$56.75	\$9.90	\$17.42	\$0.00	\$84.07
	09/01/2025	\$58.15	\$9.90	\$17.42	\$0.00	\$85.47
	03/01/2026	\$59.55	\$9.90	\$17.42	\$0.00	\$86.87
For apprentice rates see "Apprentice- PLUMBER/PIPEFITTER" or "PLUMBER/GASFITTER"						
<b>Marine Drilling</b>						
BLASTER <i>MARINE DRILLING</i>	01/01/2018	\$41.82	\$7.63	\$3.60	\$0.00	\$53.05
BOAT CAPTAIN <i>MARINE DRILLING</i>	01/01/2018	\$33.87	\$7.63	\$3.30	\$0.00	\$44.80
BOAT CAPTAIN / Over 1,000 hp <i>MARINE DRILLING</i>	01/01/2018	\$38.06	\$7.63	\$3.60	\$0.00	\$49.29
CORE DRILLER <i>MARINE DRILLING</i>	01/01/2018	\$31.43	\$7.63	\$2.90	\$0.00	\$41.96
CORE DRILLER HELPER <i>MARINE DRILLING</i>	01/01/2018	\$28.47	\$7.63	\$3.00	\$0.00	\$39.10
DRILLER <i>MARINE DRILLING</i>	01/01/2018	\$39.70	\$7.63	\$3.60	\$0.00	\$50.93
ENGINEER <i>MARINE DRILLING</i>	01/01/2018	\$39.69	\$7.63	\$3.50	\$0.00	\$50.82
HELPER <i>MARINE DRILLING</i>	01/01/2018	\$34.24	\$7.63	\$3.00	\$0.00	\$44.87
MACHINIST <i>MARINE DRILLING</i>	01/01/2018	\$38.88	\$7.63	\$3.30	\$0.00	\$49.81
OILER - MARINE DRILLING <i>MARINE DRILLING</i>	01/01/2018	\$34.24	\$7.63	\$3.00	\$0.00	\$44.87
TUG DECKHAND <i>MARINE DRILLING</i>	01/01/2018	\$27.61	\$7.63	\$3.00	\$0.00	\$38.24
WELDER <i>MARINE DRILLING</i>	01/01/2018	\$38.88	\$7.63	\$3.30	\$0.00	\$49.81
<b>Op Eng Marine (Dredging Work)</b>						
BOAT OPERATOR <i>OPERATING ENGINEERS - MARINE DIVISION</i>	10/01/2017	\$29.26	\$7.63	\$3.30	\$0.00	\$40.19
CERTIFIED WELDER <i>OPERATING ENGINEERS - MARINE DIVISION</i>	10/01/2017	\$31.09	\$7.63	\$3.60	\$0.00	\$42.32
CHIEF WELDER/ CHIEF MATE <i>OPERATING ENGINEERS - MARINE DIVISION</i>	10/01/2017	\$33.02	\$7.63	\$3.60	\$0.00	\$44.25
DERRICK / SPIDER / SPILLBARGE OPERATOR <i>OPERATING ENGINEERS - MARINE DIVISION</i>	10/01/2017	\$33.02	\$7.63	\$3.60	\$0.00	\$44.25
DRAG BARGE OPERATOR / WELDER / MATE <i>OPERATING ENGINEERS - MARINE DIVISION</i>	10/01/2017	\$30.24	\$7.63	\$3.30	\$0.00	\$41.17
ENGINEER / ELECTRICIAN <i>OPERATING ENGINEERS - MARINE DIVISION</i>	10/01/2017	\$33.02	\$7.63	\$3.60	\$0.00	\$44.25
LICENSED BOAT OPERATOR <i>OPERATING ENGINEERS - MARINE DIVISION</i>	10/01/2017	\$33.02	\$7.63	\$3.60	\$0.00	\$44.25
LICENSED TUG OPERATOR OVER 1000HP <i>OPERATING ENGINEERS - MARINE DIVISION</i>	10/01/2017	\$38.18	\$7.63	\$3.60	\$0.00	\$49.41
MAINTENANCE ENGINEER <i>OPERATING ENGINEERS - MARINE DIVISION</i>	10/01/2017	\$33.03	\$7.63	\$3.60	\$0.00	\$44.26

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
OILER - MARINE DIVISION <i>OPERATING ENGINEERS - MARINE DIVISION</i>	10/01/2017	\$24.30	\$7.63	\$3.00	\$0.00	\$34.93
OPERATOR / LEVERMAN <i>OPERATING ENGINEERS - MARINE DIVISION</i>	10/01/2017	\$38.18	\$7.63	\$3.60	\$0.00	\$49.41
RODMAN / SCOWMAN <i>OPERATING ENGINEERS - MARINE DIVISION</i>	10/01/2017	\$24.30	\$7.63	\$3.00	\$0.00	\$34.93
SHOREMAN / DECKHAND <i>OPERATING ENGINEERS - MARINE DIVISION</i>	10/01/2017	\$24.30	\$7.63	\$3.00	\$0.00	\$34.93
<b>Outside Electrical - East</b>						
CABLE TECHNICIAN (Power Zone) <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>	08/30/2020	\$29.67	\$9.25	\$1.89	\$0.00	\$40.81
For apprentice rates see "Apprentice- LINEMAN"						
CABLEMAN (Underground Ducts & Cables) <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>	08/30/2020	\$42.03	\$9.25	\$10.27	\$0.00	\$61.55
For apprentice rates see "Apprentice- LINEMAN"						
DRIVER / GROUNDMAN CDL <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>	08/30/2020	\$34.62	\$9.25	\$10.07	\$0.00	\$53.94
For apprentice rates see "Apprentice- LINEMAN"						
DRIVER / GROUNDMAN -Inexperienced (<2000 Hrs) <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>	08/30/2020	\$27.20	\$9.25	\$1.82	\$0.00	\$38.27
For apprentice rates see "Apprentice- LINEMAN"						
EQUIPMENT OPERATOR (Class A CDL) <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>	08/30/2020	\$42.03	\$9.25	\$14.35	\$0.00	\$65.63
For apprentice rates see "Apprentice- LINEMAN"						
EQUIPMENT OPERATOR (Class B CDL) <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>	08/30/2020	\$37.09	\$9.25	\$10.87	\$0.00	\$57.21
For apprentice rates see "Apprentice- LINEMAN"						
GROUNDMAN <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>	08/30/2020	\$27.20	\$9.25	\$1.82	\$0.00	\$38.27
For apprentice rates see "Apprentice- LINEMAN"						
GROUNDMAN -Inexperienced (<2000 Hrs.) <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>	08/30/2020	\$22.25	\$9.25	\$1.82	\$0.00	\$33.32
For apprentice rates see "Apprentice- LINEMAN"						
JOURNEYMAN LINEMAN <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>	08/30/2020	\$49.45	\$9.25	\$17.48	\$0.00	\$76.18

<b>Classification</b>	<b>Effective Date</b>	<b>Base Wage</b>	<b>Health</b>	<b>Pension</b>	<b>Supplemental Unemployment</b>	<b>Total Rate</b>
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**Apprentice - LINEMAN (Outside Electrical) - East Local 104**

**Effective Date - 08/30/2020**

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	\$29.67	\$9.25	\$3.39	\$0.00	\$42.31
2	65	\$32.14	\$9.25	\$3.46	\$0.00	\$44.85
3	70	\$34.62	\$9.25	\$3.54	\$0.00	\$47.41
4	75	\$37.09	\$9.25	\$5.11	\$0.00	\$51.45
5	80	\$39.56	\$9.25	\$5.19	\$0.00	\$54.00
6	85	\$42.03	\$9.25	\$5.26	\$0.00	\$56.54
7	90	\$44.51	\$9.25	\$7.34	\$0.00	\$61.10

**Notes:**

**Apprentice to Journeyworker Ratio:1:2**

TELEDATA CABLE SPLICER <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>	02/04/2019	\$30.73	\$4.70	\$3.17	\$0.00	\$38.60
TELEDATA LINEMAN/EQUIPMENT OPERATOR <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>	02/04/2019	\$28.93	\$4.70	\$3.14	\$0.00	\$36.77
TELEDATA WIREMAN/INSTALLER/TECHNICIAN <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>	02/04/2019	\$28.93	\$4.70	\$3.14	\$0.00	\$36.77

**Additional Apprentice Information:**

Minimum wage rates for apprentices employed on public works projects are listed above as a percentage of the pre-determined hourly wage rate established by the Commissioner under the provisions of the M.G.L. c. 149, ss. 26-27D. Apprentice ratios are established by the Division of Apprenticeship Training pursuant to M.G.L. c. 23, ss. 11E-11L.

All apprentices must be registered with the Division of Apprenticeship Training in accordance with M.G.L. c. 23, ss. 11E-11L.

All steps are six months (1000 hours.)

Ratios are expressed in allowable number of apprentices to journeymen or fraction thereof, unless otherwise specified.

\*\* Multiple ratios are listed in the comment field.

\*\*\* APP to JM; 1:1, 2:2, 2:3, 3:4, 4:4, 4:5, 4:6, 5:7, 6:7, 6:8, 6:9, 7:10, 8:10, 8:11, 8:12, 9:13, 10:13, 10:14, etc.

\*\*\*\* APP to JM; 1:1, 1:2, 2:3, 2:4, 3:5, 4:6, 4:7, 5:8, 6:9, 6:10, 7:11, 8:12, 8:13, 9:14, 10:15, 10:16, etc.

## DOCUMENT 00870

STANDARD FEDERAL EQUAL EMPLOYMENT OPPORTUNITY CONSTRUCTION CONTRACT  
SPECIFICATIONS

(EXECUTIVE ORDER 11246)

Revised April 9, 2019

1. As used in these specifications:
  - a. "Covered area" means the geographical area described in the solicitation from which this contract resulted:
  - b. "Director" means Director, Office of Federal Contract Compliance Programs, United States Department of Labor, or any person to whom the Director delegates authority.
  - c. "Employer identification number" means the Federal Social Security number used on the Employer's Quarterly Federal Tax Return, U.S. Treasury Department Form 941.
  - d. "Minority" includes:
    - (i) Black (all persons having origins in any of the black African racial groups not of Hispanic origin);
    - (ii) Hispanic (all persons of Mexican, Puerto Rican, Cuban, Central or South American or other Spanish Culture or origin, regardless of race);
    - (iii) Asian and Pacific Islander (all persons having origins in any of the original peoples of the Far East, Southeast Asia, the Indian Subcontinent, or the Pacific Islands); and
    - (iv) American Indian or Alaskan Native (all persons having origins in any of the original peoples of North America and maintaining identifiable tribal affiliations through membership and participation or community identification).
2. 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 the specifications and the Notice which contains the applicable goals for minority and female participation and which is set forth in the solicitations from which this contract resulted.
3. 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 Plan does not excuse any covered Contractor's or Subcontractor's failure to take good faith efforts to achieve the Plan goals and timetables.
4. The Contractor shall implement the specific affirmative action standards provided in Paragraphs 7a 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. The Contractor is expected to make substantially uniform progress toward its goals in each craft during the period specified.
5. 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 thereto.

6. 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.
7. 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 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 therefor, 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 woman 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 7b 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's 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 review of these items with on-site supervisory personnel such as Superintendents, General Foremen, 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 nonsegregated 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 supervisor's adherence to and performance under the Contractor's EEO policies and affirmative action obligations.
8. Contractors are encouraged to participate in voluntary associations which assist in fulfilling one or more of their affirmative action obligations (7a 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 7a 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 its 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.
  9. 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 the Executive Order 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 underutilized).
  10. The Contractor shall not use the goals and timetables of affirmative action standards to discriminate against any person because of race, color, religion, sex, or national origin.
  11. The Contractor shall not enter into any Subcontract with any person or firm debarred from Government contracts pursuant to Executive Order 11246.

12. 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.
13. The Contractor, in fulfilling its obligations under these specifications, shall implement specific affirmative action steps, at least as extensive as those standards prescribed in paragraph 7 of 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.
14. 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 many be required by the Government and 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.
15. Nothing herein provided shall be construed as a limitation upon the application of other 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).



APPENDIX A

The following goals and timetables for female utilization shall be included in all Federal and federally assisted construction contracts and subcontracts in excess of \$ 10,000. The goals are applicable to the Contractor's aggregate on-site construction workforce whether or not part of that workforce is performing work on a Federal or federally-assisted construction contract or subcontract.

Area covered: Goal for Women apply nationwide

Goals and Timetables

Timetable

Goals (percent)

From Apr. 1, 1980 until further notice

6.9

APPENDIX B-80

Until further notice, the following goals for minority utilization in each construction craft and trade shall included in all Federal or federally assisted construction contracts and subcontracts in excess of \$ 10,000 to be performed in the respective geographical areas. The goals are applicable to each nonexempt contractor's total on- site construction workforce, regardless of whether or not part of that workforce is performing work on a Federal, federally assisted or nonfederally related project, contract or subcontract.

Construction contractors participating in an approved Hometown Plan (see 41 CFR 6-4.5) are required to comply with the goals of the Hometown Plan with regard to construction work they perform in the area covered by the Hometown Plan. With regard to all their other covered construction work, such contractors are required to comply with the applicable SMSA or EA goal contained in this Appendix B-80.

Economic Areas

<u>STATE:</u>	<u>Goals (percent)</u>
MASSACHUSETTS	
004 Boston MA:	
SMSA Counties:	
1123 Boston-Lowell-Brockton-Lawrence-Haverhill, MA-NH	4.0
MA Essex, MA Middlesex, MA Norfolk, MA Plymouth, MA Suffolk, NH Rockingham.	
5403 Fall River- New Bedford MA, Bristol	1.6
9243 Worcester-Fitchburg-Leominster, MA	1.6
6323 Springfield-Chicopee-Holyoke MA-CT MA Hampden, MA Hampshire	4.8
Non-SMSA Counties: MA Barnstable, MA Dukes, MA Nantucket	3.6
Non-SMSA Counties: MA Franklin	5.9

## APPENDIX C

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 (hereinafter includes consultants) will comply with the Acts and Regulations relative to Non-discrimination in Federally-assisted programs of the U.S. Department of Transportation, Federal Highway Administration (FHWA), as they may be amended from time to time, which are herein incorporated by reference and made a part of this contract.
2. **Non-discrimination:** The contractor, with regard to the work performed by it during the contract, will not discriminate on the grounds of race, color, national origin (including limited English proficiency), age, sex, disability, or low-income status in the selection and retention of subcontractors, including procurements of materials and leases of equipment. The contractor will not participate directly or indirectly in the discrimination prohibited by the Acts and the Regulations, including employment practices when the contract covers any activity, project, or program set forth in Appendix B of 49 CFR Part 21.
3. **Solicitations for Subcontractors, 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 will be notified by the contractor of the contractor’s obligations under this contract and the Acts and the Regulations relative to nondiscrimination on the grounds of race, color, national origin (including limited English proficiency), age, sex, disability, or low-income status.
4. **Information and Reports:** The contractor will provide all information and reports required by the Acts, the Regulations, and directives issued pursuant thereto, and will permit access to its books, records, accounts, other sources of information, and its facilities as may be determined by the Massachusetts Department of Transportation (MassDOT) or FHWA to be pertinent to ascertain compliance with such Acts, Regulations, and instructions. Where any information required of a contractor is in the exclusive possession of another who fails or refuses to furnish this information, the contractor will so certify to MassDOT or FHWA, as appropriate, and will set forth what efforts it has made to obtain the information.
5. **Sanctions for Noncompliance:** In the event of a contractor’s noncompliance with the Nondiscrimination provisions of this contract, MassDOT will impose such contract sanctions as it or FHWA may determine to be appropriate, including, but not limited to:
  - a. withholding payments to the contractor under the contract until the contractor complies; and/or
  - b. cancelling, terminating, or suspending a control, in whole or in part.
6. **Incorporation of Provisions:** The contractor will include the provisions of paragraphs one through six in every subcontract, including procurements of materials and leases of equipment, unless exempt by the Acts, the Regulations, and directives issued pursuant thereto. The contractor will take action with respect to any subcontract or procurement as MassDOT or FHWA may direct as a means of enforcing such provisions including sanctions for noncompliance. Provided, that if the contractor becomes involved in, or is threatened with litigation by a subcontractor, or supplier because of such direction, the contractor may request MassDOT to enter into any litigation to protect the interests of MassDOT. In addition, the contractor may request the United States to enter into the litigation to protect the interests of the United States.

## APPENDIX D

During the performance of this contract, the contractor, for itself, its assignees, and successors in interest (hereinafter referred to as the “contractor,” which includes consultants) agrees to comply with the following non-discrimination statutes and authorities; including but not limited to:

**PERTINENT NON-DISCRIMINATION AUTHORITIES:**

- Title VI of the Civil Rights Act of 1964 (42 U.S.C. § 2000d *et seq.*, 78 stat. 252) (prohibits discrimination on the basis of race, color, national origin); and 49 CFR Part 21
- The Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (42 U.S.C. § 4601) (prohibits unfair treatment of persons displaced or whose property has been acquired because of Federal or Federal-Aid programs and projects)
- Federal-Aid Highway Act of 1973 (23 U.S.C. § 324 *et seq.*) (prohibits discrimination on the basis of sex)
- Section 504 of the Rehabilitation Act of 1973 (29 U.S.C. § 794 *et seq.*), as amended (prohibits discrimination on the basis of disability) and 49 CFR Part 27
- The Age Discrimination Act of 1975, as amended (42 U.S.C. § 6101 *et seq.*) (prohibits discrimination on the basis of age)
- Airport and Airway Improvement Act of 1982 (49 U.S.C. § 471, Section 47123), as amended (prohibits discrimination based on race, creed, color, national origin, or sex)
- The Civil Rights Restoration Act of 1987 (PL 100-209) (broadened the scope, coverage, and applicability of Title VI of the Civil Rights Act of 1964, the Age Discrimination Act of 1975, and Section 504 of the Rehabilitation Act of 1973, by expanding the definition of the terms “programs or activities” to include all of the programs or activities of Federal-Aid recipients, sub-recipients, and contractors, whether such programs or activities are Federally funded or not)
- Titles II and III of the Americans with Disabilities Act (42 U.S.C. §§ 12131-12189), as implemented by Department of Transportation regulations at 49 CFR parts 37 and 38 (prohibits discrimination on the basis of disability in the operation of public entities, public and private transportation systems, places of public accommodation, and certain testing entities)
- The Federal Aviation Administration’s Non-Discrimination Statute (49 U.S.C. § 47123) (prohibits discrimination on the basis of race, color, national origin, and sex)
- Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations (ensures discrimination against minority populations by discouraging programs, policies, and activities with disproportionately high and adverse human health or environmental effects on minority and low-income populations)
- Executive Order 13166, Improving Access to Services for People with Limited English Proficiency, and resulting agency guidance, national origin discrimination includes discrimination because of limited English proficiency (LEP). To ensure compliance with Title VI, you must take reasonable steps to ensure that LEP persons have meaningful access to your programs (70 Fed. Reg. at 74087 to 74100)
- Title IX of the Education Amendments Act of 1972, as amended (20 U.S.C. 1681 *et seq.*) (prohibits discrimination on the basis of sex in education programs or activities)

\*\*\* END OF DOCUMENT \*\*\*

DOCUMENT 00875  
TRAINEE SPECIAL PROVISIONS  
Revised October, 2016

THE REQUIRED NUMBER OF TRAINEES TO BE TRAINED UNDER THIS CONTRACT WILL BE 3

The contractor shall provide on-the job training aimed at developing full journeyworkers in the type of trade of job classification involved.

In the event that a contractor subcontracts a portion of the contract work, the General Contractor shall determine how many, if any, of the trainees are to be trained by the subcontractor, provided, however, that the contractor shall retain the primary responsibility for meeting the training requirements imposed by this special provision. The contractor shall also insure that this training special provision is made applicable to such subcontract. Where feasible, 25 percent of apprentices or trainees in each occupation shall be in their first year of apprenticeship or training.

The number of trainees shall be distributed among the work classifications on the basis of the contractor's needs and the availability of journeyworkers in the various classifications within a reasonable area of recruitment. Prior to commencing construction, the contractor shall submit to the Massachusetts Department Of Transportation (MassDOT) for approval the number of trainees to be trained in each selected classification and training program to be used. Furthermore, the contractor shall specify the starting time for training in each of the classifications. The contractor will be credited for each trainee employed on the contract work who is currently enrolled or becomes enrolled in an approved program and will be reimbursed for such trainees as provided hereinafter.

Training and upgrading of minorities and women toward journeyworker status is a primary objective of the Training Special Provision. Accordingly, the contractor shall make every effort to enroll minority and women trainees (e.g., by conducting systematic and direct recruitment through public and private sources likely to yield minority and women trainees) to the extent that such persons are available within a reasonable area of recruitment. The contractor will be responsible for demonstrating the steps that have been taken in pursuance thereof, prior to a determination as to whether the contractor is in compliance with this Training Special Provision. This training commitment is not intended, and shall not be used, to discriminate against any applicant for training.

No employee shall be trained under this Special Provision in any classification in which he or she has successfully completed a training course leading to journeyworker status or in which he or she has been employed as a journeyworker. The contractor should satisfy this requirement by including appropriate questions in the employee application or by other suitable means. Regardless of the method used the contractor's records should document the finding in each case.

The minimum length and type of training for each classification will be as established in the training program selected by the contractor and approved by the Massachusetts Department Of Transportation and the Federal Highway Administration. The Massachusetts Department Of Transportation and the Federal Highway Administration shall approve a program if it is reasonably calculated to meet the equal employment opportunity obligations of the contractor and to qualify the average trainee for journeyworker status in the classification concerned by the end of the training period. Furthermore, apprenticeship programs registered with the U.S. Department of Labor, Bureau of Apprenticeship and Training, or with a State apprenticeship agency recognized by the Bureau and training programs approved but not necessarily sponsored by the U.S. Department of Labor, Manpower Administration, Bureau of Apprenticeship and Training shall also be considered acceptable provided it is being administered in a manner consistent with the equal employment obligations of Federal-aid highway construction contracts. Approval or acceptance of a training program shall be obtained from the State prior to commencing work on the classification covered by the program. It is the intention of these provisions that training is to be provided in the construction crafts rather than clerk-typist or secretarial-type positions. Training is permissible in lower level management positions such as office engineers, estimators, timekeepers, etc. where the training is oriented toward construction applications. Training in the laborer classification may be permitted provided that significant and meaningful training is provided and approved by the Federal Highway Administration division office. Some offsite training is permissible as long as the training is an integral part of an approved training program and does not comprise a significant part of the overall training.

**Reimbursement**

Under these Training Special Provisions, reimbursement will be as follows:

The Contractor will only be reimbursed 80 cents for each hour of on the job training as specified in the approved Training Program.

The Contractor is advised and encouraged that it may train additional persons in excess of the number specified and will be reimbursed as stated above. Reimbursement will be made even though the contractor receives additional training program funds from other sources, provided such other source does not specifically prohibit the contractor from receiving other reimbursement.

If less than full training specified in the approved training programs is provided, payment to the contractor will be made at a rate of 80 cents for each hour of training completed under this contract. However, no payment shall be made to the contractor if either the failure to provide the required training, or the failure to hire the trainee as a journeyworker, is caused by the contractor and evidences a lack of good faith on the part of the contractor in meeting the requirements of this Training Special Provision.

**Payment**

Trainees will be paid:

1. Percentage (%) of the journeyworker's rate as provided in the existing programs approved by the Department of Labor or Transportation as of September 15, 1970.
2. For journeyworker programs submitted by the Contractor and approved by Massachusetts Department Of Transportation and the Federal Highway Administration at least 60 percent of the appropriate minimum journeyworker's rate specified in the contract for the first half of the training period, 75 percent for the third quarter if the training period, and 90 percent for the last quarter of the training period.
3. For skilled laborer programs, the minimum starting wage rate of unskilled laborer. At the conclusion of training, he or she will be paid the minimum wage rate of the Classification for programs submitted by the Contractor and approved by the Massachusetts Department Of Transportation and the Federal Highway Administration.
4. For the purposes of meeting the legal requirements of State Prevailing Wage Law, please be advised that no person may be paid the Apprentice wage rate as listed on a MA Prevailing Wage Rates schedule, unless that person and program is registered with the Department of Labor Standards/Division of Apprentice Standards (DLS/DAS). Any person or program not registered with DLS/DAS, regardless of whether or not they are registered with any other federal, state, local, or private entity must be paid the journeyworker's rate for the trade.

The contractor shall provide each trainee with a certification showing the type and length of training satisfactorily complete.

The contractor will provide for the maintenance of records and furnish periodic reports documenting his performance under this Training Special Provision.

Form FHWA-1409, Federal-aid Highway Construction Contracting Semi Annual Training Report, shall be submitted as per instructions on the Form.

\*\*\* END OF DOCUMENT \*\*\*

DOCUMENT 00880

Revised January 12, 2022



# **DEPARTMENT OF LABOR**

**Employment Standards Administration**

## **MINIMUM WAGES FOR FEDERAL AND FEDERALLY ASSISTED CONTRACTS**

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"General Decision Number: MA20240025 06/21/2024

Superseded General Decision Number: MA20230025

State: Massachusetts

Construction Type: Highway

County: Worcester County in Massachusetts.

#### HIGHWAY CONSTRUCTION PROJECTS

Note: Contracts subject to the Davis-Bacon Act are generally required to pay at least the applicable minimum wage rate required under Executive Order 14026 or Executive Order 13658.

Please note that these Executive Orders apply to covered contracts entered into by the federal government that are subject to the Davis-Bacon Act itself, but do not apply to contracts subject only to the Davis-Bacon Related Acts, including those set forth at 29 CFR 5.1(a)(1).

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If the contract is entered	. Executive Order 14026
into on or after January 30,	generally applies to the
2022, or the contract is	contract.
renewed or extended (e.g., an	. The contractor must pay
option is exercised) on or	all covered workers at
after January 30, 2022:	least \$17.20 per hour (or
	the applicable wage rate
	listed on this wage
	determination, if it is
	higher) for all hours

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	<p>spent performing on the contract in 2024.</p>
<p>If the contract was awarded on or between January 1, 2015 and January 29, 2022, and the contract is not renewed or all extended on or after January 30, 2022: listed determination,</p>	<p>. Executive Order 13658 generally applies to the contract.          . The contractor must pay covered workers at least \$12.90 per hour (or the applicable wage rate on this wage if it is higher) for all hours spent performing on that contract in 2024.</p>

The applicable Executive Order minimum wage rate will be adjusted annually. If this contract is covered by one of the Executive Orders and a classification considered necessary for performance of work on the contract does not appear on this wage determination, the contractor must still submit a conformance request.

Additional information on contractor requirements and worker protections under the Executive Orders is available at <http://www.dol.gov/whd/govcontracts>.

Modification Number	Publication Date
0	01/05/2024
1	01/19/2024
2	03/22/2024
3	05/31/2024
4	06/21/2024

CARP0336-004 03/01/2024

	Rates	Fringes
CARPENTER (Includes Form Work)...	\$ 46.86	30.94

ELEC0103-007 03/01/2024

	Rates	Fringes
ELECTRICIAN.....	\$ 61.86	36.14

\* ENGI0004-030 06/01/2024

	Rates	Fringes
POWER EQUIPMENT OPERATOR		
Group 1.....	\$ 56.03	32.75
Group 2.....	\$ 55.41	32.75

FOOTNOTE FOR POWER EQUIPMENT OPERATORS:

- A. PAID HOLIDAYS: New Year's Day, Washington's Birthday, Labor Day, Memorial Day, Independence Day, Patriot's Day, Columbus Day, Veteran's Day, Thanksgiving Day, Christmas Day

POWER EQUIPMENT OPERATORS CLASSIFICATIONS

Group 1: Backhoe/Excavator/Trackhoe; Bobcat/Skid  
Steer/Skid

Loader; Broom/Sweeper; Gradall; Loader; Paver (Asphalt,  
Aggregate, and Concrete); Post Driver (Guardrail/Fences)

Group 2: Bulldozer; Grader/Blade; Roller

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\* ENGI0004-031 05/23/2024

Rates Fringes

POWER EQUIPMENT OPERATOR:

(Milling Machine).....\$ 56.03 32.75

FOOTNOTE FOR POWER EQUIPMENT OPERATORS:

A. PAID HOLIDAYS: New Year's Day, Washington's  
Birthday,  
Labor Day, Memorial Day, Independence Day, Patriot's Day,  
Columbus Day, Veteran's Day, Thanksgiving Day, Christmas  
Day

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IRON0007-028 03/16/2024

Rates Fringes

IRONWORKER, STRUCTURAL.....\$ 54.38 36.48

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IRON0007-029 03/16/2024

Rates Fringes

IRONWORKER, ORNAMENTAL.....\$ 54.68 36.48

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LABO0039-003 06/01/2018

Rates Fringes

LABORER

Asphalt, Includes Raker,

Shoveler, Spreader and Distributor.....	\$ 33.50	22.92
Common or General.....	\$ 33.25	22.92
Guardrail Installation.....	\$ 33.50	22.92

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 PAIN0035-023 01/01/2024

	Rates	Fringes
PAINTER (Steel).....	\$ 56.06	35.60

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 SUMA2014-015 01/11/2017

	Rates	Fringes
CEMENT MASON/CONCRETE FINISHER....	\$ 56.70	21.08
IRONWORKER, REINFORCING.....	\$ 56.48	20.62
LABORER: Concrete Saw (Hand Held/Walk Behind).....	\$ 41.78	18.37
LABORER: Landscape.....	\$ 40.39	17.68
OPERATOR: Crane.....	\$ 52.14	21.08
OPERATOR: Forklift.....	\$ 64.67	0.00
OPERATOR: Mechanic.....	\$ 48.14	17.02
OPERATOR: Piledriver.....	\$ 44.46	16.94
PAINTER: Spray (Linestriping)....	\$ 48.00	0.00
PILEDRIVERMAN.....	\$ 45.65	23.33
TRAFFIC CONTROL: Flagger.....	\$ 23.00	20.44

TRAFFIC CONTROL:

Laborer-Cones/ Barricades/Barrels -		
Setter/Mover/Sweeper.....	\$ 44.49	12.41
TRUCK DRIVER: Concrete Truck....	\$ 33.69	15.79
TRUCK DRIVER: Dump Truck.....	\$ 30.38	7.20
TRUCK DRIVER: Flatbed Truck.....	\$ 48.53	0.00

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WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

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Note: Executive Order (EO) 13706, Establishing Paid Sick Leave for Federal Contractors applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2017. If this contract is covered by the EO, the contractor must provide employees with 1 hour of paid sick leave for every 30 hours they work, up to 56 hours of paid sick leave each year. Employees must be permitted to use paid sick leave for their own illness, injury or other health-related needs, including preventive care; to assist a family member (or person who is like family to the employee) who is ill, injured, or has other health-related needs, including preventive care; or for reasons resulting from, or to assist a family member (or person who is like family to the employee) who is a victim of, domestic violence, sexual assault, or stalking. Additional information

on contractor requirements and worker protections under the EO is available at <https://www.dol.gov/agencies/whd/government-contracts>.

Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (iii)).

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The body of each wage determination lists the classification and wage rates that have been found to be prevailing for the cited type(s) of construction in the area covered by the wage determination. The classifications are listed in alphabetical order of "identifiers" that indicate whether the particular rate is a union rate (current union negotiated rate for local), a survey rate (weighted average rate) or a union average rate (weighted union average rate).

#### Union Rate Identifiers

A four letter classification abbreviation identifier enclosed in dotted lines beginning with characters other than "SU" or "UAVG" denotes that the union classification and rate were prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2014. PLUM is an abbreviation identifier of the union which prevailed in the survey for this

classification, which in this example would be Plumbers.

0198

indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number,

005 in the example, is an internal number used in processing

the wage determination. 07/01/2014 is the effective date of the

most current negotiated rate, which in this example is July 1, 2014.

Union prevailing wage rates are updated to reflect all rate changes in the collective bargaining agreement (CBA)

governing

this classification and rate.

#### Survey Rate Identifiers

Classifications listed under the "SU" identifier indicate that

no one rate prevailed for this classification in the survey and

the published rate is derived by computing a weighted average

rate based on all the rates reported in the survey for that classification. As this weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SULA2012-007 5/13/2014. SU

indicates

the rates are survey rates based on a weighted average calculation of rates and are not majority rates. LA

indicates

the State of Louisiana. 2012 is the year of survey on which these classifications and rates are based. The next number,

007

in the example, is an internal number used in producing the wage determination. 5/13/2014 indicates the survey completion

date for the classifications and rates under that identifier.



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Survey wage rates are not updated and remain in effect until a new survey is conducted.

#### Union Average Rate Identifiers

Classification(s) listed under the UAVG identifier indicate that no single majority rate prevailed for those classifications; however, 100% of the data reported for the classifications was union data. EXAMPLE: UAVG-OH-0010 08/29/2014. UAVG indicates that the rate is a weighted union average rate. OH indicates the state. The next number, 0010 in the example, is an internal number used in producing the wage determination. 08/29/2014 indicates the survey completion date for the classifications and rates under that identifier.

A UAVG rate will be updated once a year, usually in January of each year, to reflect a weighted average of the current negotiated/CBA rate of the union locals from which the rate is based.

#### State Adopted Rate Identifiers

Classifications listed under the "SA" identifier indicate that the prevailing wage rate set by a state (or local) government was adopted under 29 C.F.R. 1.3(g)-(h). Example: SAME2023-007 01/03/2024. SA reflects that the rates are state adopted. ME refers to the State of Maine. 2023 is the year during which the state completed the survey on which the listed classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination.

01/03/2024 reflects the date on which the classifications and rates under the ?SA? identifier took effect under state law in the state from which the rates were adopted.

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#### WAGE DETERMINATION APPEALS PROCESS

1.) Has there been an initial decision in the matter? This can be:

- \* an existing published wage determination
- \* a survey underlying a wage determination
- \* a Wage and Hour Division letter setting forth a position on a wage determination matter
- \* a conformance (additional classification and rate) ruling

On survey related matters, initial contact, including requests for summaries of surveys, should be with the Wage and Hour National Office because National Office has responsibility for the Davis-Bacon survey program. If the response from this initial contact is not satisfactory, then the process described in 2.) and 3.) should be followed.

With regard to any other matter not yet ripe for the formal process described here, initial contact should be with the Branch of Construction Wage Determinations. Write to:

Branch of Construction Wage Determinations  
Wage and Hour Division  
U.S. Department of Labor  
200 Constitution Avenue, N.W.  
Washington, DC 20210

2.) If the answer to the question in 1.) is yes, then an interested party (those affected by the action) can request review and reconsideration from the Wage and Hour Administrator

(See 29 CFR Part 1.8 and 29 CFR Part 7). Write to:

Wage and Hour Administrator  
U.S. Department of Labor  
200 Constitution Avenue, N.W.  
Washington, DC 20210

The request should be accompanied by a full statement of the interested party's position and by any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3.) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board  
U.S. Department of Labor  
200 Constitution Avenue, N.W.  
Washington, DC 20210

4.) All decisions by the Administrative Review Board are final.

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END OF GENERAL DECISION"

"General Decision Number: MA20240002 06/14/2024

Superseded General Decision Number: MA20230002

State: Massachusetts

Construction Type: Heavy  
HEAVY CONSTRUCTION PROJECTS; AND  
MARINE CONSTRUCTION PROJECTS

County: Worcester County in Massachusetts.

HEAVY CONSTRUCTION PROJECTS; AND MARINE CONSTRUCTION  
PROJECTS

Note: Contracts subject to the Davis-Bacon Act are generally required to pay at least the applicable minimum wage rate required under Executive Order 14026 or Executive Order 13658.

Please note that these Executive Orders apply to covered contracts entered into by the federal government that are subject to the Davis-Bacon Act itself, but do not apply to contracts subject only to the Davis-Bacon Related Acts, including those set forth at 29 CFR 5.1(a)(1).

<p>If the contract is entered into on or after January 30, 2022, or the contract is renewed or extended (e.g., an option is exercised) on or after January 30, 2022:</p>	<p>. Executive Order 14026 generally applies to the contract. The contractor must pay all covered workers at least \$17.20 per hour (or the applicable wage rate listed on this wage determination, if it is</p>
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	higher) for all hours spent performing on the contract in 2024.
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<p>If the contract was awarded on or between January 1, 2015 and January 29, 2022, and the contract is not renewed or all extended on or after January 30, 2022: listed determination,</p>	<p>. Executive Order 13658 generally applies to the contract.          . The contractor must pay covered workers at least \$12.90 per hour (or the applicable wage rate on this wage if it is higher) for all hours spent performing on that contract in 2024.</p>
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The applicable Executive Order minimum wage rate will be adjusted annually. If this contract is covered by one of the Executive Orders and a classification considered necessary for performance of work on the contract does not appear on this wage determination, the contractor must still submit a conformance request.

Additional information on contractor requirements and worker protections under the Executive Orders is available at <http://www.dol.gov/whd/govcontracts>.

Modification Number	Publication Date
0	01/05/2024
1	01/19/2024
2	02/09/2024
3	03/01/2024
4	03/22/2024
5	05/31/2024
6	06/14/2024

ASBE0006-005 09/01/2023

	Rates	Fringes
Insulator/asbestos worker Includes the application of all insulating materials, protective coverings, coating, and finishes all types of mechanical systems.....	\$ 48.15	35.16
Includes the application of all insulating materials, protective coverings, coating, and finishes to all types of mechanical systems.....	\$ 37.50	24.35

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BOIL0029-001 01/01/2021

	Rates	Fringes
BOILERMAKER.....	\$ 45.87	29.02

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BRMA0001-002 08/01/2023

SPRINGFIELD/PITTSFIELD CHAPTER WORCESTER (Warren County)

	Rates	Fringes
Bricklayer, Cement Mason, Plasterer & Stonemason.....	\$ 50.81	32.27

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BRMA0001-014 08/01/2023

WORCESTER CHAPTER

WORCESTER (Auburn Barre, Blackstone, Berlin, Bolton, Boylston, the Brookfields, Charlton, Clinton, Douglas, Dudley, Grafton, Hardwick, Holden, Leicester, Mendon, Millbury, Milville, New Braintree, Northboro, Northbridge, Oakham, Oxford, Paxton, Rutland, Shrewbury, Southbridge, Spencer, Sturbridge, Sutton, Upton, Uxbridge, Webster, Westboro, West Boylston, Worcester)

	Rates	Fringes
Bricklayer, Cement Mason, Plasterer & Stonemason.....	\$ 60.26	33.71

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BRMA0001-015 08/01/2023

LOWELL CHAPTER

WORCESTER (Hopedale, Milford, Southboro)

	Rates	Fringes
Bricklayer, Cement Mason, Plasterer & Stonemason.....	\$ 60.26	33.71

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BRMA0001-023 08/01/2023

LOWELL CHAPTER

WORCESTER (Ashburham, Athol, Fitchburg, Gardner, Harvard,

Hubbardston, Lancaster, Leominster, Lunenburg, Petersham, Phillipston, Princeton, Royalston, Sterling, Templeton, Westminster, Winchendon)

	Rates	Fringes
Bricklayer, Cement Mason, Plasterer & Stonemason.....	\$ 60.26	33.71

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BRMA0003-001 08/01/2023

	Rates	Fringes
Marble & Tile Finisher.....	\$ 47.89	32.43
Marble, Tile & Terrazzo Workers.....	\$ 62.42	34.37
TERRAZZO FINISHER.....	\$ 61.34	34.21

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CARP0056-004 08/01/2022

	Rates	Fringes
DIVER TENDER.....	\$ 52.15	34.10
DIVER.....	\$ 68.70	35.57

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CARP0056-008 08/01/2022

	Rates	Fringes
PILED RIVERMAN.....	\$ 45.74	34.10

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CARP0336-002 03/01/2024

WORCESTER (Except Gilbertville, Harwick, Warren, West Brookfield)

	Rates	Fringes
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Carpenter/Lather.....\$ 46.86 30.94

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CARP0336-007 03/01/2024

WORCESTER (Gilbertville, Hardwick, Warren, West Brookfield)

Rates Fringes

Carpenter/Lather.....\$ 46.86 30.94

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CARP1121-004 01/01/2024

Rates Fringes

MILLWRIGHT.....\$ 41.20 32.99

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ELEC0096-002 09/04/2022

WORCESTER (Warren)

Rates Fringes

ELECTRICIAN.....\$ 45.59 30.92

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ELEC0104-001 08/29/2022

Rates Fringes

Line Construction:

Cableman.....\$ 53.06 28.49+A  
Equipment Operator.....\$ 45.10 25.20+A  
Groundman.....\$ 29.18 12.10+A  
Lineman.....\$ 53.06 28.49+A

A. PAID HOLIDAYS: New Year's Day; Memorial Day; Independence Day; Labor Day; Thanksgiving Day; Christmas Day and Columbus Day, provided the employee has been employed 5 working days prior to any one of the listed holidays.

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ELEV0041-002 01/01/2024

	Rates	Fringes
ELEVATOR MECHANIC.....	\$ 63.71	37.885+a+b

FOOTNOTE:

a.Vacation: 6%/under 5 years based on regular hourly rate for

all hours worked. 8%/over 5 years based on regular hourly

rate for all hours worked.

b. PAID HOLIDAYS: New Year's Day; Memorial Day; Independence

Day; Labor Day; Veterans' Day; Thanksgiving Day; the Friday

after Thanksgiving Day; and Christmas Day.

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\* ENGI0004-003 06/01/2024

WORCESTER (Except Athol, Barre, Brookfield, East Brookfield, Hardwick, New Braintree, North Brookfield, Oakham, Petersham, Phillipston, Royalston, Strutbridge, Templeton, Warren, West Brookfield, Winchendon)

	Rates	Fringes
Power equipment operators:		
BUILDING, HEAVY & MARINE		
GROUP 1.....	\$ 48.73	29.25
Group 1.....	\$ 56.03	32.75
GROUP 2.....	\$ 48.23	29.25
Group 2.....	\$ 55.41	32.75
GROUP 3.....	\$ 32.47	29.25
Group 3.....	\$ 36.17	32.75
GROUP 4.....	\$ 39.89	29.25
Group 4.....	\$ 45.23	32.75

GROUP 5.....	\$ 23.08	29.25
Group 5.....	\$ 24.71	32.75
GROUP 6.....	\$ 27.64	29.25
Group 6.....	\$ 30.28	32.75

FOOTNOTE FOR POWER EQUIPMENT OPERATORS:

A. PAID HOLIDAYS: New Year's Day, Washington's Birthday,  
 Memorial Day, Independence Day, Labor Day, Patriot's Day,  
 Columbus Day, Veteran's Day, Thanksgiving Day, Christmas Day

HOURLY PREMIUM FOR BOOM LENGTHS (Including Jib):

Over 150 ft.	+2.18
Over 185 ft.	+3.84
Over 210 ft.	+5.39
Over 250 ft.	+8.16
Over 295 ft.	+11.29
Over 350 ft.	+13.14

POWER EQUIPMENT OPERATORS CLASSIFICATIONS BUILDING AND HEAVY CONSTRUCTION

GROUP 1: Power shovel; crane; truck crane; derrick; pile driver; trenching machine; mechanical hoist pavement breaker; cement concrete paver; dragline; hoisting engine;

three drum machine; pumpcrete machine; loaders; shovel dozer; front end loader; mucking machine; shaft hoist; steam engine; backhoe; gradall; cable way; fork lift; cherry picker; boring machine; rotary drill; post hole hammer; port hole digger; asphalt plant on job site; concrete batching and/or mixing plant on job site;

crusher

plant on job site; paving concrete mixer; timber jack

GROUP 2: Sonic or vibratory hammer; grader; scraper; tandem

scraper; bulldozer; tractor; mechanic - maintenance; York rake; mulching machine; paving screed machine; stationary steam boiler; paving concrete finishing machine; grout pump; portable steam boiler; portable steam generator; roller; spreader; asphalt paver; locomotives or machines used in place thereof; tamper (self propelled or tractor-draw); cal tracks; ballast regulator; rail anchor

machine; switch tamper; tire truck  
GROUP 3: Pumps (1-3 grouped); compressor; welding  
machines  
(1-3 grouped); generator; sighting plant; heaters (power  
driven, 1- 5); syphon-pulsometer; concrete mixer; valves  
controlling permanent plant air steam, conveyor,  
wellpoint  
system (operating)  
GROUP 4: Assitant engineer (fireman)  
GROUP 5: Oiler (other than truck cranes and gradalls)  
GROUP 6: Oiler (on truck cranes and gradalls)

POWER EQUIPMENT OPERATORS CLASSIFICATIONS MARINE  
CONSTRUCTION

GROUP 1: Shovel; crane; truck crane; cherry picker;  
derrick;  
pile driver; two or more drum machines; lighters; derrick  
boats; trenching machines; mechanic hoist pavement  
breakers; cement concrete pavers; draglines; hoisting  
engines; pumpcrete machines; elevating graders; shovel  
dozer; front end loader; backhoe; gradall; cable ways;  
boring machine; rotary drill; post hole hammer; post hole  
digger; fork lift; timber jack; asphalt plant (on site);  
concrete batching and/or mixing plant (on site); crusher  
plant (on site); paving concrete mixer  
GROUP 2: Portable steam boiler; portable steam  
generator;  
sonic or vibratory hammer; grader; scraper; tandem  
scraper;  
concrete pump; bulldozer; tractor; York rake; mulching  
machine; roller; spreader; tamper (self-propelled or  
tractor-drawn); asphalt paver; concrete mixer with side  
loader; mechanic - maintenance; cal tracks; ballast  
regulator; switch tamper; rail anchor machine; tire truck  
GROUP 3: Pumps (1-3 grouped); comressor; welding  
machines  
(1-3 grouped); generator; lighting plant; heaters (power  
driven 1-5); syphon-pulsometer; concrete mixer; valves  
controlling permanent plant air or steam; conveyor; well  
point systems; auger (powered by independent engines and  
attached to pile drivers); hydraulic saws  
GROUP 4: Fireman  
GROUP 5: Assistant engineer (other than truck crane and  
gradall)  
GROUP 6: Assistant engineer (on truck crane and gradall)

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ENGI0098-005 12/01/2016

	Rates	Fringes
Power equipment operators:		
Group 1.....	\$ 33.68	23.96+A
Group 2.....	\$ 33.37	23.96+A
Group 3.....	\$ 33.15	23.96+A
Group 4.....	\$ 32.54	23.96+A
Group 5.....	\$ 29.92	23.96+A
Group 6.....	\$ 28.80	23.96+A
Group 7.....	\$ 26.86	23.96+A
Group 8.....	\$ 305.95	23.96+A
Group 9.....	\$ 230.69	23.96+A
Group 10.....	\$ 35.17	23.96+A
Group 11.....	\$ 38.18	23.96+A
Group 12.....	\$ 39.68	23.96+A
Group 13.....	\$ 40.68	23.96+A
Group 14.....	\$ 41.68	23.96+A
Group 15.....	\$ 43.18	23.96+A

HAZARDOUS WASTE PREMIUM \$2.00

FOOTNOTE FOR POWER EQUIPMENT OPERATORS:

Group 8 and Group 9 are per day wages.

- A. Paid Holidays: New year's Day, Washington's Birthday, Memorial Day, Independence Day, Labor Day, Columbus Day, Veterans Day, Thanksgiving Day and Christmas Day

POWER EQUIPMENT OPERATORS CLASSIFICATIONS

Group 1: Shovels; crawlers and truck cranes including all tower; self-propelled hydraulic cranes 10 tons and over; draglines; clam shells; cableways; shaft hoists; mucking machines derricks; backhoes; bulldozers; gradalls; elevating graders; pile drivers; concrete pavers; trenching machines; front end loaders- 5 1/2 cu yds and over; dual drum paver; automatic grader-excavator(C.M.I. or equal); scrapers towing pan or wagon; tandem dozers or push cats(2

units in tandem); shotcrete machine; tunnel boring machine;  
combination backhoe/loader 3/4 cu yd hoe or over; jet engine dryer; tree shredder; post hole digger; post hole hammer; post extractor; truck mounted concrete pump with boom; roto-mill; Grader; Horizontal Drilling Machine;  
John  
Henry Rock Drill and similar equipment.  
Group 2: Rotary drill with mounted compressor;  
compressor  
house (3 to 6 compressors); rock and earth boring machines  
(excluding McCarthy and similar drills); front end loaders  
4 cu yds to 5 1/2 cu yds); forklifts-7 ft lift and over 3 ton capacity; scraper 21 yds and over (struck load);  
sonic  
hammer console; reclaimers road planer/milling machine;  
cal  
tracks; ballast regulators; rail anchor machines; switch tampers, asphalt pavers; mechanic; welder and transfer machine.  
Group 3: Combination backhoe/loader up to 3/4 cu yd; scrapers up to 21 cu yd (struck load, self propelled or tractor drawn); tireman; front end loaders up to 4 yds; well drillers; engineer or fireman on high pressure boiler;  
self-loading batch plant; well point operators electric pumps used in well point system; pumps, 16 inches and over  
(total discharge); compressor, one or two 900 cu ft and over; powered grease truck; tunnel locomotives and dingys;  
grout pumps; hydraulic jacks; boom truck; hydraulic cranes-  
up to 10 ton.  
Group 4: Asphalt rollers; self-powered rollers and compactors; tractor without blade drawing sheepsfoot roller; rubber tire roller; vibratory roller or other type  
of compactors including machines for pulverizing and aerating soil; york rake.  
Group 5: Hoists; conveyors; power pavement breakers; self-powered concrete pavement finishing machines; two bag

mixers with skip; McCarthy and similar drills; batch plants  
(not self loading); bulk cement plants; self-propelled material spreaders; three or more 10 KW light plants; 30 KW or more generators; power broom.  
Group 6: Compressor (one or two) 315 cu ft to 900 cu ft; pumps 4 inches to 16 inches (total discharge).  
Group 7: Compressors up to 315 cu ft; small mixers with skip; pumps up to 4 inches; power heaters; oiler; A-frame trucks; forklifts-up to 7 ft. lift and up to 3 ton capacity; hydro broom; stud welder.  
Group 8: Truck crane crews  
Group 9: Oiler  
Group 10: Master Mechanic  
Group 11: Boom lengths over 150 feet including jib  
Group 12: Boom lengths over 200 feet including jib  
Group 13: Boom lengths over 250 feet including jib  
Group 14: Boom lengths over 300 feet including jib  
Group 15: Boom lengths over 350 feet including jib

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IRON0007-012 03/16/2024

	Rates	Fringes
IRONWORKER.....	\$ 54.38	36.48

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LABO0022-001 12/01/2023

	Rates	Fringes
Laborers: (HEAVY CONSTRUCTION)		
GROUP 1.....	\$ 37.86	27.59
GROUP 2.....	\$ 38.11	27.59
GROUP 3.....	\$ 38.61	27.59
GROUP 4.....	\$ 38.86	27.59
GROUP 5.....	\$ 25.40	27.59
GROUP 6.....	\$ 39.86	27.59

LABORERS CLASSIFICATIONS

GROUP 1: Laborers; carpenter tenders; cement finisher tenders, plasterer tenders

GROUP 2: Asphalt raker; fence and guard rail erector; laser beam operator; mason tender; pipelayer; pneumatic drill operator; pneumatic tool operator; wagon drill operator, jack hammer operator, pavement breaker, carbide core drilling machine, chain saw operator, barco type jumping tampers, concrete pump, motorized mortar mixer, ride-on-motorized buggy

GROUP 3: Air track operator; block paver; rammer; curb setter, hydraulic and similar self powered drills

GROUP 4: Blaster; powderman

GROUP 5: Flagger

GROUP 6: Asbestos Abatement; Toxic and Hazardous Waste Laborers

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LABO0022-003 12/01/2021

	Rates	Fringes
Plasterer tender		
BARNSTABLE, BRISTOL,		
DUKES, ESSEX, NANTUCKET,		
MIDDLESEX (with the		
exception of Arlington,		
Belmont, Burlington,		
Cambridge, Everett,		
Malden, Medford, Melrose,		
Reading, Somerville,		
Stoneham, Wakefield,		
Winchester, Winthrop and		
Woburn); NORFOLK (with the		
exception of Brookline		
Dedham and Milton) COUNTIES.	\$ 35.41	26.59
SUFFOLK COUNTY (Boston,		



Chelsea, Revere, Winthrop,  
Deer Island, Nut Island);  
MIDDLESEX COUNTY  
(Arlington, Belmont,  
Burlington, Cambridge,  
Everett, Malden, Medford,  
Melrose, Reading,  
Somerville, Stoneham,  
Wakefield, Winchester,  
Winthrop and Woburn only);  
NORFOLK COUNTY (Brookline,  
Dedham, and Milton only)....\$ 41.18 27.52

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LABO0022-013 12/01/2021

	Rates	Fringes
Laborers:		
(FREE AIR OPERATION):		
SHIELD DRIVEN AND LINER PLATE IN FREE AIR)		
GROUP 1.....	\$ 45.48	28.02
GROUP 2.....	\$ 45.48	28.02
(OPEN AIR CASSONS, UNDERPINNING AND TEST BORING INDUSTRIES):		
TEST BORING & WELL DRILLING		
Driller.....	\$ 42.58	27.67
Laborer.....	\$ 41.18	27.67
(OPEN AIR CASSONS, UNDERPINNING AND TEST BORING INDUSTRIES):		
OPEN AIR CASSON, UNDERPINNING WORK & BORING CREW		
Bottom man.....	\$ 42.33	27.67
Laborers; Top man.....	\$ 41.18	27.67
(TUNNELS, CAISSON & CYLINDER WORK IN COMPRESSED AIR)		

GROUP 1.....	\$ 42.93	28.02
GROUP 2.....	\$ 53.41	28.02
GROUP 3.....	\$ 53.41	28.02
GROUP 4.....	\$ 53.41	28.02
GROUP 5.....	\$ 53.41	28.02
GROUP 6.....	\$ 55.41	28.02
CLEANING CONCRETE AND CAULKING TUNNEL (Both New & Existing)		
GROUP 1.....	\$ 45.48	28.02
GROUP 2.....	\$ 45.48	28.02
ROCK SHAFT, CONCRETE LINING OF SAME AND TUNNEL IN FREE AIR		
GROUP 1.....	\$ 42.93	28.02
GROUP 2.....	\$ 45.48	28.02
GROUP 3.....	\$ 45.48	28.02
GROUP 4.....	\$ 45.48	28.02
GROUP 5.....	\$ 47.48	28.02

LABORERS CLASSIFICATIONS for TUNNELS, CAISSON & CYLINDER  
WORK  
IN COMPRESSED AIR

GROUP 1: Powder watchman; Top man on iron bolt; change  
house  
attendant

GROUP 2: Brakeman; trackman; groutman; tunnel laborer;  
outside lock tender; lock tender; guage tender

GROUP 3: Motorman, miner

GROUP 4: Blaster

GROUP 5: Mucking machine operator

GROUP 6: Hazardous Waste work within the "HOT" zone.  
(A  
premium of two dollars \$2.00 per hour over the basic wage  
rate.

LABORERS CLASSIFICATIONS for (FREE AIR OPERATION): SHIELD  
DRIVEN AND LINER PLATE IN FREE AIR

GROUP 1: Miner; miner welder; conveyor operator;  
motorman;  
mucking machine operator; nozzle man; grout man-; pumps,  
shaft and tunnel steel and rodman; shield and erector arm  
operators, mole nipper, outside motorman, burner, TBM  
operator, safety miner; laborer topside; heading  
motormen;  
erecting operators; top signal men

GROUP 2: Brakeman; trackman

LABORERS CLASSIFICATIONS FOR CLEANING CONCRETE AND  
CAULKING

TUNNEL (Both New & Existing)

GROUP 1: Concrete workers; strippers and form movers  
(wood &  
steel), cement finisher

GROUP 2: Form erector (wood & steel and all accessories)

LABORERS CLASSIFICATIONS for ROCK SHAFT, CONCRETE LINING  
OF

SAME AND TUNNE IN FREE AIR

GROUP 1: Change house attendants

GROUP 2: Laborers, topside, bottom men (when heading is  
50  
ft. from shaft) and all other laborers

GROUP 3: Brakeman; trackman; tunnel laborers; shaft  
laborers

GROUP 4: Miner; cage tender; bellman

GROUP 5: Hazardous Waste work within the "HOT" zone.  
(A premium of two dollars \$2.00 per hour over the basic wage rate)

FOOTNOTE FOR LABORERS:

A. PAID HOLIDAYS: New Year's Day, Washington's Birthday, Patriot's Day, Memorial Day, Independence Day, Labor Day, Columbus Day, Veteran's Day, Thanksgiving Day, and Christmas Day

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LAB01421-003 12/01/2021

	Rates	Fringes
Laborers: (WRECKING)		
Group 1.....	\$ 41.33	27.37
Group 2.....	\$ 42.08	27.37
Group 3.....	\$ 42.33	27.37
Group 4.....	\$ 37.33	27.37
Group 5.....	\$ 40.43	27.37
Group 6.....	\$ 41.33	27.37

Group 1: Adzeman, Wrecking Laborer.  
Group 2: Burners, Jackhammers.  
Group 3: Small Backhoes, Loaders on tracks, Bobcat Type Loaders, Hydraulic "Brock" Type Hammer Operators, Concrete Cutting Saws.  
Group 4: Yardman (Salvage Yard Only).  
Group 5: Yardman, Burners, Sawyers.  
Group 6: Asbestos, Lead Paint, Toxic and Hazardous Waste.

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PAIN0035-006 01/01/2024

	Rates	Fringes
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PAINTER

NEW CONSTRUCTION:

Bridge.....	\$ 56.06	35.60
Brush, Taper.....	\$ 45.56	35.60
Spray, Sandblast.....	\$ 46.96	35.60

REPAINT

Bridge.....	\$ 56.06	35.60
Brush, Taper.....	\$ 43.62	35.60
Spray, Sandblast.....	\$ 45.02	35.60

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PAIN0035-021 01/01/2024

	Rates	Fringes
GLAZIER.....	\$ 45.56	35.60

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PLUM0004-002 03/01/2024

WORCESTER (Except Hopedale and Southboro)

	Rates	Fringes
Plumbers and Pipefitters.....	\$ 53.95	28.42

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PLUM0012-002 03/03/2024

WORCESTER (Hopedale and Southboro)

	Rates	Fringes
PLUMBER.....	\$ 67.74	35.03

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ROOF0033-001 02/01/2024

	Rates	Fringes
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Roofers:

All Tear-off and/or  
 removal of any types of  
 roofing and all spudding,  
 sweeping, vacuuming and/or  
 cleanup of any and all  
 areas of any type where a  
 roof is to be relaid.....\$ 50.03 34.94

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SFMA0669-002 04/01/2024

	Rates	Fringes
SPRINKLER FITTER.....	\$ 49.70	29.16

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SHEE0017-004 02/01/2024

WORCESTER (Harvard, Lancaster)

	Rates	Fringes
Sheet metal worker.....	\$ 57.22	46.46

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\* SHEE0063-002 01/01/2024

WORCESTER (Except Harvard & Lancaster)

	Rates	Fringes
Sheet metal worker.....	\$ 40.22	34.35

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TEAM0379-003 06/01/2023

	Rates	Fringes
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Truck drivers:

Group 1.....	\$ 38.78	31.86+a+b
Group 2.....	\$ 38.95	31.86+a+b
Group 3.....	\$ 39.02	31.86+a+b
Group 4.....	\$ 39.14	31.86+a+b
Group 5.....	\$ 39.24	31.86+a+b
Group 6.....	\$ 39.53	31.86+a+b
Group 7.....	\$ 39.82	31.86+a+b

TRUCK DRIVERS CLASSIFICATIONS

Group 1: Station wagons; panel trucks; and pickup trucks

Group 2: Two axle equipment; & forklift operator

Group 3: Three axle equipment and tireman

Group 4: Four and Five Axle equipment

Group 5: Specialized earth moving equipment under 35 tons

other than conventional type trucks; low bed; vachual; mechanics, paving restoration equipment

Group 6: Specialized earth moving equipment over 35 tons

Group 7: Trailers for earth moving equipment (double hookup)

POWER TRUCKS \$.25 DIFFERENTIAL BY AXLE TUNNEL WORK (UNDERGROUND ONLY) \$.40 DIFFERENTIAL BY AXLE HAZARDOUS MATERIALS (In Hot Zone Only) \$2.00 premium

FOOTNOTES: A. PAID HOLIDAYS: New Year's Day, Washington's Birthday, Memorial Day, Independence Day, Labor Day, Patriot's Day, Columbus Day, Veteran's Day, Thanksgiving Day, & Christmas Day

B. PAID VACATION: Employees with 4 months to 1 year of service receive 1/2 day's pay per month; 1 week vacation for 1 - 5 years of service; 2 weeks vacation for 5 - 10 years of service; and 3 weeks vacation for more than 10 years of service

WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

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Note: Executive Order (EO) 13706, Establishing Paid Sick Leave for Federal Contractors applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2017. If this contract is covered by the EO, the contractor must provide employees with 1 hour of paid sick leave for every 30 hours they work, up to 56 hours of paid sick leave each year. Employees must be permitted to use paid sick leave for their own illness, injury or other health-related needs, including preventive care; to assist a family member (or person who is like family to the employee) who is ill, injured, or has other health-related needs, including preventive care; or for reasons resulting from, or to assist a family member (or person who is like family to the employee) who is a victim of, domestic violence, sexual assault, or stalking. Additional information on contractor requirements and worker protections under the EO is available at <https://www.dol.gov/agencies/whd/government-contracts>.

Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (iii)).



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The body of each wage determination lists the classification and wage rates that have been found to be prevailing for the cited type(s) of construction in the area covered by the wage determination. The classifications are listed in alphabetical order of "identifiers" that indicate whether the particular rate is a union rate (current union negotiated rate for local), a survey rate (weighted average rate) or a union average rate (weighted union average rate).

#### Union Rate Identifiers

A four letter classification abbreviation identifier enclosed in dotted lines beginning with characters other than "SU" or "UAVG" denotes that the union classification and rate were prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2014. PLUM is an abbreviation identifier of the union which prevailed in the survey for this classification, which in this example would be Plumbers. 0198 indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. 07/01/2014 is the effective date of the most current negotiated rate, which in this example is July 1, 2014.

Union prevailing wage rates are updated to reflect all rate changes in the collective bargaining agreement (CBA) governing this classification and rate.

#### Survey Rate Identifiers

Classifications listed under the "SU" identifier indicate that no one rate prevailed for this classification in the survey and the published rate is derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As this weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SULA2012-007 5/13/2014. SU indicates the rates are survey rates based on a weighted average calculation of rates and are not majority rates. LA indicates the State of Louisiana. 2012 is the year of survey on which these classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. 5/13/2014 indicates the survey completion date for the classifications and rates under that identifier.

Survey wage rates are not updated and remain in effect until a new survey is conducted.

#### Union Average Rate Identifiers

Classification(s) listed under the UAVG identifier indicate that no single majority rate prevailed for those classifications; however, 100% of the data reported for the classifications was union data. EXAMPLE: UAVG-OH-0010 08/29/2014. UAVG indicates that the rate is a weighted union average rate. OH indicates the state. The next number, 0010 in

the example, is an internal number used in producing the wage determination. 08/29/2014 indicates the survey completion date for the classifications and rates under that identifier.

A UAVG rate will be updated once a year, usually in January of each year, to reflect a weighted average of the current negotiated/CBA rate of the union locals from which the rate is based.

State Adopted Rate Identifiers

Classifications listed under the "SA" identifier indicate that the prevailing wage rate set by a state (or local) government was adopted under 29 C.F.R 1.3(g)-(h). Example: SAME2023-007 01/03/2024. SA reflects that the rates are state adopted. ME refers to the State of Maine. 2023 is the year during which the state completed the survey on which the listed classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. 01/03/2024 reflects the date on which the classifications and rates under the ?SA? identifier took effect under state law in the state from which the rates were adopted.

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WAGE DETERMINATION APPEALS PROCESS

1.) Has there been an initial decision in the matter? This can be:

- \* an existing published wage determination
- \* a survey underlying a wage determination
- \* a Wage and Hour Division letter setting forth a position on a wage determination matter
- \* a conformance (additional classification and rate) ruling

On survey related matters, initial contact, including requests for summaries of surveys, should be with the Wage and Hour National Office because National Office has responsibility for the Davis-Bacon survey program. If the response from this initial contact is not satisfactory, then the process described in 2.) and 3.) should be followed.

With regard to any other matter not yet ripe for the formal process described here, initial contact should be with the Branch of Construction Wage Determinations. Write to:

Branch of Construction Wage Determinations  
Wage and Hour Division  
U.S. Department of Labor  
200 Constitution Avenue, N.W.  
Washington, DC 20210

2.) If the answer to the question in 1.) is yes, then an interested party (those affected by the action) can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Write to:

Wage and Hour Administrator  
U.S. Department of Labor  
200 Constitution Avenue, N.W.  
Washington, DC 20210

The request should be accompanied by a full statement of the interested party's position and by any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3.) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board  
U.S. Department of Labor  
200 Constitution Avenue, N.W.  
Washington, DC 20210

4.) All decisions by the Administrative Review Board are final.

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END OF GENERAL DECISION"

"General Decision Number: MA20240006 01/05/2024

Superseded General Decision Number: MA20230006

State: Massachusetts

Construction Type: Heavy Dredging

Counties: Massachusetts Statewide.  
STATEWIDE

Massachusetts All Dredging, except self-propelled hopper dredges, on the Atlantic Coast & tributary waters emptying into the Atlantic Ocean.

Note: Contracts subject to the Davis-Bacon Act are generally required to pay at least the applicable minimum wage rate required under Executive Order 14026 or Executive Order 13658.

Please note that these Executive Orders apply to covered contracts entered into by the federal government that are subject to the Davis-Bacon Act itself, but do not apply to contracts subject only to the Davis-Bacon Related Acts, including those set forth at 29 CFR 5.1(a)(1).

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If the contract is entered	. Executive Order 14026
into on or after January 30,	generally applies to the
2022, or the contract is	contract.
renewed or extended (e.g., an	. The contractor must pay
option is exercised) on or	all covered workers at
after January 30, 2022:	least \$17.20 per hour (or
	the applicable wage rate
	listed on this wage

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	determination, if it is
	higher) for all hours
	spent performing on the
	contract in 2024.

If the contract was awarded on	. Executive Order 13658
or between January 1, 2015 and	generally applies to the
January 29, 2022, and the	contract.
contract is not renewed or	. The contractor must pay
all	covered workers at least
extended on or after January	\$12.90 per hour (or the
30, 2022:	applicable wage rate
listed	on this wage
determination,	if it is higher) for all
	hours spent performing on
	that contract in 2024.

The applicable Executive Order minimum wage rate will be adjusted annually. If this contract is covered by one of the Executive Orders and a classification considered necessary for performance of work on the contract does not appear on this wage determination, the contractor must still submit a conformance request.





Operator (NCCCO License/Certification) \$1.80 Licensed  
Tug

Operator over 1000 HP (Assigned as Master) (USCG  
licensed

Master of Towing Vessels (MOTV) \$1.80; Licensed Boat  
Operator (Assigned as lead boat captain) USCG licensed  
boat operator \$1.30; Engineer (QMED and Tankerman  
endorsement or licensed engineer (USCG) \$1.80

Oiler (QMED and Tankerman endorsement (USCG) \$1.80; All  
classifications (Tankerman endorsement only) USCG \$1.55;  
Deckhand or Mate (AB with Lifeboatman endorsement (USCG)  
\$1.80; All classifications (lifeboatman endorsement only  
(USCG) \$1.55; Welder (ABS certification) \$1.55

FOOTNOTES APPLICABLE TO ABOVE CRAFTS:

a. PAID HOLIDAYS: New Year's Day, Martin Luther King,  
Jr.'s  
Birthday, Memorial Day, Good Friday, Independence Day,  
Labor Day, Veterans' Day, Thanksgiving Day and Christmas  
Day

b. VACATION: Eight percent (8%) of the straight time  
rate,  
multiplied by the total hours worked.

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WELDERS - Receive rate prescribed for craft performing  
operation to which welding is incidental.

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Note: Executive Order (EO) 13706, Establishing Paid Sick  
Leave  
for Federal Contractors applies to all contracts subject to  
the  
Davis-Bacon Act for which the contract is awarded (and any  
solicitation was issued) on or after January 1, 2017. If  
this  
contract is covered by the EO, the contractor must provide  
employees with 1 hour of paid sick leave for every 30 hours  
they work, up to 56 hours of paid sick leave each year.  
Employees must be permitted to use paid sick leave for  
their

own illness, injury or other health-related needs, including preventive care; to assist a family member (or person who is like family to the employee) who is ill, injured, or has other health-related needs, including preventive care; or for reasons resulting from, or to assist a family member (or person who is like family to the employee) who is a victim of, domestic violence, sexual assault, or stalking. Additional information on contractor requirements and worker protections under the EO is available at <https://www.dol.gov/agencies/whd/government-contracts>.

Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (iii)).

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The body of each wage determination lists the classification and wage rates that have been found to be prevailing for the cited type(s) of construction in the area covered by the wage determination. The classifications are listed in alphabetical order of "identifiers" that indicate whether the particular rate is a union rate (current union negotiated rate for local), a survey rate (weighted average rate) or a union average rate (weighted union average rate).

## Union Rate Identifiers

A four letter classification abbreviation identifier enclosed in dotted lines beginning with characters other than "SU" or "UAVG" denotes that the union classification and rate were prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2014. PLUM is an abbreviation identifier of the union which prevailed in the survey for this classification, which in this example would be Plumbers. 0198 indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. 07/01/2014 is the effective date of the most current negotiated rate, which in this example is July 1, 2014.

Union prevailing wage rates are updated to reflect all rate changes in the collective bargaining agreement (CBA) governing this classification and rate.

## Survey Rate Identifiers

Classifications listed under the "SU" identifier indicate that no one rate prevailed for this classification in the survey and the published rate is derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As this weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SULA2012-007 5/13/2014. SU indicates the rates are survey rates based on a weighted average

calculation of rates and are not majority rates. LA indicates the State of Louisiana. 2012 is the year of survey on which these classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. 5/13/2014 indicates the survey completion date for the classifications and rates under that identifier.

Survey wage rates are not updated and remain in effect until a new survey is conducted.

#### Union Average Rate Identifiers

Classification(s) listed under the UAVG identifier indicate that no single majority rate prevailed for those classifications; however, 100% of the data reported for the classifications was union data. EXAMPLE: UAVG-OH-0010 08/29/2014. UAVG indicates that the rate is a weighted union average rate. OH indicates the state. The next number, 0010 in the example, is an internal number used in producing the wage determination. 08/29/2014 indicates the survey completion date for the classifications and rates under that identifier.

A UAVG rate will be updated once a year, usually in January of each year, to reflect a weighted average of the current negotiated/CBA rate of the union locals from which the rate is based.

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WAGE DETERMINATION APPEALS PROCESS

1.) Has there been an initial decision in the matter? This can be:

- \* an existing published wage determination
- \* a survey underlying a wage determination
- \* a Wage and Hour Division letter setting forth a position on a wage determination matter
- \* a conformance (additional classification and rate) ruling

On survey related matters, initial contact, including requests for summaries of surveys, should be with the Wage and Hour National Office because National Office has responsibility for the Davis-Bacon survey program. If the response from this initial contact is not satisfactory, then the process described in 2.) and 3.) should be followed.

With regard to any other matter not yet ripe for the formal process described here, initial contact should be with the Branch of Construction Wage Determinations. Write to:

Branch of Construction Wage Determinations  
Wage and Hour Division  
U.S. Department of Labor  
200 Constitution Avenue, N.W.  
Washington, DC 20210

2.) If the answer to the question in 1.) is yes, then an interested party (those affected by the action) can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Write to:

Wage and Hour Administrator  
U.S. Department of Labor  
200 Constitution Avenue, N.W.  
Washington, DC 20210

The request should be accompanied by a full statement of the interested party's position and by any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3.) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board  
U.S. Department of Labor  
200 Constitution Avenue, N.W.  
Washington, DC 20210

4.) All decisions by the Administrative Review Board are final.

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END OF GENERAL DECISION"

DOCUMENT A00801

**SPECIAL PROVISIONS****WEBSTER****Federal Aid Project No. HSI/STP/CMQ-0033(039)X  
Intersection Improvements at I-395 Ramps (Exit 3)  
at Route 16 (East Main Street) and Sutton Road**

Labor participation goals for this Project shall be 15.3% for minorities and 6.9% for women for each job category. The goals are applicable to both Contractor's and Subcontractor's on-site construction workforce. Refer to Document 00820 for details.

**SCOPE OF WORK**

All work under this Contract shall be done in conformance with the *2024 Standard Specifications for Highways and Bridges*, the *Supplemental Specifications* contained in this book, the *2017 Construction Standard Details*, the *Traffic Management Plans and Detail Drawings*, *MassDOT Work Zone Safety Temporary Traffic Control*, the *1990 Standard Drawings for Signs and Supports*; the *2015 Overhead Signal Structure and Foundation Standard Drawings*, the *2009 Manual on Uniform Traffic Control Devices (MUTCD) with Revisions 1, 2, and 3 and the November 2022 Massachusetts Amendments to the MUTCD*; the *1968 Standard Drawings for Traffic Signals and Highway Lighting*; *The American Standard for Nursery Stock*; the Plans and these Special Provisions.

The work under this Contract consists of the reconstruction of the intersections of Route 16 (East Main Street) with the I-395 Northbound and Southbound ramps in the Town of Webster. The Route 16 intersection with the I-395 Southbound on and off ramps will be reconstructed into a signalized intersection. The Route 16 intersection with the I-395 Northbound on and off ramps and Sutton Road will be reconstructed as a roundabout. The roadway reconstruction work will include ledge/rock excavation, pavement reclamation, full depth construction, full depth widening and milling and overlay. The work will also include reconstruction of the drainage system and installation of stormwater infiltration basins. New sidewalks and a shared use path will also be constructed within the project limits. The work will also include the installation of new roadway lighting, guardrail, concrete barrier, fencing, landscaping treatments, curbing, pavement markings, signing, temporary traffic control during construction, and all other related items as noted in these Contract Documents. The work will also include construction of a water main, fire hydrants, and valves, as well as an underground cable TV conduit duck bank and manholes. The existing Intelligent Transportation System (ITS) service meter pedestal for one (1) I-395 NB closed circuit TV (CCTV) camera in MassDOT District 3 shall be relocated.

In addition completely replace the existing twin corrugated metal pipe arch Mill Brook culvert (Br. No. W-12-030) that is located just west of the I-395 Southbound ramp intersection. The new culvert will be a precast concrete box culvert that will be filled with natural streambed material.

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**SCOPE OF WORK (Continued)**

New concrete headwalls and gravity wingwalls are also included in the scope of reconstruction. The culvert and wingwalls shall be reconstructed in phases and temporary water control will be required to maintain flow in the Mill Brook and temporary earth support will be required to maintain traffic along Route 16.

The Contractor shall satisfy themselves by their own investigation and research as to conditions and measurements affecting the work to be done and shall make their bid in sole reliance thereon.

**SUBSECTION 7.05 INSURANCE REQUIREMENTS****B. Public Liability Insurance**

The insurance requirements set forth in this section are in addition to the requirements of the Standard Specifications and supersede all other requirements.

**Paragraphs 1 and 2**

The Massachusetts Department of Transportation and applicable railroads shall be named as additional insureds.

**WORK IN MILL BROOK**

Mill Brook originates from Mill Pond, which is located immediately upstream of the Mill Brook culvert inlet. Mill Pond is used as an intermediate natural retention basin to regulate flow between Mill Brook and the further upstream Lake

Chargoggagoggmanchauggagoggchaubunagungamaug- g (Webster Lake). Flow from Webster Lake is carried under I-395 to Mill Pond via a pair of 60" diameter reinforced concrete pipes. Flow into these pipes is controlled by the Webster Lake Dam, which is owned by Webster Lake Preservation, LLC and is operated by LaFramboise Well Drilling Inc. Midpoint Engineering & Consulting, LLC provides engineering services in support of dam operations and serves as the Webster Lake Dam owner's engineer. The water level within Mill Brook was observed at elevation 476.3 in September 2018. It should be noted that higher or lower water levels may be encountered at any time of the year and that storm events may cause a rise in the water level.

The water level in Mill Pond, and subsequently Mill Brook, can be temporarily lowered through regulation of flow into Mill Pond via the Webster Lake Dam. This can only occur when Webster Lake is naturally at its lowest levels during the months of July/August/September and at the discretion of the dam operator.

Flow through Mill Brook can also be completely ceased using the flow control structure located immediately south of the culvert inlet. The flow control structure consists of a steel upward-sliding sluice gate mounted on the upstream face of a 4'-6" high by 4'-0" wide rectangular orifice within a concrete basin structure and a secondary reinforced concrete bypass pipe to the east of the sluice gate. To cease flow through Mill Brook, the Contractor will be allowed to close the steel sluice gate, which will seal the opening to Mill Pond.



**WORK IN MILL BROOK (Continued)**

Closure of the sluice gate shall only occur upon written confirmation of the Webster Lake dam operator. Sandbagging or other means of temporary plugging the bypass pipe may be required depending on water levels in Mill Pond. **This will only be allowed on a limited basis during key phases of construction which require a complete stoppage of flow through the work area and as authorized within the Environmental Permit conditions.** Similar to flow regulation via the Webster Lake Dam, full stoppage of flow can only occur when Webster Lake is naturally at its lowest levels during the months of July/August/September and at the discretion of the dam operator.

Water level reductions in Mill Pond, and complete flow stoppage through Mill Brook, is solely at the discretion of the Webster Lake dam operator. Available dates/times and durations of water level reductions and flow stoppage is subject to change at any time depending on operational needs of Webster Lake Dam. The total duration for a single stoppage of flow shall not exceed the lesser of; 7 days, the available time granted by the dam operator, and the duration of time allowed by the project's environmental permits.

See special provision language under Item 991.1 for additional requirements for working within Mill Brook, and for requirements specific to the design and operation of the temporary water control system.

The Contractor is responsible for all coordination with the Webster Lake dam operator and engineering representative regarding reductions in flow within Mill Brook. The means and methods for in-water work and the schedule for culvert installation shall be coordinated with the dam operator as soon as possible in the construction schedule.

The dam operator will require at least 30 days advanced notice of any planned work within Mill Brook requiring water control to then plan for reductions to flow into Mill Pond using the Webster Lake Dam. Contact information for Webster Lake Dam is provided below.

**Dam Operator**

LaFramboise Well Drilling, Inc.  
Attn: Paul LaFramboise  
647 Thompson Road (Route 193)  
Thompson, CT 06277  
800-624-2327  
paul@thewaterexperts.com

**Webster Lake Owner's Engineer**

MidPoint Engineering & Consulting, LLC  
Attn: Patrick Doherty, PE  
37 Sutton Road,  
Webster, MA 01570  
508-721-1900  
pdoherty@midpointengineering.com

LaFramboise Well Drilling Inc and Midpoint Engineering & Consulting LLC shall be included in all pre-construction meetings held by the Contractor.

## **CONTRACTOR QUESTIONS AND ADDENDUM ACKNOWLEDGEMENTS**

Prospective bidders are required to submit all questions to the Construction Contracts Engineer by 3:00 P.M. on the Tuesday of the previous week before the scheduled bid opening date. Any questions received after this time will not be considered for review by the Department.

Contractors should email questions and addendum acknowledgements to the following email address [massdotSpecifications@dot.state.ma.us](mailto:massdotSpecifications@dot.state.ma.us) The MassDOT project file number and municipality is to be placed in the subject line.

## **NEW ELECTRICAL SERVICE FOR MASSDOT ITS CCTV EQUIPMENT**

*(Supplementing Subsection 5.11 Final Acceptance)*

New electrical service for the MassDOT ITS CCTV service meter shall be assigned to MassDOT ITS Programs; it shall not be assigned to the Contractor at any time. The owner's name on the bill shall be set as "MassDOT ITS Programs-'Site ID'" where 'Site ID' is [Road Name][Road Direction]-[Device Type]-[Mile Marker]. For the current CCTV meter pedestal remove and relocate: 395NB-CCTV-2.4. MassDOT will forward the electric service bills to the Contractor. The Contractor shall pay for electric service prior to final acceptance, including the entire billing period within which the final acceptance date falls. The Contractor shall pay the utility bill within one (1) week of receipt from MassDOT; failure to do so shall result in the removal of the failed payment amount from the subsequent estimate.

MassDOT shall not pay electrical bills until after a final inspection is completed. The Contractor cost of the utility bills will be incidental to the Contract bid Items 813.801 without additional compensation.

The MassDOT ITS Programs unit contact information is the following:

MassDOT-Highway Division  
Highway Operations Section  
ITS Programs <SITE ID>  
ATTN: New Electrical Service Coordinator  
10 Park Plaza, Room 7410  
Boston, MA 02116  
MassDOT Main Phone: 857-368-4636

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## **NORTHERN LONG-EARED BAT PROTECTION**

The U.S. Fish and Wildlife Service (USFWS) has listed the northern long-eared bat (NLEB) as endangered under the Endangered Species Act (ESA) and the following requirements exist to protect the bat and its habitat. This project has been consulted with the USFWS through the Federal Highway Administration (FHWA), Federal Railroad Administration (FRA), and Federal Transit Administration (FTA) Programmatic Biological Opinion for Transportation Projects in the Range of the Indiana Bat and Northern Long-Eared Bat revised February 5, 2018 and amended March 31, 2023.

On behalf of FHWA, the lead federal agency for Section 7 consultation, MassDOT submitted a Programmatic Consultation for Transportation Projects affecting NLEB or Indiana Bat to the USFWS through the Information for Planning and Consultation (IPaC) webpage and generated a USFWS No Effect Consistency Letter (see **Document A00870**), whereby it was determined that this Project will have “No Effect” to the NLEB. Therefore, the project has completed Section 7 consultation through the Endangered Species Act, and no AMMs apply to the project.

If the project scope changes (i.e., tree clearing, bridge work), additional review is required by the MassDOT Highway Division’s Environmental Services Section. Contact MassDOT Environmental Services - Wildlife & Endangered Species Unit Supervisor (David Paulson, [david.j.paulson@dot.state.ma.us](mailto:david.j.paulson@dot.state.ma.us), 857-262-3378).

## **MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION FILE NUMBER SIGN**

This project is subject to Massachusetts General Laws, Chapter 131, Section 40 as amended. Signs shall be in accordance with the latest MassDOT Construction Standards. All costs for the manufacture, erection, maintenance, moving, and removal of the signs shall be absorbed by the contractor with no additional compensation other than the contract unit prices.

For this project the Massachusetts Department of Environmental Protection File Number is 323-1265.

## **PROPRIETARY PRODUCTS**

MassDOT has approved the use of the following proprietary products on this contract pursuant to M.G.L. c. 30, § 39M(b):

- Item 815.1 and 816.02/ Field Monitoring Unit (FMU)/ Model AI-500-085-02 equipment manufactured by Applied Information (AI)
- Item 376./ hydrant/ Kennedy Model 81D
- Items 815.1 and 816.02/ single-point video detection system (SPVD)/ Gridsmart System, manufactured by Cubic, or the TrafficLink and SmartView systems, manufactured by Miovision.

Approval letter has been filed with MassDOT.

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## **HOLIDAY WORK RESTRICTIONS**

(Supplementing Subsection 7.09)

The District Highway Director (DHD) may authorize work to continue during these specified time periods if it is determined by the District that the work will not negatively impact the traveling public. DHD may allow work in those areas on a case-by-case basis and where work is behind barrier and will not impact traffic

Below are the holiday work restrictions:

### New Years Day (Federal Holiday)

No work on major arterial roadways from 5:00 AM on the day before until the normal start of business on the next subsequent business day. No work on local roadways on the holiday without permission by the DHD and the local police chief.

### Martin Luther King's Birthday (Federal Holiday)

No work restrictions due to traffic concerns, however work on local roadways requires permission by the DHD and local police chief.

### President's Day (Federal Holiday)

No work restrictions due to traffic concerns, however work on local roadways requires permission by the DHD and local police chief.

### Evacuation Day (Suffolk County State Holiday)

No work restrictions due to traffic concerns.

### Patriot's Day (State Holiday)

Work restrictions will be in place for Districts 3 and 6 along the entire Boston Marathon route and any other locations that the DHD in those districts determine are warranted so as to not to impact the marathon. All other districts work restrictions will be as per DHD.

### Mother's Day

No work on Western Turnpike and Metropolitan Highway System from 5:00 AM on the Friday before, until the normal start of business on the following day.

### Memorial Day (Federal Holiday)

No work on major arterial roadways from 5:00 AM on the Friday before, until the normal start of business on the following day.

### Bunker Hill Day (Suffolk County State Holiday)

No work restrictions due to traffic concerns.

### Juneteenth

No work restrictions due to traffic concerns, however work on local roadways requires permission by the DHD and local police chief.

## **HOLIDAY WORK RESTRICTIONS** (Continued)

### Independence Day (Federal Holiday)

No work on major arterial roadways from 5:00 AM on the day before until the normal start of business on the next subsequent business day. No work on local roadways on the holiday without permission by the DHD and the local police chief.

### Labor Day (Federal Holiday)

No work on major arterial roadways from 5:00 AM on the Friday before, until the normal start of business on the following day.

### Columbus Day (Federal Holiday)

No work on major arterials from 5:00 AM on the Friday before, until the normal start of business on the following day

### Veterans' Day (Federal Holiday)

No work restrictions due to traffic concerns.

### Thanksgiving Day (Federal Holiday)

No work on major arterials from 5:00 AM two days before until the normal start of business on the following Monday.

### Christmas Day (Federal Holiday)

No work on major arterial roadways from 5:00 AM on the day before until the normal start of business on the next subsequent business day.

## **NON-BID ITEM**

### **A) Payment for Specialty Services**

The Contractor will be reimbursed for any specialty services services including unknown utility (power and communications) installation costs by the respective utility companies that have not been included as incidental to any Contract Bid Item, if needed and as required by the Engineer.

The Contractor will be paid for any specialty services required to perform the work plus 10%.

No specialty services shall be hired until approved by the Engineer and competitive prices may be required if the Engineer so directs. The Contractor will not bid this item. If the Engineer has knowledge of a source of specialty services, which are competitive with the Contractor's choice, then the Contractor may be required to investigate and use an alternative.

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**SUPPLEMENTAL REQUIREMENTS FOR NON-BID ITEMS**

(Supplementing Subsection 3.04 of Standard Specifications)

The Contractor will be paid for additional artisans, equipment rental, materials, engineering services and specialty services required to perform the work plus (10%) percent, plus actual increased bond premium.

The Contractor shall be required to furnish certified paid receipts for additional artisans, equipment rental, materials, engineering services and specialty services that are required to perform the work prior to payment by the Department. Increased bond premium for additional artisans, equipment rental, materials, engineering services and specialty services will be paid after a certified paid receipt is submitted showing payment of the increased bond.

**WORK SCHEDULE**

(Supplementing Subsection 7.09)

The work under this contract shall be conducted during both day and night-time hours. The Prime Contractor and all Subcontractors shall be restricted to the same work hours. Night-time work hours shall be determined in coordination with the Engineer, but shall be considered to be between 10:00 pm and 5:00 am pending MassDOT approval of the Contractor's submitted schedule. The Contractor shall request other work hours or additional work hours in writing and submit the request to the Engineer for approval at least ten days prior to the requested start date.

Select work activities associated with the replacement of Bridge W-12-030 (C83) will require extended work hours. These activities are limited to those requiring a complete stoppage of flow through Mill Brook as outlined in these Special Provisions. During these periods where flow in Mill Brook is stopped, the Contractor shall work 7 days per week with 12-hour shifts between 7:00 am and 7:00 pm pending MassDOT's approval of the Contractor's schedule and coordination with the operations of the Webster Lake Dam operations. All work performed during extended work hours shall be within permanent work zones behind limited deflection barrier.

Closures on any of the I-395 Ramps may only be performed during night-time hours Sunday through Thursday, subject to holiday and other restrictions with prior written approval from MassDOT. The Contractor shall submit a written request for I-395 ramp closures to the Engineer at least 2 weeks in advance of the earliest date of any proposed closure. Requests shall include a list of all dates for proposed ramp closures and shall indicate which ramps will be closed on the requested dates. Ramp closures will be approved on individual basis for each date requested.

**NOTICE TO OWNERS OF UTILITIES**

*(Supplementing Subsection 7.13)*

Written notice shall be given by the Contractor to all public service corporations or officials owning or having charge of public or private utilities, of his/her intention to commence operations affecting such utilities at least one week in advance of the start of such operations. The Contractor shall at the same time file a copy of said notice with the Engineer.

Following are the names and addresses of the companies or agencies that may be affected, but the completeness of the list is not guaranteed:

District Utility/Constructability Engineer  
Ross Goodale  
(857) 368-3204  
[Ross.A.Goodale@state.ma.us](mailto:Ross.A.Goodale@state.ma.us)

Town of Webster Highway Dept.  
Kenneth L. Pizzetti  
(508) 949-3862 x 1041

MassDOT District 3 Lighting/Electrical  
Joseph Ostrowski  
(508) 864-0902  
[Joseph.Ostrowski@dot.state.ma.us](mailto:Joseph.Ostrowski@dot.state.ma.us)

MassDOT ITS/Fiber  
Tony Wade  
(781) 431-5168  
[Tony.Wade@dot.state.ma.us](mailto:Tony.Wade@dot.state.ma.us)  
William Adams  
(508) 431-5166  
[William.Adams@dot.state.ma.us](mailto:William.Adams@dot.state.ma.us)

MassDOT District 3 Operations Engineer  
Joseph Frawley  
(857) 368-3000  
[Joseph.Frawley@state.ma.us](mailto:Joseph.Frawley@state.ma.us)

National Grid Electric  
Sandra Annis  
(413) 582-7424  
[Sandra.Annis@nationalgrid.com](mailto:Sandra.Annis@nationalgrid.com)

National Grid Gas  
Melissa Owens  
(781) 907-2845  
[Melissa.Owens@nationalgrid.com](mailto:Melissa.Owens@nationalgrid.com)

Verizon  
Karen Mealey  
(774) 409-3160  
[Karen.M.Mealey@verizon.com](mailto:Karen.M.Mealey@verizon.com)

Webster Water & Sewer Department  
Tom Cutler  
(508) 949-3865

Charter Communications  
Ted Michaud  
(774) 243-9834  
[TedMichaud@charter.com](mailto:TedMichaud@charter.com)

## **NATIONAL GRID EMERGENCY TELEPHONE NUMBERS**

### **GAS:**

Emergency: 1-800-233-5325

New Service: 1- 877-696-4743

Customer Support: 1-800-732-3400

### **ELECTRIC:**

Outage/ Emergency: 1-800-465-1212

New Service: 1-800-375-7405

Customer Support: 1-800-322-3223

## **REMOVE AND STACK ITEMS**

The project involves several items designated as Remove and Stack (R&S). The Contractor shall remove, stack, protect, transport, and deliver these items to the following locations:

- Hydrants shall be delivered to 38 Hill Street, Webster, MA
- Chain Link Fencing owned by IIP-MA 7 LLC shall be delivered to 30 Worcester Road, Webster, MA
- Existing signing owned by East Village Square, LLC shall be delivered to Galaxy Development, 37 Sutton Road, Webster, MA
- Roadway lighting bracket arms and luminaires shall be delivered to the Town of Webster Highway Department at 23 Cudworth Road, Webster, MA
- Existing signing owned by MAPFRE Insurance shall be delivered to MAPFRE Insurance at 11 Gore Road, Webster, MA

No separate payment will be made for transportation, loading, unloading and stacking, but all costs in connection therewith shall be included in the respective Contract Items.



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## **VALUE ENGINEERING CHANGE PROPOSAL**

This Subsection defines the conditions and requirements which apply to Value Engineering Change Proposals (“VECPs”). The purpose of this provision is to encourage the Contractor to propose changes in certain project requirements that will maintain the project’s functional requirements at a savings in contract time, contract price, or both. The net savings obtained by using a VECP that meets the conditions and requirements set forth here will be shared by the Contractor and MassDOT.

VECP’s under this provision are to be initiated, developed, and submitted to MassDOT by the Contractor. The VECP must show the contemplated changes to the Drawings, Specifications, and other requirements in the Contract. When a VECP submitted pursuant to this section is fully accepted by MassDOT, the VECP will be implemented by the Contractor and paid using the current cost and resource loaded schedule. Contractor shall demonstrate that the VECP is equal to, or better than, the original design or material; that there is an interest in public safety within the VECP; that there is a life-cycle cost benefit; and/or that end users will benefit from the shortened schedule. VECPs shall be consistent with the MassHighway/MassDOT Standard Specifications for Highways and Bridges and other applicable reference documents and directives. Any proposed deviation from these documents will need to be clearly identified in the VECP Proposal Documents, and must be approved by MassDOT’s Chief Engineer before accepting this VECP.

- A. In order to be considered for MassDOT review each VECP shall:
1. Be clearly labeled pursuant to this Subsection;
  2. Yield a net savings of at least two hundred and fifty thousand (250,000.00) Dollars and/or a net saving of contract completion duration of at least three (3) months;
  3. The proposed changes to contract items must:
    - a. maintain the specified items’ required functions (service life, reliability);
    - b. meet applicable safety regulations and codes;
    - c. material substitutions must be in accordance with DOT prequalified/preapproved products and must be tested in accordance with standard material specs/testing methods (and considering all relevant environmental, load, and other relevant factors);
    - d. show economy of operation, ease of maintenance, ease of construction, and necessary standardized features and appearance; and
  4. Shall not require an extension of Contract Time or Contract Milestones, with the exception of cases when there are anticipated significant cost saving.

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**VALUE ENGINEERING CHANGE PROPOSAL** (Continued)

The thresholds above are considered to be a general guideline. MassDOT will consider VECPs outside of these thresholds if a significant benefit is demonstrated. Additionally, notwithstanding this VECP process, MassDOT will consider minor revisions in the form of a Contract Modification.

Further, any VECP submitted shall be in sufficient detail to clearly define the proposed change. The Contractor's failure to provide information of the type, detail and in a format to facilitate the MassDOT's review, may be grounds for rejection of the VECP. Additionally, the Contractor will not be entitled to any equitable adjustment or increased Time, due to any aspect of any of the proposed VECP including permitting, right of way, utility coordination or delayed responses by MassDOT. If, after the progression of the work associated with the executed Contract Modification for the VECP, any additional costs are realized by the Contractor or any of the sub-consultants, sub-contractors, or suppliers, the Contractor shall be obligated to pay for any and all costs.

- B. The following initial items shall be provided by the Contractor for MassDOT's review. *Items 1-6 need to be submitted prior to the start of MassDOT's review of the VECP and item 7 is an important consideration for the pricing of the VECP and the timeline of the proposed VECP schedule.*
1. ***VECP Description:*** A description of the difference between the existing and the proposed Contract requirements, and the comparative advantages and disadvantages of each;
  2. ***VECP Change Listing:*** A listing of the Contract requirements that will need to be changed, modified, or reviewed as well as the proposed Contract document changes in the Instructions to Bidders, Contract, Standard Specifications, General Requirements and Special Provisions required by the VECP.
  3. ***Construction Schedule Update:*** Any changes in the Contract Time(s) or Contract Milestone(s), that will result from acceptance of the VECP, shall be accompanied by a contemporaneous schedule analysis (*i.e., the Contractor's baseline schedule submission, all past/required monthly schedule updates, a detailed assessment of all past delays, and a resource loaded Critical Path Method schedule as specified in Section 8.00 / Subsection 8.02 of this Contract*) of the projected Work that remains including the proposed VECP related schedule changes (*inclusive of the timeline to review accept the VECP and the timeline for implementing the design changes*) in the remaining work. This shall be submitted in the form of a Proposal Schedule until the VECP has been formally accepted. Note: All of this information is to be updated, recertified, and formally accepted by MassDOT before final acceptance of this VECP is issued.

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**VALUE ENGINEERING CHANGE PROPOSAL** (Continued)

4. ***Date for MassDOT's Acceptance:*** A statement that clearly justifies the date by which the VECP must be accepted to obtain the maximum price reduction, noting any effect upon the Contract Time(s) and/or Contract Milestone(s). This statement must include a narrative that demonstrates the most recent construction schedule has been utilized to justify that proposed acceptance date (*e.g. "in order to start to fabricate critical materials, authorization must be provided to work on the shop drawings by no later than [date]"*). The Contractor should allow for at least sixty (60) to ninety (90) days for acceptance by MassDOT once all of the VECP documentation has been provided. Acceptance shall mean that MassDOT has received a finalized and executed contract modification. However, this is a proposed Contract change.

The Contractor is fully obligated to progress the Work of the original Contract and MassDOT is not liable for any delays or costs that may occur in the review phase of any VECP proposal.

5. ***Cost and Savings Estimates:*** A detailed estimate of the anticipated net savings, calculated as follows:
- a. ***Original Scope:*** Isolate the cost of performing the original contract construction activities, in accordance with the original Contract Documents, as originally bid by the Contractor, that are anticipated to be superseded by the VECP. *This cost is to include any original contract scope that is anticipated to be altered or eliminated by the VECP such as, shop drawing preparation, inspection work, testing, maintenance of traffic, or any other original contract costs, that have yet to have been performed at the time of this VECP submission.*
  - b. ***New VECP Scope:*** Calculate the cost of performing the comparable construction activities associated with the VECP.
  - c. ***Contractor's Engineer & Inspection:*** Calculate the cost of engineering, inspection, and design work by the Contractor's Engineer/Designer. This should be a realistic estimate of the costs of any required engineering, design, and review work by the Contractor's Engineer.
  - d. ***MassDOT's Costs:*** MassDOT's estimate of costs to perform engineering/design reviews, cost estimate reviews, schedule reviews, and any other administrative costs to review and recommend implementation of the proposed VECP (*including all anticipated increased costs to MassDOT on other Contracts and all anticipated follow-on increased costs to MassDOT, if any*) as provided by MassDOT. MassDOT's estimated costs must be included in the VECP calculation and will be provided by MassDOT in support of the VECP evaluation process.
  - e. ***Other Costs:*** Estimated costs associated with any revisions to other project related costs, such as Environmental Permits or Right of Way acquisitions, including other agency or municipality costs, as provided by MassDOT.

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**VALUE ENGINEERING CHANGE PROPOSAL** (Continued)Net Savings:

**The net savings to be split between MassDOT and the Contractor shall be calculated using the items above as follows:  $a - (b+c+d+e) = \text{net savings}$**

6. *The Contractor shall also provide:*

- a. A proposed Change Order, which explains and justifies any required Equitable Adjustment in the Contract Price.
- b. The Contractor's actual costs expended for developing the VECP as of the date of the VECP submission;

7. ***Design Changes and Drawings:*** The costs that are outlined above should be inclusive of the following design and engineering responsibilities.

- a. Design changes shall be prepared and stamped by the Contractor's professional designer and/or engineer. In addition, in the development of the VECP; the Contractor is responsible for anticipating and managing all aspects associated with any VECP design work that must be performed by a licensed Engineer.
- b. The Contractor's engineer must analyze and stamp all components of any aspect of the project that has been redesigned, changed, or altered as a result of this VECP.
- c. The Contractor's engineer shall provide all calculations and supporting design/engineering documentation that was utilized to develop the changes and stamped drawings. These will be used by MassDOT's Designer-of-Record to review the VECP changes. The Contractor is limited to selecting only those engineer's that have been pre-qualified by MassDOT's A&E Board.
- d. MassDOT's Designer-of-Record will review and respond to all completed design submissions related to this VECP within thirty (30) calendar days, unless determined to be a non-critical path item.
- e. MassDOT will be responsible for estimating and managing MassDOT's Designer-of-Record during the VECP review and implementation. Should any significant conflicts arise, between the Contractor's Engineer and MassDOT's Designer-of-Record, the DOT and the Contractor will work expeditiously to resolve the conflict. Should this type of conflict continue for greater than five (5) days, the Contractor is to bear all financial and time related impacts of such delay and must seek to resolve the design conflict, in an acceptable manner to MassDOT. The resolution of this conflict will be funded at the Contractor's expense – exclusive of the net saving that was agreed to at the execution of the contract modification for this VECP.
- f. The Contractor's Engineer may also be required to inspect the construction work. The Contractor is to include such anticipated inspection costs in the initial VECP.

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**VALUE ENGINEERING CHANGE PROPOSAL** (Continued)

- g. MassDOT's Designer of Record will remain the Designer-of-Record for the entire Project. Any costs incurred in the use of MassDOT's Designer-of-Record by MassDOT or Contractor associated with the review of a VECP are to be included in the calculated net savings.
- C. Approval of the VECP shall not occur until a Contract Modification, incorporating the VECP, is issued by MassDOT and properly executed by the Contractor. MassDOT may accept or reject part or all of any VECP at any time prior to an executed Contract Modification for the applicable VECP. The decision of MassDOT, concerning acceptance or rejection of any VECP, shall be final and shall not be subject to dispute resolution.

It is expected that several weeks may go by before the final VECP documentation has been executed with a Contract Modification. Therefore, MassDOT intends to make certain that the initial cost estimate information has not changed before entering into a Contract Modification. As the VECP evaluation process is finalized, and prior to the signed Contract Modification for the VECP, the Contractor and MassDOT must re-certify the current status of the originally proposed cost and/or schedule savings.

Until a contract modification is issued and schedule and cost/savings re-certification is complete and accepted by MassDOT, the Contractor shall remain obligated to perform the Work in accordance with the terms and conditions of the original Contract Documents.

Upon completion of the work associated with the VECP, MassDOT may require verification that the VECP savings has been achieved.

- D. VECPs will be processed (distributed, reviewed, commented upon, accepted, or rejected) expeditiously (pursuant to M.G.L. c. 30, § 39R); however, as this is an elective modification to the contract, MassDOT shall not be liable for any delay or cost in the review and acceptance of the VECP. During the review of the VECP, the Contractor remains obligated to progress the original Contract scope, and schedule, as planned; until a Contract Modification, accepting the Contractor re-certified VECP, has been executed by MassDOT.

The Contractor has the right to withdraw part, or all of any VECP, prior to acceptance by MassDOT. Such withdrawal shall be made in writing to the Engineer. The Contractor shall state the period of time, from the date of the initial VECP submittal, that the VECP shall remain valid and feasible. Revision of this validity and feasibility period shall be allowed only by mutual agreement of the Contractor and the Engineer in writing.

If the Contractor desires to withdraw the proposal prior to the expiration of this period for non-technical reason, MassDOT reserves the right to recover all actual costs that have been incurred to MassDOT.

**VALUE ENGINEERING CHANGE PROPOSAL** (Continued)

If the Contractor withdraws the VEC Proposal, MassDOT reserves the right to proceed with the VECP or any portion of the VECP as a normal change and the Contractor waives any right it may have had to share in net savings thereunder.

For purposes of this provision, expiration of the time established by the Contractor for approval shall be considered as withdrawal by the Contractor if MassDOT requests an extension of that time and the Contractor does not provide a written extension.

- E. With regard to unknown conditions or sub-surface work, in general, the expectation is that the Contractor and MassDOT will strive to gain enough knowledge about the risks in order to provide a forward-priced Change Proposal. Therefore, any costs to fully evaluate the proposal, such as additional borings and/or test pits, must be considered in the cost evaluation of whether the VECP is worth pursuing. However, if it is impractical to gather conclusive exploratory information, before the VECP is executed, MassDOT may consider provisions in the VECP that clearly identifies the risk sharing (cost and time) related specifically to the unknown/sub-surface conditions. If these VECP provisions are acceptable to MassDOT they are to include supplemental language to provide a determination of the final savings/cost, and time impacts, no later than 45 days after the sub-surface work is completed. All other aspects of the VECP, unrelated to these Provisions, will be binding upon execution of the VECP.

**BIDDERS LIST**

Pursuant to the provisions of 49 CFR Part 26.11 all official bidders will be required to report the names, addresses and telephone numbers of all firms that submitted bids or quotes in connection with this project. Failure to comply with a written request for this information within 15 business days may result in a recommendation to the Prequalification Committee that prequalification status be suspended until the information is received.

The Department will survey all firms that have submitted bids or quotes during the previous year prior to setting the annual goal and shall request that each firm report its age and gross receipts for the year.

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**BUILD AMERICA BUY AMERICA PREFERENCE**

On Federally-aid projects the Buy America (23.CFR § 635.410) and Build America, Buy America Act (Pub. L. No. 117-58, §§ 70901-52). requires the following,

- (1) all iron and steel used in the project are produced in the United States--this means all manufacturing processes, from the initial melting stage through the application of coatings, must occur in the United States. Foreign steel and iron can be used if the cost of the materials does not exceed 0.1% of the total Contract cost or \$2,500, whichever is greater. The action of applying a coating to a covered material (i.e., steel and iron) is deemed a manufacturing process subject to Buy America. Coating includes epoxy coating, galvanizing, painting and any other coating that protects or enhances the value of a material subject to requirements of Build America, Buy America. Steel used for temporary support of excavation, including H piles, soldier piles, and sheeting when the steel is required to be left in place is subject to requirements of Build America, Buy America. Temporary steel, shall remain in place when it falls within the influence zone of the soil supporting any structure or railroad tracks.
  
- (2) all manufactured products used in the project are produced in the United States—this means the manufactured product was manufactured in the United States; and the cost of the components of the manufactured product that are mined, produced, or manufactured in the United States is greater than 55 percent of the total cost of all components of the manufactured product, unless another standard for determining the minimum amount of domestic content of the manufactured product has been established under applicable law or regulation; and
  
- (3) all construction materials are manufactured in the United States—this means that all manufacturing processes for the construction material occurred in the United States. “Construction materials” includes an article, material, or supply—other than an item of primarily iron or steel; a manufactured product; cement and cementitious materials; aggregates such as stone, sand, or gravel; or aggregate binding agents or additives—that is or consists primarily of:
  - non-ferrous metals,
  - plastic and polymer-based products (including polyvinylchloride, composite building materials, and polymers used in fiber optic cables),
  - glass (including optic glass),
  - lumber; or
  - drywall.

The Buy America preference only applies to articles, materials, and supplies that are consumed in, incorporated into, or affixed to an infrastructure project. As such, it does not apply to tools, equipment, and supplies, such as temporary scaffolding, brought to the construction site and removed at or before the completion of the infrastructure project. Nor does a Buy America preference apply to equipment and furnishings, such as movable chairs, desks, and portable computer equipment, that are used at or within the finished infrastructure project but are not an integral part of the structure or permanently affixed to the infrastructure project.

**NOTE:** The requirements for manufactured products indicated in paragraph (2) above are not in effect for this contract.

## **NOTIFICATION OF FUNDING SOURCES FOR WORK TO BE PAID BY OTHERS**

This contract contains work that shall be paid by the *Town of Webster*. The said *Town* shall be responsible for construction costs associated with a Non-Participating Agreement with MassDOT.

Work included in the Non-Participating Agreement includes the following:

- Installation of a new 16" water main (outside the limits of excavation required to reconstruct the Mill Brook Culvert) as shown on the Plans.
- Abandoning of the existing water main.
- Installation of new hydrants at locations shown on the Plans (except for the hydrant located at STA. 13+14, RT.).
- Any incidental work associated with the above, including excavation, trenching, backfilling, temporary pavement patching, etc.

## **EMERALD ASH BORER ADVISORY**

To the extent possible, all trees and brush shall be disposed on site, typically chipped and spread in place. When trees or brush must be removed, such as in urban, or otherwise populated areas, Contractor shall identify proposed location for disposal, and provide written notification to the Engineer for approval. Disposal shall be in city or town of project, or at minimum, within county, of construction operations.

## **EQUIVALENT SINGLE AXLE LOADS (ESALS)**

The estimated traffic level to be used for SUPERPAVE HMA mixture designs for this contract, expressed in Equivalent Single Axle Loads (ESALs) for the design travel lane over a 20-year period, is 4.1 Million 18-kip (80-kn) ESALs.



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## **SUBSECTION 8.14 UTILITY COORDINATION, DOCUMENTATION, AND MONITORING RESPONSIBILITIES**

### **A. GENERAL**

In accordance with the provisions of Section 8.00 Prosecution and Progress, utility coordination is a critical aspect to this Contract. This section defines the responsibility of the Contractor and MassDOT, with regard to the initial /utility relocation plan and changes that occur as the prosecution of the Work progresses. The Engineer, with assistance from the Contractor shall coordinate with Utility companies that are impacted by the Contractor's operations. To support this effort, the Contractor shall provide routine and accurate schedule updates, provide notification of delays, and provide documentation of the steps taken to resolve any conflicts for the temporary and/or permanent relocations of the impacted utilities. The Contractor shall provide copies to the Engineer of the Contractor communication with the Utility companies, including but not limited to:

- Providing advanced notice, for all utility-related meetings initiated by the Contractor.
- Providing meeting minutes for all utility-related meetings that the Contractor attends.
- Providing all test pit records.
- Request for Early Utility work requirements of this section (see below).
- Notification letters for any proposed changes to Utility start dates and/or sequencing.
- Written notification to the Engineer of all apparent utility delays within seven (7) Calendar Days after a recognized delay to actual work in the field – either caused by a Utility or the Contractor.
- Any communication, initiated by the Contractor, associated with additional Right-of-Way needs in support of utility work.
- Submission of completed Utility Completion Forms.

### **B. PROJECT UTILITY COORDINATION (PUC) FORM**

The utility schedule and sequence information provided in the Project Utility Coordination Form (if applicable) is the best available information at the time of the bid and has been considered in setting the contract duration. The Contractor shall use all of this information in developing the bid price and the Baseline Schedule Submission, inclusive of the individual utility durations sequencing requirements, and any work that has been noted as potentially concurrent utility installations.

### **C. INITIATION OF UTILITY WORK**

The Engineer will issue all initial notice-to-proceed dates to each Utility company based on either the:

- 1) Contractor's accepted Baseline Schedule
- 2) An approved Early Utility Request in the form of an Early Utility sub-net schedule (in accordance with the requirements of this Subsection)
- 3) An approved Proposal Schedule

#### **C.1 - BASELINE SCHEDULE – UTILITY BASIS**

The Contractor shall provide a Baseline Schedule submission in accordance with the requirements of Subsection 8.02 and inclusive of all of the information provided in the PUC Form that has been issued in the Contract documents. This is to include the utility durations, sequencing of work, allowable concurrent work, and all applicable considerations that have been depicted on the PUC Form.

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**SUBSECTION 8.14** (Continued)**C.2 – EARLY UTILITY REQUEST – (aka SUBNET SCHEDULE) PRIOR TO THE BASELINE**

All early utility work is defined as any anticipated/required utility relocations that need to occur prior to the Baseline Schedule acceptance. In all cases of proposed early utility relocation, the Contractor shall present all known information at the pre-construction conference in the form of a 'sub-net' schedule showing when each early utility activity needs to be issued a notice-to-proceed. The Contractor shall provide advance notification of this intent to request early utility work in writing at or prior to the Pre-Construction meeting. Prior to officially requesting approval for early utility work, the Contractor shall also coordinate with MassDOT and all utility companies (private, state or municipal) which may be impacted by the Contract. If this request is acceptable to the Utilities and to MassDOT, the Engineer will issue a notice-to-proceed to the affected Utilities, based on these accepted dates.

**C.3 – PROPOSAL SCHEDULE - CHANGES TO THE PUC FORM**

If the Contractor intends to submit a schedule (in accordance with MassDOT Standard Specifications, Division I, Subsection 8.02) that contains durations or sequencing that vary from those provided in the Project Utility Coordination (PUC) Form, the Contractor must submit this as an intended change, in the form of a Proposal Schedule and in accordance with MassDOT Standard Specifications, Division I, Subsection 8.02. These proposed changes are subject to the approval of the Engineer and the impacted utilities, in the form of this Proposal Schedule and a proposed revision to the PUC form. The Contractor shall not proceed with any changes of this type without written authorization from the Engineer, that references the approved Proposal Schedule and PUC form changes. The submission of the Baseline Schedule should not include any of these types of proposed utility changes and should not delay the submission of the Baseline Schedule. As a prerequisite to the Proposal Schedule submission, and in advance of the utility notification(s) period, the Contractor shall coordinate the proposed utility changes with the Engineer and the utility companies, to develop a mutually agreed upon schedule, prior to the start of construction.

**D. UTILITY DELAYS**

The Contractor shall notify the Engineer upon becoming aware that a Utility owner is not advancing the work in accordance with the approved utility schedule. Such notice shall be provided to the Engineer no later than seven (7) calendar days after the occurrence of the event that the Contractor believes to be a utility delay. After such notice, the Engineer and the Contractor shall continue to diligently seek the Utility Owner's cooperation in performing their scope of Work.

In order to demonstrate that a critical path delay has been caused by a third-party Utility, the Contractor must demonstrate, through the requirements of the monthly Progress Schedule submissions and the supporting contract records associated with Subsection 8.02, 8.10 and 8.14, that the delays were beyond the control of the Contractor.

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**SUBSECTION 8.14** (/Continued)

All documentation provided in this section is subject to the review and verification of the Engineer and, if required, the Utility Owner. In accordance with MassDOT Specifications, Division I, Subsection 8.10, a Time Extension will be granted for a delay caused by a Utility, only if the actual duration of the utility work is in excess of that shown on the Project Utility Coordination Form, and only if;

- 1) proper Notification of Delay was provided to MassDOT in accordance with the time requirements that are specified in this Section
- 2) the utility delay is a critical path impact to the Baseline Schedule (or most recently approved Progress Schedule)

**E. LOCATION OF UTILITIES**

The locations of existing utilities are shown on the Contract drawings as an approximation only. The Contractor shall perform a pre-construction utility survey, including any required test pits, to determine the location of all known utilities no later than thirty (30) calendar days before commencing physical site work in the affected area.

**F. POST UTILITY SURVEY – NOTIFICATION**

Following completion of a utility survey of existing locations, the Contractor will be responsible to notify the Engineer of any known conflicts associated with the actual location of utilities prior to the start of the work. The Engineer and the Contractor will coordinate with any utility whose assets are to be affected by the Work of this Contract. A partial list of utility contact information is provided in the Project Utility Coordination Form.

**G. MEETINGS AND COOPERATION WITH UTILITY OWNERS**

The Contractor shall notify the Engineer in advance of any meeting they initiate with a Utility Owner's representative to allow MassDOT to participate in the meeting if needed.

Prior to the Pre-Construction Meeting, the Contractor should meet with all Utility Owners who will be required to perform utility relocations within the first 6 months of the project, to update the affected utilities of the Project Utility Coordination Form and all other applicable Contract requirements that impact the Utilities. The Contractor shall copy the Engineer on any correspondence between the Utility Owner and the Contractor.

**H. FORCE ACCOUNT / UTILITY MONITORING REQUIREMENTS**

The Engineer will be responsible for recording daily Utility work force reports. The start, suspension, re-start, and completion dates of each of the Utilities, within each phase of the utility relocation work, will be monitored and agreed to by the Engineer and the Contractor as the work progresses.

**I. ACCESS AND INSPECTION**

The Contractor shall be responsible for allowing Utility owners access to their own utilities to perform the relocations and/or inspections. The Contractor shall schedule their work accordingly so as not to delay or prevent each utility from maintaining their relocation schedule.

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**COMPLIANCE WITH THE NATIONAL DEFENSE AUTHORIZATION ACT**

(Supplementing Subsection 7.01)

On all projects, the “Prohibition on Certain Telecommunications and Video Surveillance Services or Equipment” Regulation (2 CFR 200.216) prohibits the Contractor from using or furnishing the following telecommunications equipment or services:

- Telecommunications equipment produced by Huawei Technologies Company or ZTE Corporation (or any subsidiary or affiliate of such entities).
- For the purpose of public safety, security of government facilities, physical security surveillance of critical infrastructure, and other national security purposes, video surveillance and telecommunications equipment produced by Hytera Communications Corporation, Hangzhou Hikvision Digital Technology Company, or Dahua Technology Company (or any subsidiary or affiliate of such entities).
- Telecommunications or video surveillance services provided by such entities or using such equipment.
- Telecommunications or video surveillance equipment or services produced or provided by an entity that the Secretary of Defense, in consultation with the Director of the National Intelligence or the Director of the Federal Bureau of Investigation, reasonably believes to be an entity owned or controlled by, or otherwise connected to, the government of a covered foreign country.

This prohibition applies to all products manufactured by the aforementioned companies, including any individual components or parts.

By submitting a bid on a project, the Contractor certifies that all work will be in compliance with the terms of 2 CFR 200.216. The Contractor shall submit a COC indicating compliance with the above provisions for all telecommunications equipment or services included in the Contract.

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Payment for the item in which the materials are incorporated may be withheld until these COCs are received. Any cost involved in furnishing the certificate(s) shall be borne by the Contractor.

**SUBSECTION 8.02 SCHEDULE OF OPERATIONS**

Replace this subsection with the following:

An integrated cost and schedule controls program shall be implemented by the Contractor to track and document the progress of the Work from Notice to Proceed (NTP) through the Contractor Field Completion (CFC) Milestone. The Contractor’s schedules will be used by the Engineer to monitor project progress, plan the level-of-effort required by the Department’s work force and consultants and as a critical decision-making tool. Accordingly, the Contractor shall ensure that it complies fully with the requirements specified herein and that its schedules are both accurate and updated as required by the specification throughout the life of the project. Detailed requirements are provided in Division II, Section 722 Construction Scheduling.

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## SECTION 722 CONSTRUCTION SCHEDULING

### DESCRIPTION

#### 722.20 General

The Contractor's approach to prosecution of the Work shall be disclosed to the Department by submission of a Critical Path Method (CPM) schedule and a cost/resource loaded Construction Schedule when required in this Subsection. These requirements are in addition to, and not in limitation of, requirements imposed in other sections.

The requirements for scheduling submissions are established based on the Project Value at the time of the bid and are designated as Type A, B, C or D. The definitions of these Schedule Requirement Types are summarized below. Complete descriptions of all detailed requirements are established elsewhere in this specification.

**Type A** – for all Site-Specific Contracts with a Project Value over \$20 Million

- Schedule Planning Session
- Baseline CPM Schedule
- Monthly Update CPM Schedule
- Short-term Construction Schedule
- Contract Schedule Update Meeting
- Resource-Loading
- Resources Graphic Reporting
- Cash Flow Projections from the CPM
- Cash Flow Charts
- Cost-loaded CPM
- Contractor-furnished CPM software, computer and training

**Type B** – for all Site-Specific Contracts with a Project Value between \$10 Million and \$20 Million

- Schedule Planning Session
- Baseline CPM Schedule
- Monthly Update CPM Schedule
- Short-term Construction Schedule
- Contract Schedule Update Meeting
- Cost-loaded CPM
- Resource-Loading
- Monthly Projected Spending Report (PSR)
- Contractor-furnished CPM software, computer and training

**SECTION 722** (Continued)

**Type C** – for all Site-Specific Contracts with a Project Value between \$3 Million and \$10 Million

- Schedule Planning Session
- Baseline CPM Schedule
- Monthly Update CPM Schedule
- Short-term Construction Schedule
- Contract Schedule Update Meeting
- Monthly Projected Spending Report (PSR)
- Contractor-furnished CPM software, computer and training

**Type D** - for all contracts with a Project Value less than \$3 Million; various locations contracts of any dollar amount; contracts with durations less than one-hundred and eighty (180) Calendar Days; and other contracts as determined by the Engineer.

- Bar chart schedule updated monthly or at the request of the Engineer (See Section 722.62.B - Bar Charts.)
- Monthly Projected Spending Report (PSR) (See Section 722.62.F - Projected Spending Reports.)

**MATERIALS, EQUIPMENT, PERSONNEL****722.40 General****A. Software Requirements** (Types A, B and C)

The Contractor shall use Primavera P6 computer scheduling software.

In addition to the requirements of Section 740 – Engineer’s Field Office and Equipment, the Contractor shall provide to the Department one (1) copy of the scheduling software, one (1) software license and one (1) computer capable of running the scheduling software for the duration of the Contract. This computer and software shall be installed in the Engineer’s Field Office within twenty-eight (28) Calendar Days after Notice to Proceed. The computer and software shall be maintained and serviced as recommended by the computer manufacturer and/or as required by the Engineer during the duration of the Contract at no additional cost to the Department. The Contractor shall provide professional training in the basic use of the software for up to eight (8) Department employees. The trainer shall be approved by the Engineer. This training shall be provided within twenty-eight (28) Calendar Days after Notice to Proceed.

**B. Scheduler Requirements**

For all schedule types, if the Contractor plans to use outside scheduling services, the scheduler shall be approved as a subcontractor by the Engineer.

For Type A, B and C Schedules the name of the Contractor’s Project Scheduler together with his/her qualifications shall be submitted to the Department for approval by the Engineer within seven (7) Calendar Days after NTP. The Project Scheduler shall have a minimum of five [5] years of project CPM scheduling experience, three [3] years of which shall be on projects of similar scope and value as the project for which the Project Scheduler is being proposed. References shall be provided from past projects that can attest to the capabilities of the Project Scheduler.

**SECTION 722** (Continued)**CONSTRUCTION METHODS****722.60 General****A. Schedule Planning Session**

(Types A, B and C)

The Contractor shall conduct a schedule planning session within seven (7) Calendar Days after the Contractor receives the NTP and prior to submission of the Baseline Schedule. This session will be attended by the Department and its consultants. During this session, the Contractor shall present its planned approach to the project including, but not limited to:

1. the Work to be performed by the Contractor and its subcontractors;
2. the planned construction sequence and phasing; planned crew sizes;
3. summary of equipment types, sizes, and numbers to be used for each work activity;
4. all early work related to third party utilities;
5. identification of the most critical submittals and projected submission timelines;
6. estimated durations of major work activities;
7. the anticipated Critical Path of the project and a summary of the activities on that Critical Path;
8. a summary of the most difficult schedule challenges the Contractor is anticipating and how it plans to manage and control those challenges;
9. a summary of the anticipated quarterly cash flow over the life of the project.

This will be an interactive session and the Contractor shall answer all questions that the Department and its consultants may have. The Contractor shall provide a minimum of five (5) copies of a written summary of the information presented and discussed during the session to the Engineer. The Contractor's Baseline Schedule and accompanying Schedule Narrative shall incorporate the information discussed at this Schedule Planning Session.

**B. Schedule Reviews by the Department (All Types)****1. Baseline Schedule Reviews**

The Engineer will respond to the Baseline Schedule Submission within thirty (30) Calendar Days of receipt providing comments, questions and/or disposition that either accepts the schedule or requires revision and resubmittal. Baseline Schedules shall be resubmitted within fifteen (15) Calendar Days after receipt of the Engineer's comments.

**2. Contract Progress Schedule / Monthly Update Reviews**

The Engineer will respond to each submittal within twenty one (21) Calendar Days. Schedules shall be resubmitted by the Contractor within five (5) Calendar Days after receipt of the Engineer's comments.

Failure to submit schedules as and when required could result in the withholding of full or partial pay estimate payments by the Engineer.

**SECTION 722** (Continued)**722.61 Schedule Content and Preparation Requirements**  
(Types A, B and C unless otherwise noted)

Each Contract Progress Schedule shall fully conform to these requirements.

**A. LOGIC**

The schedules shall divide the Work into activities with appropriate logic ties to show:

1. conformance with the requirements of this Section and Division I, Subsection 8.02 - Schedule of Operations
2. the Contractor's overall approach to the planning, scheduling and execution of the Work
3. conformance with any additional sequences of Work required by the Contract Documents, including, but not limited to, Subsection 8.03 - Prosecution of Work and Subsection 8.06 – Limitations of Operations.

**B. ACTIVITIES**

The schedules shall clearly define the progression of the Work from NTP to Contractor Field Completion (CFC) by using separate activities for each of the following items:

1. NTP
2. Each component of the Work defined by specific activities
3. Detailed activities to satisfy permit requirements
4. Procurement of fabricated materials and equipment with long lead times, including time for review and approval of submittals required before purchasing
5. The preparation and submission of shop drawings, procedures and other required submittals, with a planned duration that is to be demonstrated to the Engineer as reasonable
6. The review and return of shop drawings, procedures and other required submittals, approved or with comments, the duration of which shall be thirty (30) Calendar Days, unless otherwise specified or as approved by the Engineer
7. Interfaces with adjacent work, utility companies, other public agencies, sensitive abutters, and/or any other third party work affecting the Contract
8. The Critical Path, clearly defined and organized
9. Float shall be clearly identified
10. Access Restraints – restrictions on access to areas of the Work that are defined by the Department in the bid package, in Subsection 8.06 – Limitations of Operations or elsewhere in the Contract
11. Milestones listed in Subsection 8.03 - Prosecution of Work or elsewhere in the Contract Documents
12. Subcontractor approvals at fifteen (15) Calendar Days from submittal to response
13. Full Beneficial Use (FBU) Contract Milestone per the requirements of Subsection 8.03 - Prosecution of Work
14. Contractor's request for validation of FBU (ready to open to traffic)
15. The Department's confirmation of completed work to allow for FBU



**SECTION 722** (Continued)

16. Substantial Completion Contract Milestone per the requirements of Subsections 7.15 - Claims Against Contractors for Payment of Labor, Materials and Other Purposes and 8.03 - Prosecution of Work
17. Contractor's request for validation of Substantial Completion
18. Punchlist Completion Period of at least thirty (30) Calendar Days per the requirements of Subsections 5.11 - Final Acceptance, 7.15 - Claims Against Contractors for Payment of Labor, Materials and Other Purposes and 8.03 - Prosecution of Work
19. Contractor confirmation that all punchlist work and documentation has been completed
20. Physical Completion of the Work Contract Milestone per the requirements of Subsections 5.11 - Final Acceptance and 8.03 - Prosecution of Work
21. Documentation Completion per the requirements of Subsections 5.11 - Final Acceptance and 8.03 - Prosecution of Work
22. Contractor Field Completion Contract Milestone per the requirements of Subsections 5.11 - Final Acceptance and 8.03 - Prosecution of Work
23. Utility work to be performed in accordance with the Project Utility Coordination (PUC) Form as provided in Section 8.14 - Utilities Coordination, Documentation and Monitoring Responsibilities
24. Traffic work zone set-up and removal, night work and phasing
25. Early Utility Relocation (by others) that has been identified in the Contract
26. Right-of-Way (ROW) takings that have been identified in the Contract
27. Material Certifications
28. Work Breakdown Structure in accordance with the MassDOT-Highway Division Contractor Construction Schedule Toolkit located on the MassDOT-Highway Division website at:  
<https://www.mass.gov/info-details/massdot-highway-contractors-schedule-toolkit>
29. For Type A and B Contracts only: All items to be paid, including all Unit Price and Lump Sum pay items, shall be identified by activity. This shall include all non-construction activities such as engineering work; purchase of permanent materials and equipment, purchase of structural steel stock, equipment procurement, equipment delivery to the site or storage location and the representative amount of overhead/indirect costs that was included in the Contractor's Bid Prices.

**C. EARLY AND LATE DATES**

Early Dates shall be based on proceeding with the Work or a designated part of the Work exactly on the date when the corresponding Contract Time commences. Late Dates shall be based on completing the Work or a designated part of the Work exactly on the corresponding Contract Time, even if the Contractor anticipates early completion.

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**SECTION 722** (Continued)**D. DURATIONS**

Activity durations shall be in Work Days. Planned Original Durations shall be established with consideration to resources and production rates that correspond to the Contractor's Bid Price. Within all of the Department-required schedules, the Contractor shall plan the Work using durations for all physical construction activities of no less than one (1) Work Day and no greater than fourteen (14) Work Days, unless approved by the Engineer as part of the Baseline Schedule Review.

Should there be an activity with a duration that is determined by the Engineer to be unreasonable, the Contractor will be asked to provide a basis of the duration using bid documents, historic production rates for similar work, or other form of validation that is acceptable to the Engineer. Should the Contractor and the Engineer be unable to agree on reasonable activity durations, the Engineer will, at a minimum, note the disagreement in the Baseline Schedule Review along with a duration the Engineer considers reasonable and the basis for that duration. A schedule that contains a substantial number of activities with durations that are deemed unreasonable by the Engineer will not be accepted.

**E. MATERIALS ON HAND (for Types A and B only)**

The Contractor shall identify in the Baseline Schedule all items of permanent materials (Materials On Hand) for which the Contractor intends to request payment prior to the incorporation of such items into the Work.

**F. ACTIVITY DESCRIPTIONS**

The Contractor shall use activity descriptions in all schedules that clearly describe the work to be performed using a combination of words, structure numbers, station numbers, bid item numbers, work breakdown structure (WBS) and/or elevations in a concise and compact label as specified in the MassDOT-Highway Division Contractor Construction Schedule Toolkit located on the MassDOT-Highway Division website at:

<https://www.mass.gov/info-details/massdot-highway-contractors-schedule-toolkit>

**G. ACTIVITY IDENTIFICATION NUMBERS**

The Contractor shall use the activity identification numbering system specified in the MassDOT-Highway Division Contractor Construction Schedule Toolkit located online at the address above.

**H. ACTIVITY CODES**

The Contractor shall use the activity codes specified in the MassDOT-Highway Division Contractor Construction Schedule Toolkit located online at the address above.

**I. CALENDARS**

Different calendars may be created and assigned to all activities or to individual activities. Calendars define the available hours of work in each Calendar Day, holidays and general or project-specific non-Work Days such as Fish Migration Periods, time of year (TOY) restrictions and/or area roadway restrictions.

**SECTION 722** (Continued)

Examples of special calendars include, but are not limited to:

- Winter Shutdown Period, specific work is required by separate special provision to be performed during the winter. See Special Provision 8.03 (if applicable)
- Peak traffic hours on heavily traveled roadways. This shall be from 6:30 am to 9:30 am and from 3:30 pm to 7:00 pm, unless specified differently elsewhere in the Contract.
- Special requirements by sensitive abutters, railroads, utilities and/or other state agencies as defined in the Contract.
- Cape Cod and the Islands Summer Roadway Work Restrictions: A general restriction against highway and bridge construction is enforced between Memorial Day and Labor Day, unless otherwise directed by the Engineer. Refer to the Project Special Provisions for specific restrictions.
- Cape Ann Summer Roadway Work Restrictions: While there are no general restrictions for Cape Ann as there are for Cape Cod and the Islands, project-specific restrictions may be enforced. Refer to the Project Special Provisions for specific restrictions.
- Turtle and/or Fish Migration Periods and/or other in-water work restrictions: Refer to the Project Special Provisions for specific restrictions.
- Working over Waterways Restricted Periods: Refer to the Project Special Provisions for specific restrictions.
- Night-time paving and striping operations, traffic and temperature restrictions: Refer to the Project Special Provisions for specific restrictions.
- Utility Restrictions shall be as specified within the Contract.

**J. FLOAT**

For the calculation of float in the CPM schedule, the setting for *Retained Logic* is required for all schedule submissions, starting with the Baseline Schedule Submission. Should the Contractor have a reason to propose that an alternative calculation setting such as *Progress Override* be used, the Contractor shall obtain the Engineer's approval prior to modifying to this setting.

**K. COST AND RESOURCE LOADING (Types A and B only)**

For all Type A and B Schedules, the Contractor shall provide a cost and resource-loaded schedule with an accurate allocation of the costs and resources necessary to complete the Work. The costs and resources shall be assigned to all schedule activities in order to enable the Contractor to efficiently execute the Contract requirements and the Engineer to validate the original plan, monitor progress, provide cash flow projections and analyze delays.

1. Each schedule activity shall have an assigned cost that accurately represents the value of the Work. Each schedule activity shall have its resources assigned to it by craft and the anticipated hours to accomplish the work. Each schedule activity's equipment resources shall be assigned to it by equipment type and hours operated. Front-loading or other unbalancing of the cost distribution will not be permitted.
2. The sum of the cost of all schedule activities shall be equal to the Contractor's Bid Price.
3. Indicating the labor hours per individual, per day, by craft and equipment hours/day will be acceptable.

**SECTION 722** (Continued)

4. The Engineer reserves the right to use the cost-loading as a means to resolve changes, disputes, time entitlement evaluations, increases or decreases in the scope of Work, unit price renegotiations and/or claims.
5. For all Type A and B Schedules, all subnets, fragnets, Proposal Schedules, and Recovery Schedules shall be cost and resource- loaded to help to quickly validate and monitor the duration of the Work to be performed.
6. For Type A Schedules, cost-loading of the schedule will also be used for cash flow projection purposes.
7. The cost-loading of each activity shall indicate the portion of the cost for that activity that is applicable to a specific bid item (cost account.) The total cost for each cost account must equal the bid item price.
8. For Type A Schedules, each month, the Contractor will be paid using the Cost-loaded CPM activities for Lump Sum payment items. This requirement supersedes any requirements elsewhere in this Contract regarding partial payments of schedule-of-values for all Lump Sum items.

**L. NOT TO BE USED IN THE CONTRACTOR'S CPM SCHEDULE**

1. Milestones or constraint dates not specified in the Contract
2. Scheduled work not required for the accomplishment of a Contract Milestone
3. Use of activity durations, logic ties and/or sequences deemed unreasonable by the Engineer
4. Delayed starts of follow-on trades
5. Float suppression techniques

**722.62 Submittal Requirements**

All schedules shall be prepared and submitted in accordance with the requirements listed below.

Each monthly Contract Progress Schedule submittal shall be uniquely identified.

Except as stated elsewhere in this subsection, schedule submittals shall include each of the documents listed below, prepared in two formats, for distribution as follows:

- a. four (4) compact discs (CD); one (1) each for the Office of Project Controls and Performance Oversight (O-PC&PO), the Boston Construction Section Office, the District Construction Office and the Resident Engineer's Office. Additional copies shall be required if the work is performed in more than one district.
- b. two (2) hard copies plotted in color on 24" X 36" paper; one (1) copy each for the District Construction Office and the Resident Engineer's Office. No copies for the O-PC&PO and the Boston Construction Section Office. Additional copies shall be required if the work is performed in more than one district.

**SECTION 722** (Continued)**A. Narratives**

A written narrative shall be submitted with every schedule submittal. The narrative shall:

1. itemize and describe the flow of work for all activities on the Critical Path in a format that includes any changes made to the schedule since the previous Contract Progress Schedule / Monthly Update or the Baseline Schedule, whichever is most recent;
2. provide a description of any specification requirements that are not being followed. Identify those that are improvements and those that are not considered to be meeting the requirements;
3. provide all references to any Notice of Delay that has been issued, within the time period of the Contract Progress Schedule Update, by letter to the Engineer. Note that any Notice of Delay that is not issued by letter will not be recognized by the Engineer. See Subsection 722.64.A - Notice of Delay;
4. provide a description of each third-party utility's planned vs. actual progress and note any that are trending late or are late per the durations and commitments as provided in the PUC Form; provide a description of the five (5) most important responses needed from the Department and the need date for the responses in order to maintain the current Schedule of Record;
5. provide a description of all critical issues that are not within the control of the Contractor or the Department (third party) and any impact they had or may have on the Critical Path;
6. provide a description of any possible considerations to improve the probability of completing the project early or on-time;
7. compare Early and Late Dates for activities on the Critical Path and describe reasons for changes in the top three (3) most critical paths ;
8. describe the Contractor's plan, approach, methodologies and resources to be employed for completing the various operations and elements of the Work for the top three (3) most critical paths. For update schedules, describe and propose changes to those plans and verify that a Proposal Schedule is not required;
9. describe, in general, the need for shifts that are not 5 days/week, 8 hours/day, the holidays that are inserted into each calendar and a tabulation of each calendar that has been used in the schedule;
10. describe any out-of-sequence logic and provide an explanation of why each out-of-sequence activity does not require a correction, if one has not been provided, and an adequate demonstration that these changes represent the basis of how these activities will be built, including considerations for resources, dependencies and previously-approved production rates;
11. identify any possible duration increases resulting from actual or anticipated unit price item quantity overruns as compared to the baseline duration, with a corresponding suggestion to mitigate any possible delays to the Critical Path. If the delay is anticipated to impact the Critical Path, refer to Subsections 4.06 - Increased or Decreased Contract Quantities and 8.10 - Determination and Extension of Contract Time for Completion and submit a letter to the Engineer notifying of a potential delay;
12. include a schedule log consisting of the name of the schedule, the data date and the date submitted.

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**SECTION 722** (Continued)**B. Bar Charts (Types A, B, C and D)**

One (1) time-scaled bar chart containing all activities shall be prepared and submitted using a scale that yields readable plots and that meets the requirements of Subsection 722.61 - Schedule Content and Preparation Requirements. Activities shall be linked by logic ties and shown on their Early Dates. Critical Paths shall be highlighted and Total Float shall be shown for all activities.

A second time-scaled bar chart shall also be prepared containing only the Critical Path or, if the Critical Path is not the longest path, the Longest Path using a scale that yields readable plots and that meets the requirements of Subsection 722.61 - Schedule Content and Preparation Requirements. Activities shall be linked by logic ties and shown on their Early Dates. Total Float shall be shown for all activities.

Bar Charts shall be printed in color and submitted on 11" X 17" paper or, if approved by the Engineer, as a .pdf file.

**C. Detailed Activity Schedule Comparisons**

A Detailed Activity Schedule Comparison (DASC) is a simple reporting tool in the format of a graphical report that will provide Resident Engineers with immediate, timely and up-to-date information. The DASC consists of an updated bar chart that overlays the current time period's bar chart onto the previous time period's bar chart for an easily-read comparison of progress during the present and previous reporting periods. The DASC shall be prepared and submitted in accordance with the instructions contained in the Construction Schedule Toolkit located on the MassDOT-Highway Division website at:

<https://www.mass.gov/info-details/massdot-highway-contractors-schedule-toolkit>

The reports described in Subsections D, E and F below shall be submitted with all of the schedules listed in Subsection 722.20 - General:

**D. Activity Cost Report and Monthly Cash Flow Projections (Type A only)**

With each Contractor Quantity Estimate (CQE), the Contractor shall submit an Activity Cost Report and Cash Flow Projection that includes all activities grouped by Contract Bid Item.

The Activity Cost Report shall be generated from the Schedule of Record and shall be the basis of the Monthly Cash Flow Projection. Within each contract Bid Item, activities shall be sequenced by ascending activity identification number and shall show:

1. activity ID and description,
2. forecast start and finish dates for each activity and,
3. when submitted as a revised schedule, actual start and finish dates for each completed activity.

For Unit Price pay items, in addition to the above, estimates to complete and any variance to the estimated Contract quantity shall be shown.

**E. Resource Graphs (Type A only)**

Monthly and cumulative resource graphs for the remaining Contract period using the Early Dates and Late Dates in the Contract Progress Schedule shall be included as part of each schedule submittal.

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**SECTION 722** (Continued)**F. Projected Spending Reports (Types B, C and D)**

A Projected Spending Report (PSR) shall be prepared and submitted in accordance with the instructions listed at the end of this section. The PSR shall indicate the monthly spending (cash flow) projection for each month from NTP to Contractor Field Completion (CFC). Each month's actual spending shall be calculated using all CQEs paid during that month. If the difference between the Contractor's monthly projections vs. the actual spending is greater than 10%, the Contractor's monthly spending projection shall be revised and resubmitted within fifteen (15) Calendar Days.

The Projected Spending Report (PSR) shall be depicted in a tabular format and printed in color on 11 x 17-sized paper or larger as approved by the Engineer. For additional instructions and a template for preparing the Projected Spending Report (PSR), refer to the Contractor's Construction Schedule Toolkit located on the MassDOT-Highway Division website at:

<https://www.mass.gov/info-details/massdot-highway-contractors-schedule-toolkit> or consult with the District Construction Scheduler.

**722.63. Progress Schedule Requirements****A. Baseline Schedule**

The Baseline Schedule shall be due thirty (30) Calendar Days after Notice to Proceed (NTP.) The Baseline Schedule shall only reflect the Work awarded to the Contractor and shall not include any additional work involving Extra Work Orders or any other type of alleged delay. The Baseline Schedule shall be prepared and submitted in accordance with Subsections 722.61 - Schedule Content and Preparation Requirements and 722.62 - Submittal Requirements. Once the Baseline Schedule has been accepted by the Engineer, with or without comments, it shall represent the as-planned schedule for the Work and become the Contract Progress Schedule of Record until such time as the schedule is updated or revised under Subsections 722.63.C - Contract Progress Schedules / Monthly Updates, 722.64.C - Recovery Schedules and 722.64.D - Proposal Schedules.

The Cost and Resource-Loading information (Types A and B only) shall be provided by the Contractor within forty-five (45) Calendar Days after NTP.

The Engineer's review comments on the Baseline Schedule and the Contractor's responses to them will be maintained for the duration of the Contract and will be used by the Engineer to monitor the Contractor's work progress by comparing it to the Contract Progress Schedule / Monthly Update.

**B. Interim Progress-Only Schedule Submissions**

The first monthly update of the Contract Progress Schedule/Monthly Update is due within seventy (70) Calendar Days after Notice to Proceed (NTP.) The Baseline Schedule review period ends at sixty (60) Calendar Days after NTP, see Subsection 722.60.B - Schedule Reviews by the Department. If the Baseline Schedule has not been accepted within sixty (60) Calendar Days after NTP, an Interim Progress-Only Schedule shall be due within seventy (70) Calendar Days after NTP. The purpose of the Interim Progress-Only Schedule is to document the actual progress of all activities, including non-construction activities, from NTP until the Baseline Schedule is accepted.

**SECTION 722** (Continued)**C. Contract Progress Schedules / Monthly Updates** (Types A, B, C and D)

The first Contract Progress Schedule shall be submitted by the Contractor no later than seventy (70) Calendar Days after NTP. The data date for this first Progress Schedule shall be sixty (60) Calendar Days after NTP. Subsequent Progress Schedules shall be submitted monthly.

Each Contract Progress Schedule shall reflect progress up to the data date. Updated progress shall be limited to as-built sequencing and as-built dates for completed and in-progress activities. As-built data shall include actual start dates, remaining Work Days and actual finish dates for each activity, but shall not change any activity descriptions, the Original Durations, or the Original Resources (as planned at the time of bid), without the acceptance of the Engineer. If any activities have been completed out-of-sequence, the Contractor shall propose new logic ties for affected in-progress and future activities that accurately reflect the previously-approved sequencing. Alternatively, the Contractor may submit to the Engineer for approval an explanation of why an out-of-sequence activity does not require a correction and an adequate demonstration that the changes accurately represent how the activities will be built, including considerations for resources, dependencies and previously approved production rates. Once approved by the Engineer, the Contractor may incorporate the changes in the next Contract Progress Schedule/Monthly Update with the affected activities clearly identified and explained in the Schedule Narrative.

No revisions to logic ties; sequence, description or duration of future activities; or planned resource costs shall be made without prior approval by the Engineer.

Any proposed logic changes for in-progress or future activities shall be submitted to the Engineer for approval before being incorporated into a Contract Progress Schedule. The logic changes must be submitted using a Proposal Schedule or a schedule fragment submission. Once approved by the Engineer, the Contractor may incorporate the logic in the next Contract Progress Schedule/Monthly Update with the affected activities clearly identified and explained in the Schedule Narrative.

For any proposed changes to the original sequence, description or duration of future activities, the Contractor shall submit to the Engineer for approval an explanation of how the proposed description or duration change reflects how the activity will be progressed, including considerations for resources and previously approved production rates. Any description or duration change that does not accurately reflect how the activity will be progressed will not be approved by the Engineer. Once approved by the Engineer, the Contractor may incorporate the changes in the next Contract Progress Schedule/Monthly Update with the affected activities clearly identified and explained in the Schedule Narrative.

Except as otherwise designated by a Contract Modification, no Contract Progress Schedule that extends performance beyond the Contract Time and/or beyond any Contract Milestone shall be approved by the Engineer. The Contractor shall submit a Recovery Schedule if any Contract Progress Schedule/Monthly Update indicates a failure to meet the Contract Dates.

**D. Short-Term Construction Schedule**

The Contractor shall provide a Short-Term Construction Schedule that details daily work activities, including any multiple shift work that the Contractor intends to conduct, in a bar chart format. The daily activities shall directly correspond to the Contract Progress Schedule activities, with a matching reference to the activity identification number in the Contract Progress Schedule, and may be at a greater level of detail.



**SECTION 722** (Continued)

The Short-Term Construction Schedule shall be submitted every two weeks. It shall display all work for a thirty-five (35) Calendar Day period consisting of completed work for the two (2) week period prior and all planned work for the following three (3) week period. The initial submission shall be provided no later than thirty (30) Calendar Days after NTP or as required by the Engineer.

The Contractor shall be prepared to discuss the Short-Term Construction Schedule, in detail, with the Engineer in order to coordinate field inspection staff requirements, the schedule of work affecting abutters and any corresponding work with affected utilities. Short-Term Construction Schedules shall be prepared and submitted in accordance with Subsections 722.61 - Schedule Content and Preparation Requirements and 722.62 - Submittal Requirements.

Failure to submit Short-Term Construction Schedules every two (2) weeks may result in withholding of full or partial payments by the Engineer.

**722.64 Impacted Schedule Requirements****A. Notice of Delay**

The Contractor shall notify the Engineer in writing, with copies to the District and State Construction Engineers, within three (3) Calendar Days of the start of any delays to the Critical Path that are caused by actions or inactions that were not within the control of the Contractor. Delay notifications that are not provided in a letter to the Engineer, such as a delay notification in the schedule narrative, will not be recognized as contractual notice in the determination of any Time Extension related to the impacts to the work associated with this specific alleged delay. Should such delay continue for more than one (1) week, the Contractor shall note it in the Schedule Narrative until the delay is no longer impacting the Critical Path for the completion of the Contract Milestones. The Engineer will evaluate the alleged delay and its impact and will respond to the Contractor within ten (10) Calendar Days after receipt of a notice of delay.

**B. Time Entitlement Analysis**

A Time Entitlement Analysis (TEA) shall consist of a descriptive narrative, prepared in accordance with Subsection 722.62.A - Narratives, and an as-built CPM schedule, which may be in the form of a schedule fragnet ( that has been developed from the project's Contract Progress Schedule of Record, and illustrates the impact of a delay to the Critical Path, Contract Milestones and/or Contract Completion Date as required in Subsection 8.10 - Determination and Extension of Contract Time for Completion. TEAs shall also be used to determine the schedule impact of proposed Extra Work Orders (EWO) as also required in Subsection 8.10.

TEAs shall be prepared and submitted in accordance with the requirements of Subsections 722.61 - Schedule Content and Preparation Requirements and 722.62 - Submittal Requirements and shall be based on the Contract Progress Schedule of Record applicable at the start of the delay or impact from an EWO. A TEA fragnet must start with a specific new activity describing the work contained in either a Notice of Delay previously submitted to the Department per Subsection 722.64.A - Notice of Delay or an EWO.

**SECTION 722** (Continued)

TEAs shall be submitted:

1. as part of any Extra Work Order that may impact Contract Time,
2. with a request for a Time Extension,
3. within fourteen (14) Calendar Days after a request for a TEA by the Engineer for any other reason.

A TEA shall be submitted to the Engineer before any Time Extension is granted to the Contractor. Time Extensions will not be granted unless the TEA accurately reflects an evaluation of all past delays and the actual events that occurred that impacted the Critical Path. The TEA must also demonstrate a plan for the efficient completion of all of the remaining work through an optimized CPM Schedule. The analysis shall include all delays, including Contractor-caused delays, and shall be subdivided into timeframes and causes of delays.

TEAs shall incorporate any proposed activities, logic ties, resource considerations, and activity costs required to most efficiently demonstrate the schedule impacts in addition to detailing all impacts to existing activities, logic ties, the Critical Path, Contract Milestones and the Contract Completion Date. In addition, TEAs shall accurately reflect any changes made to activities, logic ties, restraints and activity costs, necessitated by an Extra Work Order or other schedule impact, for the completion of the remaining work. The Contractor shall provide TEAs that demonstrate that all delays have been mitigated to the fullest extent possible without requiring an Equitable Adjustment to the original bid basis.

All TEAs shall clearly indicate any overtime hours, additional shifts and the resource that are proposed to be incorporated in the schedule. The Engineer shall have final discretion over the use of overtime hours and additional shifts. The Engineer shall have the right to require that overtime hours and/or additional shifts be used to minimize the duration of Time Extensions if it is determined to be in the best interest of the Department to do so.

When accepted, the changes included in a TEA shall be incorporated into the next Contract Progress Schedule per the requirements of Subsection 722.63.C - Contract Progress Schedules / Monthly Updates.

During the review of any TEA, all Contract Progress Schedules shall continue to be submitted as required.

The Engineer may request that the Contractor prepare a Proposal Schedule or a Recovery Schedule to further mitigate any delays that are shown in the accepted TEA/Contract Progress Schedule.

**C. Recovery Schedules**

The Contractor shall promptly report to the Engineer all schedule delays during the prosecution of the Work. Except as otherwise designated by a Contract Modification, no Contract Progress Schedule that extends performance beyond the Contract Time and/or beyond any Contract Milestone shall be approved by the Engineer. The Contractor shall submit a Recovery Schedule within fourteen (14) Calendar Days of a Contract Progress Schedule submission that shows failure to meet the Contract Dates. This requirement is critical to the Department's ability to make informed decisions regarding Contract Time and costs.

**SECTION 722** (Continued)

During the prosecution of the Work, should the Contractor's progress on a critical operation clearly not meet anticipated production, without cause by fault of the Department, or should a critical activity or series of activities not be staffed in accordance with the Contractor's approved Baseline Schedule resource planning, the Contractor shall be obligated to recover such delay. Recovery Schedules shall be prepared and submitted in accordance with Subsections 722.61 - Schedule Content and Preparation Requirements and 722.62 - Submittal Requirements within fourteen (14) Calendar Days of any of the cases listed above.

Recovery Schedules shall clearly indicate any proposed overtime hours, additional shifts, and the resources that are proposed to be incorporated in to the schedule. The Engineer shall have final discretion over the use of overtime hours and additional shifts and shall have the right to require that overtime hours and/or additional shifts be used to minimize the duration of Time Extensions, without additional compensation for any Contractor delays, if it is determined to be in the best interest of the Department to do so.

During the review of any Recovery Schedule, all Contract Progress Schedules shall continue to be required every month.

The Engineer may request that the Contractor prepare a Recovery Schedule to further mitigate any delays that are shown in an accepted TEA/Contract Progress Schedule.

Changes represented in accepted Recovery Schedules shall be incorporated into the next Contract Progress Schedule.

**D. Proposal Schedules**

A Proposal Schedule is an alternative schedule used to evaluate proposed changes to the Contract scope or significant alternatives to previously approved approaches to complete the Work, which may include changes to activity durations, logic and sequence. For Types A and B Schedules, the Proposal Schedule shall be cost and resource-loaded.

A Proposal Schedule may be requested by the Department at any time or may be offered by the Contractor. The Engineer may request that the Contractor prepare a Proposal Schedule to further mitigate any delays that are shown in an accepted TEA/Contract Progress Schedule.

The Contractor shall submit the Proposal Schedule within thirty (30) Calendar Days of a request from the Department.

The Proposal Schedule shall not be considered a Schedule of Record until the logic, durations, narrative and basis of the Proposal Schedule have been accepted by the Engineer. If the Proposal Schedule took the form of a fragnet, it must be incorporated into the Contract Progress Schedule of Record showing the current progress of all other activities and the impacts/results of the changes made by the Proposal Schedule before the Proposal Schedule is accepted by the Department.

Proposal Schedules shall clearly indicate any proposed overtime hours, additional shifts, and the resources that are proposed to be incorporated in the schedule. The Engineer shall have final discretion over the use of overtime hours and additional shifts.

Changes represented in accepted Proposal Schedules shall be incorporated into the next Contract Progress Schedule. During the review of any Proposal Schedule, all Contract Progress Schedules shall continue to be required every month.

**SECTION 722** (Continued)

**E. Disputes (Types A, B, C and D)**

All schedules shall be submitted, reviewed, dispositioned and accepted in the timely manner specified herein so as to provide the greatest possible benefit to the execution of this Contract.

Any dispute concerning the acceptance of a schedule or any other question of fact arising under this subsection shall be determined by the Engineer. Pending resolution of any dispute, the last schedule accepted by the Engineer will remain the Contract Schedule of Record.

**COMPENSATION**

**722.80 Method of Measurement and Basis of Payment** (Types A, B, C and D)

The Special Provisions will specify the fixed-price amount to be paid to the Contractor for the Project Schedule requirements contained herein. Each bidder shall include this lump-sum, fixed-price bid item amount in his/her bid. Failure to do so may be grounds for the rejection of the bid.

All required schedule-related work, including, but not limited to computers, computer software, the planning and coordination with utilities, training, schedule preparation and schedule submittals will be paid for under the fixed price amount.

This fixed price amount is for payment purposes only and is separate from what the Department considers to be the Contractor's General Condition costs. If the Contractor deems it necessary to include additional costs to provide all of the requirements of this section, these additional costs shall be included in the Contractor's overall bid price.

Twenty percent (20%) of this pay item will be paid upon the Engineer's acceptance of the Contractor's Baseline Schedule, prepared and submitted in accordance with Subsection 722.63.A.

The remaining eighty percent (80%) of this pay item will be paid in equal monthly installments distributed across the Contract Duration from Notice to Proceed (NTP) to Contractor Field Completion (CFC), less the 2 months required for the submittal and review of the Baseline Schedule in accordance with the following formula:

$$\text{Monthly Payment} = \frac{\text{Remaining Fixed Price amount (80\% of Item 100.)}}{\text{Contract Duration in whole months} - 2 \text{ months}}$$

The timely and accurate submission of the Baseline Schedule is critical to the Contract and the Department's ability to make informed decisions. Only payments under Item 740 - Engineer's Field Office and Item 748 - Mobilization will be made until the Baseline Schedule is accepted by the Engineer.

**SECTION 722** (Continued)

No payment for any other pay item will be processed beyond seventy-five (75) Calendar Days from Notice to Proceed (NTP) until the Baseline Schedule is accepted by the Engineer. Until the Engineer's acceptance of the Baseline Schedule, the combined total of all payments made to the Contractor will be limited to an amount no greater than the total price for Item 748 - Mobilization or 3% of the contract price, whichever is less.

All Contract Progress Schedule Updates submitted later than ten (10) Calendar Days after the CQE (Contract Quantity Estimate) completion date, or greater than forty (40) Calendar Days from the Data Date of the previous submission, will be deemed to be no longer useful and will not qualify for payment. Late submittal of missed Contract Progress Monthly Updates will not result in recovery of the previously forfeited portion of the Schedule of Operations Fixed Price Payment Item.

Failure to submit schedules as and when required may result in the forfeiture of that portion of the Schedule of Operations Fixed Price Payment and/or the withholding of the full or partial CQE payments by the Engineer.

Failure to submit schedules that are acceptable to the Engineer may result in the forfeiture of that portion of the Schedule of Operations Fixed Price Payment and/or the withholding of the full or partial CQE payments by the Engineer.

The Schedule of Operations pay item will be adjusted to pay for only the actual quantity of schedules that have been submitted in accordance with this section.

The Contractor's failure or refusal to comply with the requirements of this Section shall be reasonable evidence that the Contractor is not prosecuting the Work with due diligence and may result in the withholding of full or partial payments by the Engineer.

Should there be a Time Extension granted to the Contractor, the Engineer may provide an Equitable Adjustment for additional Contract Progress Schedule Updates at intervals directed by the Engineer. Item 100. will be the basis for this Equitable Adjustment.

**722.82            Payment Items**

100.                    SCHEDULE OF OPERATIONS - FIXED PRICE \$ \_\_\_\_\_            LUMP SUM

**ITEM 100.9****AS-BUILT SURVEY AND PLANS****LUMP SUM**

The Contractor shall furnish electronic "as-built" plans of the MassDOT ITS CCTV equipment for I-395 NB within the project limits (once the service meter pedestal has been relocated) to the Engineer. These "as-built" plans shall be furnished prior to the date of final acceptance. The Engineer will make all original electronic files available to the Contractor for use in preparing the as-built drawings. The "as-built" plans shall be prepared in accordance with the latest MassDOT field procedure and survey base plan CAD standards:

<https://www.mass.gov/cad-standards>

The "as-built" plans shall show the following at a minimum:

1. All surface and subsurface work performed under this Contract within the project limits including 10 feet on each side of all trenches and elevation data of all conduits
2. GPS coordinates for all conduit bends, pull boxes, handholes, pedestals, control cabinets, and CCTV structures as well as at every 200' ( $\pm$ ).
3. The GPS Coordinates shall be GPS NAD83 & NAVD88 survey grade coordinates
4. Identify the type and size of foundation installed for each camera pole structure
5. Show updated network and system architecture drawings indicating the fiber optic strand connections identified by MassDOT and to which equipment/location the device connects (if applicable)
6. Be titled "AS-BUILT".
7. Be prepared by a Professional Engineer registered in the Commonwealth of Massachusetts, and prequalified by MassDOT to perform the work:

<https://www.mass.gov/prequalification-of-architectural-engineering-firms>

In addition, the contractor shall provide an excel spreadsheet listing each device name and the respective power service meter number that corresponds to the power service feeding each equipment location.

An electronic pdf file as well as up to six (6) half sized hard copy plans shall be submitted for review and approval prior to final acceptance. The distribution of the as-built plans shall be determined by the Engineer.

**BASIS OF PAYMENT**

Item 100.9 will be paid for at the contract unit price per lump sum, which price shall include all labor, equipment, materials, submittal of electronic CAD files and pdf plans, and all incidental costs required to complete the work.

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**ITEM 102.3**      **HERBICIDE TREATMENT OF INVASIVE PLANTS**      **HOOR**

This work must be performed by persons who meet the qualifications below and are approved by the Landscape Design Section.

Work under this item consists of herbicide treatment of invasive plants currently existing within the project limits and as directed. An Invasive Plant Management Strategy (IPMS) shall be submitted to the Engineer for review and approval and the IPMS shall be implemented on-site. The IPMS shall be measured and paid for under Item 102.33 Invasive Plant Management Strategy.

Work under this item shall be coordinated with work and schedule for Selective Clearing, Clearing and Grubbing, Mowing, Tree Removal, Planting, and Wetland Mitigation items.

Payment is per hour on-site and shall be compensation for a minimum crew of 2 licensed applicators, 2 back-pack sprayers and mist-blowers, a properly equipped spray truck with spray hoses, and a tank with sufficient capacity for a full day of work. If there is only one applicator, hourly payment shall be adjusted to 50 percent of the unit price. This item is not intended for manual removal of plants.

Management of plants determined to have been introduced to the site via imported loam, compost, mulch, plants, equipment, or other construction activities will be the Contractor's responsibility and at the Contractor's expense.

Herbicide shall be applied during daytime hours only.

Measures to prevent the introduction of invasive plant species to the site and to address introduction due to construction-related activities shall be covered under the Standard Specifications, Division I - Subsections 7.01(D) Plant Pest Control and 7.13 Protection and Restoration of Property as amended in these Special Provisions.

Plant species targeted for management under this item shall be as determined in the field per the site walk and as specified in the IPMS.

The definition of invasive plant species shall be as described by Massachusetts Invasive Plant Advisory Group (MIPAG): "non-native species that have spread into native or minimally managed plant systems in Massachusetts, causing economic or environmental harm by developing self-sustaining populations and becoming dominant and/or disruptive to those systems."

Control of invasive plants shall begin immediately with the initiation of construction activities and prior to any clearing or site disturbance. Treatment areas shall include stockpile locations and may, upon approval of the Engineer, extend outside the project limit. Treatment shall be done each consecutive year for the duration of the contract unless specified otherwise in the IPMS or unless directed otherwise by the MassDOT invasive species contact. Work shall be done during the growing season from May – October unless otherwise specified in the IPMS.

**ITEM 102.3** (Continued)

Areas identified for vegetation control measures shall be as shown on the plans and as determined in the field by the Engineer and a MassDOT Landscape Architect. Contact at MassDOT Landscape Design Section may be contacted at: [Tara.Mitchell@dot.state.ma.us](mailto:Tara.Mitchell@dot.state.ma.us).

Submittals

No work shall begin without approval of the submittals.

Within 15 business days prior to the site walk, the Contractor shall submit all qualifications to the Engineer for approval by MassDOT Landscape Design.

Submittals include the following items.

*Qualifications*

1. Company must provide proof of qualifications by providing the following:
  - a. Narrative describing company, its expertise and experience with invasive plant control.
  - b. Demonstrate experience with herbicide treatment as part of restorations and in sensitive areas
  - c. Describe company's technical qualifications and past performance.
2. Company must meet licensing requirements:
  - a. All crew applicators must have a Massachusetts Commercial Applicator License (CORE).
  - b. At least one or more applicator must have a ROW certification, if required for work.
  - c. Company must provide name(s) of applicator(s) and Applicator License/Certification number for all contractor crew leaders working on the project.
  - d. Company must provide documentation of any warnings, penalties or fines received in the last three (3) years.
3. Company must provide proof of experience with invasive plant control and include following:
  - a. At least five (5) references from prior invasive plant control work completed in last five (5) years. Provide contact information including address, phone number and email.
  - b. Provide a summary of each of these projects including nature of the problem, specific invasive vegetation treated, dates and period of treatment, methodologies used, and summary of success or not in terms of meeting performance objectives. Include summary of equipment used.
  - c. Photo documentation of these projects.
  - d. GPS coordinates of project locations, if available.
4. Crew leader must have expertise with invasive plant control and provide the following:
  - a. Have held Core license for at least five (5) years.
  - b. Resume listing five (5) or more years of experience applying pesticides with the company or with another company specializing in vegetation management.



**ITEM 102.3** (Continued)

The following companies are pre-approved by MassDOT Landscape Design Section:

<p><b><i>Groundscapes Express, Inc.</i></b> P.O. Box 737 Wrentham, MA 02093 Contact: Butch Goodwin <a href="mailto:butch@groundscapesexpress.com">butch@groundscapesexpress.com</a> Phone: 508-400-5366</p>	<p><b><i>Solitude Lake Management</i></b> 590 Lake Street Shrewsbury, MA 01545 Contact: Keith Gazaille <a href="mailto:kgazaille@solitudelake.com">kgazaille@solitudelake.com</a> Phone: 508-885-0101</p>
<p><b><i>Land Stewardship, Inc.</i></b> PO Box 511 Turner Falls, MA 01376 Contact: Chris Polatin <a href="mailto:info@landstewardshipinc.com">info@landstewardshipinc.com</a> Phone: 413-367-5292</p>	<p><b><i>SWCA Environmental Consultants</i></b> 15 Research Drive Contact: Scott Fisher Phone: 413-658.2056 <a href="mailto:sfisher@swca.com">sfisher@swca.com</a> Amherst, MA 01002</p>
<p><b><i>Native Habitat Restoration</i></b> P.O. Box 582 Stockbridge, MA 01262 Contact: Jess M. Toro: 413-358-7400 <a href="mailto:nativehabitatrestoration@gmail.com">nativehabitatrestoration@gmail.com</a> Phone: 413-394-0277</p>	<p><b><i>Vegetation Control Service, Inc.</i></b> 2342 Main St. Athol, MA 01331 Contact: Andrew Powers <a href="mailto:apowers@vegetationcontrol.com">apowers@vegetationcontrol.com</a> Phone: 800-323-7706</p>
<p><b><i>Ecological Land Management</i></b> 293 High Road Newbury, MA 01950 <a href="mailto:Brian@ecologicalandmanagement.com">Brian@ecologicalandmanagement.com</a> Phone: (978) 358-1423</p>	

***Invasive Plant Management Strategy (IPMS)***

At least thirty (30) days prior to proposed treatment the IPMS shall be submitted for approval by the Engineer and MassDOT Landscape Architect. All chemicals, methods and work done under this item shall be consistent with the IPMS. The IPMS shall be as described under Item 102.33.

***Herbicide Use Report***

Within two (2) weeks after each application, the Contractor shall provide to the Engineer a completed and signed MassDOT Herbicide Use Report.

**Photo Documentation**

Digital photos with date and time of herbicide application work may be required and shall be submitted upon request.

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**ITEM 102.3** (Continued)**Materials**

All proposed herbicides shall be as approved in the IPMS. Herbicides shall be labeled for the method of treatment and shall meet all federal, state and local regulation requirements. Application rates will depend on herbicide proposed and shall be per the manufacturer's label for specific application.

**Methods**

All methods used shall be as approved in the IPMS which shall be determined during the Initial Site Walk as described under Item 102.33 Invasive Plant Management Strategy.

The Contractor shall be responsible for marking delineated areas and plants to be preserved, removed, or otherwise treated. Fencing or other materials needed for marking and delineating protected areas shall be incidental to this item.

The Contractor shall notify the Engineer a minimum of 3 days prior to date of expected herbicide application. Applicators shall notify the Engineer upon arriving on-site.

***Herbicide Applications***

All herbicide application shall conform to Massachusetts Pesticide Laws and Regulations per the Massachusetts Department of Agricultural Resources (MDAR) Pesticide Bureau.

Mixing, applying and/or disposing of herbicides shall always be in accordance with instructions on their labels and all applicable federal, state, and local regulations. Mixing shall not occur within sensitive areas, wetlands, or buffer zones.

Contractor shall not spray 2 hours prior to precipitation, during rain, or during windy conditions. The Contractor shall be responsible for monitoring weather conditions and adjusting the work schedule as appropriate for the herbicide and application method to be used.

Targeted vegetation shall be identified and marked prior to treatment. Plants treated by foliar spray, injection or glove application or other methods that leave standing vegetation, as opposed to cut-stump application, shall remain clearly marked for identification through the contract period.

Desirable vegetation shall be protected from both spray and other physical damage.

Contractor is responsible for any damage to vegetation not designated for removal or treatment. Vegetation damaged shall be restored. Cost of replacement plants and/or restoration shall be borne by the Contractor.

Contractor shall ensure that the public does not enter a work area while herbicide application or spraying is underway.

**ITEM 102.3** (Continued)*Disposal Of Invasive Plant Material*

All material to be cleared shall become the property of the Contractor. The satisfactory disposal of all cleared plant material (seeds, roots, woody vegetation, associated soils, etc.) shall be the Contractor's responsibility.

The Contractor shall take measures to prevent viable plant material from leading to further infestations (seeds, roots, woody material, etc.) while stockpiled, in transit, or at final disposal locations. All precautions shall be taken to avoid contamination of natural landscapes with invasive plants or invasive plant material.

Chipping, shredding, or on-site burning of plant material must be approved by the Engineer and included in the IPMS.

For plant material taken to an incinerating facility per the IPMS, a receipt from that facility shall be submitted to the Engineer as proof of disposal.

Where feasible, it is preferable to dispose of plants on-site or to bury them on-site with on-going monitoring for re-sprouting. Disposal locations and methods must be approved and included in the IPMS. Site work such as grading and seeding to stabilize and restore disposal area shall be incidental to this item.

The Contractor shall be responsible for treating or otherwise managing areas of re-growth due to improper disposal. Treatment shall be at the Contractor's expense.

*Follow-Up Treatment*

Plants and areas shall be re-treated as necessary and as appropriate to the time of year. Treatment shall be for the duration of the contract and per the IPMS.

Measure of Success

The expectation is a minimum of 85-95 percent control achieved after the first treatment, depending on plants targeted and extent of population, and based on the expectations laid out in the IPMS. The expectation for the contract duration is 95-100% eradication by the end of the treatment period, unless otherwise specified in the IPMS.

Method of Measurement

Item 102.3 will be measured for payment by the Hour of crew time spent on the project doing actual herbicide application work. A crew shall be defined as a minimum of two licensed applicators each equipped with (at minimum) back-pack sprayer and mist blower. The crew shall also have a properly equipped spray truck with hoses and a tank with sufficient capacity for a full day of work.

**ITEM 102.3** (Continued)

Basis of Payment

Item 102.3 will be paid at the contract unit price per Hour, which price shall include all labor, materials, equipment, tools, and all incidentals required to complete the work.

Payment will be based upon time spent on the project doing actual work and shall not include travel time to and from the Contractor's place of business and shall also not include time for investigative field trips.

If there is only one applicator, hourly payment shall be adjusted to 50 percent of the unit price.

The Invasive Plant Management Strategy will be paid for under Item 102.33.

**ITEM 102.33****INVASIVE PLANT MANAGEMENT STRATEGY****HOUR**

This item consists of providing an Invasive Plant Management Strategy (IPMS) for the control of invasive plants currently existing on the project site and/or as directed and shall be coordinated with Item 102.3 Herbicide Treatment of Invasive Plants. The IPMS shall be submitted for review and approval and the IPMS shall be implemented on-site.

Herbicide treatment for invasive plants shall be as described under Item 102.3 Herbicide Treatment of Invasive Plants and shall be compensated per that Item.

Work under this item shall be coordinated with work and schedule for Selective Clearing, Clearing and Grubbing, Mowing, Tree Removal, Planting, and Wetland Mitigation as relevant to the project.

Individual attending the site walk and determining the Invasive Plant Management Strategy must demonstrate expertise with vegetation management and invasive plant control and submit qualifications as described below.

**QUALIFICATIONS**

Individual shall be from the same company as that providing services for Item 102.3 Herbicide Treatment of Invasive Plants and shall submit the following, if not submitted under Item 102.3:

- Submit copy of current Core license.
- Submit a resume listing five (5) or more years of experience managing invasive plants with a company specializing in vegetation management.
- References shall be submitted if requested.

**SUBMITTALS****Task Summary & Reports**

For measurement of payment, the contractor shall submit the total sum and a breakdown of hours for the tasks performed. At a minimum, the tasks shall include the Initial Site Walk, the IPMS Written Report, and if necessary to accommodate project or site changes, a Follow-up Site Inspection and accompanying IPMS Amendment.

Interim Site Monitoring Reports and/or a Final Report shall be submitted if requested by the MassDOT Landscape Design contact. The MassDOT Landscape Design contact must be notified to attend the final walk through when a Final Report has been requested.

**Invasive Plant Management Strategy (IPMS)**

At least thirty (30) days prior to construction activities and/or any proposed treatment, submit a written IPMS proposal for approval by the Engineer and MassDOT Landscape Architect. All chemicals and methods proposed shall be consistent with applicable Massachusetts Wetlands Protection Act Order of Conditions.

**ITEM 102.33** (Continued)

The IPMS shall be completed in coordination with the Roadway Contractor and the Engineer and shall include the following as appropriate to the project:

- I. Project Information**
  - a. Company writing IPMS and performing herbicide application.
  - b. Date of site walk
  - c. Attendees at site walk
  - d. Expected end date of contract and expected last treatment (month/season)
- II. Brief Description of Conditions**
  - a. Provide a free-hand sketch on construction plans or aerial image showing species, location, and as relevant, show or note extent of population as relevant to Strategy (i.e., population extends off ROW preventing eradication, small population and eradication deemed feasible within contract schedule, etc.).
- III. Coordination with Roadway Contractor regarding other work**
  - a. Tree Work: Note coordination to be implemented with tree removal, clearing, and clearing and grubbing as applicable to the project.
  - b. Wetland Mitigation - Include management proposed for wetland mitigation areas in the IPMS, if and as required.
  - c. Planting: If there will be planting in areas proposed for treatment, propose treatment and schedule to avoid herbicide damage to plants.
  - d. Mowing: If coordination is required with state mowers, note need in IPMS.
- IV. Soil Management**
  - a. Provide specifics on how soil with invasive plant roots (in particular) or seeds will be handled (i.e., separate stockpiles, plant material will be buried on-site, re-used on-site, disposed off site and if so, where?).
  - b. Show stockpile locations on plan and include treatment schedule.
  - c. Note measures that will be implemented to avoid spread through equipment, including how and where equipment will be cleaned.
- V. Invasive Plant Treatment & Management**
  - a. Proposed chemical and methods of treatment for each species or area.
  - b. Time of treatment based on target plant species.
  - c. Submit product label including application methods and rates (entire MSDS information need not be submitted if available online).
  - d. Proposed performance metrics or measure of treatment success if different from that specified under Item 102.3.
  - e. Method for disposing invasive plant material. This includes material that may result in spread (i.e., seeds, roots) and material that has been treated and/or is not viable (foliage, dead wood, etc.). Methods may include grinding in place, stockpiling and treating, and incinerating offsite.
  - f. Expected follow-up treatment for duration of contract.
- VI. Monitoring Schedule** if requested by MassDOT.

Note: The IPMS is critical for identifying pre-construction conditions as well as strategies for minimizing import or spread of invasive plants. Failure to provide an approved IPMS may jeopardize this item, in which case, the contractor will be responsible for management of invasive plants found on-site at no cost to the contract.

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**ITEM 102.33** (Continued)**Photo Documentation**

Digital photos with date and time verification shall be provided with the IPMS and with any follow-up monitoring or reporting.

**METHODS****Initial Site Walk**

Prior to any construction activities and soil disturbance, the Contractor shall walk the site with the Engineer and the MassDOT Landscape Architect to determine the IPMS. During the site walk the Contractor shall identify limits of work and, as necessary, mark locations of areas designated for treatment and individual plants targeted for treatment or removal. The Contractor shall be responsible for marking delineated areas and plants to be preserved, removed, or otherwise treated. Fencing or other materials needed for marking and delineating protected areas shall be incidental to this item.

**IPMS Follow-up Amendment**

The IPMS may be amended to address additional concerns or adjust to conditions if required by the MassDOT Landscape Architect. The amended IPMS shall be submitted to the Engineer and MassDOT Landscape Architect for approval at least fourteen (14) days prior to any proposed treatment.

**Interim Site Monitoring Inspection Reports**

If required by the MassDOT Landscape Architect and Engineer, Interim Site Monitoring and an accompanying report shall be conducted.

**Final Inspection**

A final inspection and report documenting the status of the invasive control may be required for regulatory purposes or for instances where control will be continued by others. The report shall include photo documentation of pre-construction (existing) and post-treatment conditions, notations on a plan or aerial image of area treated, summary of treatment performed, and control achieved.

**METHOD OF MEASUREMENT**

Item 102.33 will be measured for payment by the Hour. The basis for measurement shall be per the completion of tasks as approved under the Task Summary submittal.

**BASIS OF PAYMENT**

Item 102.33 will be paid at the contract unit price per Hour, which price shall include all labor, materials, equipment, tools, and all incidentals required to complete the work.

Payment shall not include travel time to and from the Contractor's place of business.

**ITEM 102.511**      **TREE PROTECTION – ARMORING & PRUNING**      **EACH**

The work under this item shall conform to the relevant provisions of Sections 771 and shall be for furnishing and installing temporary tree trunk protection and for minor limb pruning or removal of lower tree limbs to prevent injury to the tree from construction equipment and activities.

Trunk armoring is for instances where construction activity (the use of heavy equipment) comes close enough to potentially damage the tree trunk or limbs. It is to be used where shown on the plans and as directed by the Engineer.

References

If requested, the Contractor shall provide to the Engineer one copy of the latest edition of the American National Standards Institute (ANSI) A300 Standard Practices for Tree, Shrub, and Other Woody Plant Maintenance: Part 1-Pruning and Part 5-Construction Management Standard. Provision of reference shall be incidental to this item.

Materials

Trunk armoring shall be such that it prevents damage to the trunk from construction equipment. Selected material shall be such that installation and removal will not damage the trunk.

Acceptable materials include 2x4 wood cladding with wire or metal strapping, or, for instances when duration of construction activities is less than three months, corrugated plastic pipe mounted with duct tape. Height of cladding shall be from base of tree (including root flare) to the bottom of the first branch, eight feet above the ground, or as required by the Engineer. Material and methods shall be approved by the Engineer.

Other materials or methods may be acceptable if approved by MassDOT Landscape Design or by an Arborist (if included in the contract).

Methods of Work

Prior to construction activities, the Engineer, the Contractor, the Town Tree Warden, and the Arborist (if item is included in the contract), shall review trees noted on the plans to be protected. Final decision as to trees armored and/or pruned shall be per the Engineer.

Care shall be taken to avoid damage to the bark during installation and removal of armoring. Trunk armoring shall be replaced and maintained such that it is effective for as long as required and shall be removed immediately upon completion of work activities adjacent to trees.

Pruning of limbs shall conform to the techniques and standards of the most recent ANSI A300 standards.



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**ITEM 102.511** (Continued)**Damages & Penalties**

If trees designated for protection under this item are damaged, including root damage from unapproved trespassing onto the root zone, the Contractor shall, at his own expense obtain an Arborist. The Arborist shall be approved by MassDOT.

If, based on the recommendations of the Arborist, the Engineer determines that damages can be remedied by corrective measures, such as repairing trunk or limb injury, soil compaction remediation, pruning, and/or watering, the damage will be repaired as soon as possible within the appropriate season for such work and according to industry standards.

If the Engineer determines that damages are irreparable, the Contractor shall pay for the damages in the amount of \$500.00 per diameter inch at breast height (DBH) per tree.

Additionally, if the Engineer determines that the damages are such that the tree is sufficiently compromised as to pose a future safety hazard, the tree shall be removed. Tree removal will include cleanup of all wood parts, grinding of the stump to a depth sufficient to plant a replacement tree or plant, removal of all chips from the stump site, and filling the resulting hole with topsoil.

**Method of Measurement and Basis of Payment**

Item 102.511 will be measured and paid at the contract unit price per each. This will include full compensation for all labor, equipment, materials, and incidentals for the satisfactory completion of the work and the subsequent removal and satisfactory disposal of the protective materials upon completion of the contract.

In the event of tree damage, cost of Arborist services, of remediation measures, and/or tree removal will be borne by the Contractor.

Payment under this item will be scheduled throughout the length of contract:

- 40% of value shall be paid upon installation of trunk armoring and completion of pruning work, if required.
- 60% shall be paid at the end of construction operations that would damage the tree and after protection materials have been removed and properly disposed of by the Contractor. In the event of repairable damages, payment shall be made after the completion of remediation measures.

In the event of irreparable damage due to lack of proper protective measures being take there will be no compensation in addition to the \$500.00 per diameter inch penalty.

**ITEM 102.521****TREE AND PLANT PROTECTION FENCE****FOOT**

The work under this Item shall conform to the relevant provisions of Sections 644 and 771 of the Standard Specifications and the following:

Work under this item consists of furnishing, installing, removing and resetting, maintaining fence in a vertical and effective position at all times, and final removal of temporary fence.

The purpose of the fence is to prevent damage to tree roots, tree trunks, soil, and all other vegetation within a delineated Tree and Plant Protection Zone (TPPZ) as shown on the plans, as directed by the Engineer, and as described herein.

Protection shall be for the duration of the construction activities unless otherwise directed.

**Materials**

Temporary Fence shall be such that it provides a minimum 48-inch tall barrier that remains vertical and effective (not sagging) for the duration of period required. Fence shall be plastic orange safety fence (recommended where high visibility is necessary), wooden snow fencing, or other approved material.

Per the Engineer, additional posts, deeper post depths, and/or additional attachments will be used if the fabric or fence sags, leans or otherwise shows signs of failing to create a sufficient barrier to access.

**References**

If requested, the Contractor shall provide to the Engineer one copy of the American National Standards Institute (ANSI) A300 Standard Practices for Tree, Shrub, and Other Woody Plant Maintenance Part 1, Pruning and Part 5, Construction Management Standard. Provision of reference shall be incidental to this item.

**Establishment of TPPZ**

Fencing shall be used for construction areas, staging areas, and stockpile areas as shown on the plans and as directed by the Engineer to establish the Tree and Plant Protection Zone (TPPZ).

Fence shall be located as close to the work zone limit and as far from the trunk as possible to maximize the area to be protected. Fence shall run parallel and adjacent to construction activity to create a barrier between the work zone and the root zone or designated limit of plants and soils to be protected.

When construction activities surround (or have the potential to surround) trees or plants to be protected, a circular enclosure shall be used. In these instances, the TPPZ limit shall be the Drip Line of each tree or as close as possible to the Drip Line, and as shown on the plans and details. The Drip Line is defined as the limit of tree canopy.

**ITEM 102.521** (Continued)

The Contractor shall not engage in any construction activity within the TPPZ without the approval of the Engineer, including: operating, moving or storing equipment; storing supplies or materials; locating temporary facilities including trailers or portable toilets; and shall not permit employees to traverse the area to access adjacent areas of the project or use the area for lunch or any other work breaks.

**Method of Work**

Fence shall be installed prior to any construction work or staging activities and shall be installed and maintained in a vertical and effective position at all times.

Fence shall be repositioned where and as necessary for optimum effectiveness. Repositioning shall be incidental to this item. Fence shall not be moved without prior approval by the Engineer.

The TPPZ shall be protected at all times from compaction of the soil; damage of any kind to trunks, bark, branches, leaves, and roots of all plants; and contamination of the soil with construction materials, debris, silt, fuels, oils, and any chemicals substance.

After construction activities are completed, or when directed by the Engineer, fence, stakes, and other materials shall be removed and disposed off-site by the Contractor.

**Required Work Within the TPPZ**

In the event that grading, trenching, utility work, or storage is unavoidable within the TPPZ, the Engineer shall be notified. Measures may be required for tree protection and preservations, including air spading, the use of six-inch depth of wood chips or approved matting for root protection, pruning of branches, and/or trunk protection. These protection measures will be paid under applicable items.

Landscaping work specified within the TPPZ shall be accomplished by hand tools. Where hand work is not feasible, with permission of the Engineer, work shall be conducted with the smallest mechanized equipment necessary.

**Tree and Plant Damages or Loss**

If the TPPZ is intruded upon, at the discretion of the Engineer, the Contractor will be required to provide a more durable barrier (e.g., Jersey Barriers) to secure the area. Cost of furnishing and installing additional or more durable barrier shall be borne by the Contractor.

If the Contractor intrudes into a TPPZ without approval, soil will be considered compacted and tree root damage will be assumed. Action will be taken as specified below.

In the event that trees designated for protection under this item are damaged, including root damage from unapproved trespassing onto the root zone, the Contractor shall, at his own expense obtain an Arborist. The Arborist shall be approved by MassDOT.

In the event of spills, compaction or damage, the Contractor shall take corrective action immediately using methods approved by the Engineer in coordination with the Arborist.

**ITEM 102.521** (Continued)

If, based on the recommendations of the Arborist, the Engineer determines that damages can be remedied by corrective measures, such as repairing trunk or limb injury, soil compaction remediation, pruning, and/or watering, the damage will be repaired as soon as possible within the appropriate season for such work and according to industry standards.

If the Engineer determines that damages are irreparable, the Contractor shall pay for the damages in the amount of \$500.00 per diameter inch at breast height (DBH) per tree.

Additionally, if the Engineer determines that the damages are such that the tree is sufficiently compromised as to pose a future safety hazard, the tree shall be removed. Tree removal will include cleanup of all wood parts, grinding of the stump to a depth sufficient to plant a replacement tree or plant, removal of all chips from the stump site, and filling the resulting hole with topsoil.

Shrubs will be replaced with a plant of similar species and equal size or the largest size plants reasonably available. The Engineer will approve the size and quality of the replacement plant. Replacement will include a minimum of one year of watering and care.

**Method of Measurement and Basis of Payment**

Item 102.521 will be measured and paid for payment by the foot of Tree and Plant Protection Fence, complete in place. This includes all labor, materials, equipment, maintenance, final removal and disposal of the protective materials, damages repair, and all incidental cost required to complete the work.

Payment of 40 percent of value will be made upon installation of Fence. The remaining 60 percent will be made when protection materials have been removed and disposed off-site.

No separate payment will be made for costs of remedial actions, including addition of more durable barriers, or arborist services, but all costs in connection therewith shall be included in the Contract unit price bid.

In the event of irreparable damage due to lack of proper protective measures being take there will be no compensation in addition to the \$500.00 per diameter inch penalty.

**ITEM 115.1****DEMOLITION OF BRIDGE NO. W-12-030 (C3V)****LUMP SUM**

Work under this Item shall conform to the relevant provisions of Subsection 112 and 140 of the Standard Specifications and the following:

The work to be done under this Item shall include furnishing all labor and equipment necessary to perform the demolition, removal, and proper disposal of the entire existing twin corrugated metal pipe (CMP) culvert structure, including its concrete headwalls metal pipe railings on the culvert headwall and approach channel walls, partial demolition of the existing concrete channel walls, and partial removal of the existing concrete channel lining within Mill Brook. Excavation and disposal of the existing roadway materials and fill above and 12” to each side of the CMP structure shall also be included under this item. All work shall be performed to the limits shown on the plans or as directed by the Engineer.

The Contractor shall ensure that the termination point for the railing removal shall be such that positive fall protection is in place with the railing to remain and the proposed chain link fence in this area. Any materials and workmanship required to brace the termination points of the metal pipe railing is considered incidental to the cost of this Item. Any damage to the railing scheduled to remain due to the Contractor’s operations shall be repaired by the Contractor at no additional cost to the department.

Prior to the start of work, the Contractor shall locate all existing utilities and shall submit to the Engineer and the utility companies his/her proposed method of protecting them during demolition operations. Procedure submittal shall not relieve the Contractor of his/her responsibility to protect all utilities from damage at all times during demolition. Any damage done to utilities due to the Contractor’s operations shall be immediately repaired at the Contractor’s expense.

The Contractor shall prepare and submit plans, calculations, and procedures indicating the proposed demolition procedures and methods to be used for all stages of construction, including equipment, tools, devices, schedule of operations, control of water, methods of utility protection, and temporary shoring. The Contractor is solely responsible for maintaining the stability of the existing structure at all times during the demolition and construction operations. Any designs for temporary strengthening or bracing of portions of the existing structure to remain are the responsibility of the Contractor, shall be included within the submittals for this Item, and shall be considered incidental to the cost of this Item. The plan shall also document the Contractor’s coordination with the Webster Lake Dam operator and its engineering representative for any control of water required to complete demolition.

The Contractor is responsible for all coordination with the Webster Lake operator and engineering representative regarding stoppage of flow through Mill Brook required to complete work under this Item. See language within the “Work in Mill Brook” section of these specifications for additional requirements.

All plans, procedures, and calculations submitted to the Engineer for review and approval for work under this Item shall be stamped by a Professional Engineer licensed in Massachusetts. Calculations shall be performed in conformance with the latest AASHTO Guide Design Specifications for Bridge Temporary Works and the AASHTO Construction Handbook for Bridge Temporary Works.

**ITEM 115.1** (Continued)

Construction Methods

There are no original plans for the existing CMP culvert structure or the upstream/downstream channel walls. The Contractor shall verify all existing conditions and construction features of the structural elements to be demolished, as necessary, for the proper planning and completion of the work. The Contractor shall base its bid on his/her own findings without any additional compensation for variances from the Plans or these Special Provisions regarding actual conditions for the items to be removed. Except as specified, all material and debris shall become the property of the Contractor, and shall be recycled, reused, or disposed of properly.

The Contractor shall take care to not damage any portions of the existing channel walls to remain, or any components of the existing flow-control structure located just south of the CMP culvert inlet, as part of the demolition work under this item. Demolition or damage caused to these components due to the Contractor's negligence shall be repaired or replaced at the Contractor's expense to the satisfaction of the Engineer.

The Contractor shall minimize the falling of debris into Mill Brook to the extent practical. The Contractor shall be required to remove any debris which is generated by demolition from the site immediately and to restore portions of the site affected by the Contractor's operations to their original undisturbed condition or better. The Contractor is responsible for dust control during the demolition operation.

The Contractor is responsible for protecting all utilities during his/her operations. If any utilities are damaged due to the Contractor's negligence, the Contractor shall make repairs at his/her own expense.

**ITEM 115.1** (Continued)

**BASIS OF PAYMENT**

Item 115.1 will be paid for at the contract unit price Lump Sum, which price shall include full compensation for all labor, materials, tools, equipment, excavation, and all incidental costs required to complete the work.

MassDOT does not guarantee or represent that the bridge materials will actually coincide with any descriptions contained herein or represented on the plans. The Contractor shall be satisfied, by the Contractor's own investigation and research, regarding all conditions and materials affecting the work to be done. No additional compensation, other than the lump sum price bid for this Item, will be made if the materials or work prove to be different than that inferred or described herein, or shown on the Plans.

Payments will be made according to the following schedule:

Payment of 10% of the Lump Sum price of this item will be made upon approval of the design.

Payment of 30% of the Lump Sum price of this item will be made upon completion of Stage 1.

Payment of 30% of the Lump Sum price of this item will be made upon completion of Stage 2.

Payment of 30% of the Lump Sum price of this item will be made upon completion of Stage 3.

Suggested Sequence of Construction staging shown in the Bridge Plans.

Excavation required to facilitate construction of the proposed bridge beyond the limits of excavation required to remove the existing CMP culvert and channel walls will be paid for under Item 140. Bridge Excavation or Item 144. Class B Rock Excavation.

Temporary earth support required to remove the existing structure will be paid for under Item 950.31 Temporary Earth Support System.

Temporary water control required to remove the existing structure will be paid for under Item 991.1 Control of Water – Structure No. W-12-030 (C83).

**ITEM 120.**

**EARTH EXCAVATION**

**CUBIC YARD**

The work under this Item shall conform to the relevant provisions of Subsection 120 of the Standard Specifications and the following:

The work shall consist of removing and disposing, all materials required for execution of the required work as shown on the Plans and as directed, except material for which payment is made under the item of Bridge Excavation of this Contract and except those materials for which payment is made under other items of this Contract.

The work shall also include excavation and removal of existing roadways, temporary pavement, bituminous curb, bounds, and all other materials not designated to be reused on the project or to be removed and discarded. The Engineer shall determine the disposition of all materials with respect to removal and disposal.

The Contractor's attention is also directed to the historic plaque that is mounted along Route 16 at STA. 15+35 RT. The plaque is secured to a rock outcrop. This plaque is to be maintained in its current location. The Contractor shall protect the plaque from any damage and not remove or excavate the rock around this location. Any damage to this plaque will be repaired at the Contractor's expense. The work associated with the protection of this plaque is incidental to this Item.

The Contractor shall perform all excavation in such a manner as to maintain slopes, longitudinally and laterally and to ensure proper and continuous drainage at all times.

To avoid damage to trees which have parts of their root system in roadways or planting areas designated for excavation, such excavation shall be accomplished as carefully as possible or as directed by the Engineer (see also Items 102.511 and 102.521).

**Method of Measurement**

Item 120. will be measured for payment as per Subsection 120.80 of the Standard Specifications.

**Basis of Payment**

Item 120. will be paid for as per Subsection 120.81 of the Standard Specifications.



**ITEM 121.****CLASS A ROCK EXCAVATION****CUBIC YARD**

The work to be done under this Item shall conform to the relevant provisions of Subsection 120 of the Standard Specifications and the following:

The work shall include drilling and blasting of rock required to complete Class A Rock Excavation during construction of the proposed improvements.

**Definitions**

- A. **Perimeter Control Blasting:** The use of explosives and blasting accessories in carefully spaced and aligned drill holes to produce a final excavation surface or shear plane in the rock along the specified excavation backslope. These blasting techniques are used to better distribute the explosive charge to minimize damage, such as fracturing and overbreak, backbreak, or endbreak, beyond the final excavation face by using small diameter, decoupled charges in closely spaced blastholes placed on the perimeter of an excavation. Perimeter control blasting method shall be presplitting.
- B. **Blasting Contractor:** A company specializing in the use of explosives for breaking rock. The blasting contractor shall be responsible for loading and firing each blast, as well as the design and management of blasting operations.
- C. **Blaster-in-Charge:** An employee of the blasting contractor with total authority over the handling, use and security of explosives, and is responsible for coordinating, planning, and supervising explosives use. The blaster-in-charge shall be responsible for inspecting blast areas after each blast event. The blaster-in-charge will be required to be on-site during blasting.
- D. **Blasting Consultant:** A consultant with specialized experience and academic knowledge of commercial explosives, perimeter control blasting applications, vibration, and air-overpressure control. The blasting consultant shall use this knowledge to evaluate, plan, and oversee the safe use of explosives in commercial applications in accordance with blasting industry and regulatory standards. The blasting consultant shall review and sign all blasting plans and required submittals provided by the blasting contractor. The blasting consultant shall not be an employee of the Contractor or any affiliated companies or suppliers of products to the project and shall not have any conflict-of-interest affiliations with MassDOT, or other entities involved with the work.

**Submittals**

1. **Pre-Construction Submittals:** The Contractor shall present the submittals listed below for approval prior to the beginning of the work. Allow a 21-calendar day review period and 14 calendar days for review of each subsequent resubmittal shall be allowed. The pre-construction submittals shall be submitted at least 10 working days prior to the pre-blast meeting. Drilling and blasting operations shall not begin until all the submittals have been approved.

**ITEM 121.** (Continued)

2. Qualifications: Submit documentation that the Blasting Contractor has successfully completed at least five blasting projects within the last 3 years with subsurface conditions and blasting of a similar scope and complexity to the project at anticipated. Documentation shall include the names of the general contractor and the owner, descriptions of each past project, and current contact information of a representative of the construction manager or project owner. Contact information shall include at least one valid phone number.

Submit qualifications for the Blaster-in-Charge including documentation of valid licenses for each blaster-in-charge, including state of Massachusetts Department of Fire Safety Explosive User Certificate and U.S. Bureau of Alcohol, Tobacco, Firearms and Explosives License. Documentation shall be provided showing that each blaster-in-charge has a minimum of 10 years of experience in blasting with past projects of similar scope and complexity. Documentation shall include resumes, references, certifications, project lists, experience descriptions and details. References shall include valid phone numbers for the representatives of the construction manager or owner from at least 3 past projects involving similar perimeter control blasting. Provide a signed statement from the proposed Blaster-in-Charge certifying that during the past 5 years they:

- a) Have not been involved in incidents where fly rock traveled within the active travel way, out of the construction right-of-way, onto private property, caused damage of property, or resulted in injury.
- b) Have not had a blasting license restricted or revoked in any state.
- c) Have not been fined or sanctioned personally in any way by a regulating authority.

Submit qualifications for the Blasting Consultant including documentation that the Blasting Consultant has a minimum of 10 years of experience in using perimeter control blasting on projects of similar scope and complexity. The Blasting Consultant shall have directly participated in at least three projects of similar scope and complexity. Documentation shall include the names of the general contractor and the owner, descriptions of each past project, and current contact information of a representative of the construction manager or project owner. Contact information shall include at least one valid phone number.

**ITEM 121.** (Continued)

3. Preliminary Blast Plan: The Contractor shall submit a preliminary blast plan before beginning drilling, when revised drilling or blasting methods are proposed, or as directed by the Engineer. The preliminary blast plan shall clarify the means and methods anticipated to be used during construction to meet the required blasting tolerances. The preliminary blast plan shall include:
- a) A description of the sequence and procedures to be employed to execute the anticipated blasting operations including the drilling, blasting, fragmentation size, number of blasts, benching details if applicable, and proposed blasting schedule.
  - b) A description of drilling methods, including production holes, buffer holes and perimeter control holes as applicable, the type of drills, size and type of drill bits, drill hole inclinations, anticipated subdrill depths, burden between rows, hole spacing within rows, and hole diameter.
  - c) Figures of typical plan and area of blasts with profile and sectional views, free faces, burden, bench or lift heights, station limits, blast limits, hole types, burden, hole spacing, depths, diameters, subdrill depths, and inclination.
  - d) A description of blasting methods, including types of anticipated explosives to be used, detonators, boosters, blasting agents, type and amount of stemming, method of primary initiation, sequence of delays, any blank or unloaded holes, and detonation methods and timing and loading diagrams.
  - e) A description and preliminary calculations of charge-weight-per-delay.
  - f) Manufacturer's data sheets and safety data sheets (SDS) on all blasting material and equipment proposed, including the type of explosives, blasting agents, cartridge sizes and weights, detonators, blast initiation devices, and other equipment required to perform the blast.
  - g) Station limits for proposed test blast locations.
  - h) Technical specifications for blasting mats used to cover blasts, including type, size, weight, and number.
  - i) Plans for control of water, disposal of spoils, disposal of blasting related equipment, materials and waste, and other significant aspects of the work related to drilling and blasting.
  - j) An organizational chart identifying the key personnel and points of contact for the portion of the work involving drilling and blasting.
  - k) Examples of the forms used in the Contractor's blasting submissions.
  - l) Signature of the blasting consultant confirming that the preliminary blast plan was prepared under their supervision.

**ITEM 121.** (Continued)

4. Explosives Transportation, Handling, and Storage Plan: This plan shall include work procedures and safety precautions for the storage, transportation, and handling of explosives including:
  - a) A list of all authorities having jurisdiction over operations involving the transportation, storage, handling, and use of explosives, copies of all required blasting permits regarding explosive use and storage, and copies of necessary blasting licenses or authorizations obtained from the state and pertinent localities.
  - b) A scaled map showing locations where explosives will be kept in temporary day boxes or delivery vehicles while on site.
  - c) Information describing how explosives will be inventoried, secured, and guarded to prevent unauthorized use of explosives.
  - d) Explosive materials shall not be delivered to the site until the submittal has been approved in writing by the Engineer.
  
5. Blasting Safety Plan for Use of Explosives: This plan shall include work procedures and safety precautions for the detonation of explosives including:
  - a) Worker, site, and public safety procedures, blast communication procedures, signage, and equipment details.
  - b) Means to prevent contamination and deleterious effects to environmental and other natural resources.
  - c) A complete description of the clearing and guarding procedures that will be employed to ensure personnel, staff, visitors, and all other persons are at safe locations during blasting. This information shall include details regarding visible warning signs or flags, audible warning signals, method of determining blast area zones, access blocking methods, guard placement and guard release procedures, primary initiation method, and the system by which the blaster-in-charge will communicate clearing and guarding procedures.
  - d) A description of the equipment and procedures that will be used to monitor the approach of lightning storms and, in the event of such, evacuation and site safety security plans. This includes specifications of the lightning detection equipment.
  - e) Contingency plans for handling of misfires.
  - f) Fire prevention plan details, including smoking policies, procedures and limitations for work involving any open flames or sparks, description and location of all firefighting equipment, and firefighting and evacuation plans.

**ITEM 121.** (Continued)

6. Pre-Blast Submittals: The following information shall be submitted no later than 8:00 a.m. on the weekday prior to the proposed upcoming blast.
  - a) Pre-Blast Plan: The blaster-in-charge shall submit a pre-blast plan for review by the Engineer. The review of a blasting plan shall not relieve the Contractor of responsibility to produce adequate rock breakage, to limit breakage to within the design excavation final lines and grades, that vibration limits are not exceeded, and to ensure that flyrock does not result from the blasting operation. The pre-blast plan shall include:
    - 1) A scaled drawing showing the location, orientation, number, diameter, and depth of blastholes relative to the specified stations, slopes, lines, and grades.
    - 2) Calculations showing determinations of maximum charge-per-delay.
    - 3) A detailed log showing the proposed amounts of all explosives, by type, and stemming used in all charged holes, rock volume calculations, and powder factor calculations.
    - 4) Drawing showing surface initiation and in-hole firing times of all charges.
    - 5) Proposed date and time of blast.
    - 6) A description of methods that will be used to reduce and control flyrock potential.
    - 7) Methods to prevent overbreak, backbreak, endbreak, and loosening of rock not intended to be removed or disturbed by the blast.
    - 8) Locations and distances from the center of the blast area to the seismographs and instruments that will measure ground and air blast vibrations.
    - 9) Proposed changes to the preliminary blast plan based on a review of observation made during drilling.
  - b) Drill Logs: The blasting contractor shall submit a completed and detailed drill logs that include records of all holes drilled. The drill logs shall include:
    - 1) Project name, date and time of drilling, general weather conditions, and the drilling equipment used.
    - 2) Station limits and bench identification number, if applicable for the drilling operation.
    - 3) Layout, location, and identification of drill holes. Production holes, buffer holes, presplit or precision presplit holes, and line drilling holes shall be identified as appropriate.
    - 4) Diameter and depth of each drill hole.
    - 5) Planned borehole inclination, drill inclination during operation, final borehole inclination, and any deviation from planned angle at each borehole drilled.

**ITEM 121.** (Continued)

- 6) Description and depth of key observations and deviations encountered during drilling of each hole, including jointing or voids, zones where loss or gain of fluid or air is encountered, changes in lithology, changes in the rate of drilling not due to equipment, color variation in cuttings, odors emanating from the drill hole, soil types encountered, water bearing zones, unrecovered equipment left in a drilled hole, any collapse of drilled holes or backfilling of holes for any reason.
  - 7) Signature of the drill operator acknowledging review of the data contained, and
  - 8) Signature of the blaster-in-charge acknowledging review of the data contained in the drill logs.
7. Post-Blast Submittals: The Contractor shall submit the following information for approval not more than 48 hours after each blast and before any further blasting operations can continue. Post-blast reports must be completed and approved before the next pre-blast plan is submitted.
- a) Post-Blast Report: The blaster-in-charge shall submit a post-blast report to provide a full detailed account of the blast that includes:
    - 1) Blast Details
      - Blast number, date, time, station location, and weather conditions,
      - Final burden, spacing and number of holes blasted.
      - Calculated volume of blast.
      - Explosive details, including, load parameters, including type, quantity, size, weight of explosives, per type, overall total, and stemming type and depths.
      - Maximum charge weight per delay, for production holes and perimeter control blastholes.
      - Total number and type of delays used, number of holes for each delay period, and sequence of time delay.
    - 2) Performance Details
      - Relative quality of rock fragmentation, including identifying high-bottom areas.
      - Evidence of backbreak, overbreak, endbreak or blast damage along the new slope face including within any half barrel casts. Include station limits and estimated dimensions of damage.
      - Amount and measured distance of flyrock ejected.
      - Areas of over loading or under loading as shown in the constructed rock slope face.
      - A section that includes an evaluation by the blaster-in-charge and blasting consultant of the blast performance.
      - Corrective actions to the blast design and methods should the results of the blasting violate any section of the specification, or the tolerances and intent shown on the Plans.

**ITEM 121.** (Continued)

- b) **Vibration Report:** The Contractor shall submit a report prepared by the Vibration Specialist in accordance with Item 121.11 that includes:
- 1) Instruments used.
  - 2) Name of qualified observer and interpreter.
  - 3) Blast number and date.
  - 4) The location of the blast (station and offset, latitude and longitude, and elevation) and the blast area center location (station and offset, latitude and longitude, and elevation).
  - 5) A scaled map showing the location of the blast and the seismographs.
  - 6) Indicate the surface material type the geophone has been coupled to at the recording station and the coupling method.
- c) **Fly rock Report:** If fly rock travels within the active travel way, out of the construction right-of-way, onto private property, causes damage of property, or results in injury, the blasting contractor shall file a fly rock report. This report shall be reviewed by the blasting consultant and submitted to the Engineer for approval before blasting operations resume. This report shall include:
- 1) Cause of the fly rock.
  - 2) Methods used to prevent the fly rock, if used.
  - 3) Methods to be employed on subsequent blasts to reduce the throw of fly rock.
  - 4) Plans to prevent future encroachments of private property if applicable.

**Construction Methods**

**Site Preparation:** The blasting limits as shown in the Plans shall be cleared of all vegetation, overburden, and boulders prior to beginning blasting work. Use of explosive charges is not in a manner that shall not dislodge them and cause them to move downslope. The methods allowed for boulder breaking include hydraulic splitter and hydraulic hammer. Alternative methods of boulder removal may be proposed by the Contractor and submitted to the Engineer for approval.

**Pre-Blast Meeting:** A pre-blast meeting shall be held prior to the start of drilling and blasting work and shall be attended by the Engineer, the Contractor, the Blasting Contractor, Blaster-in-Charge, Blasting Consultant, and Vibration Specialist. The pre-blast meeting shall be conducted to clarify the construction requirements for the work, to coordinate construction activities, and to identify contractual relationships and responsibilities. The pre-construction submittals shall be submitted at least 10 working days prior to the pre-blast meeting.

**Public Meeting:** To better inform the public about anticipated drilling and blasting operations, at the request of the Engineer, the Contractor shall make their blasting consultant, blasting contractor, and vibration specialist prepare for and participate in a public meeting conducted by the Engineer.

The participants shall be prepared to answer any questions regarding the blasting operations, ground vibrations, airblast overpressure, and fly rock expected to impact the public.

**ITEM 121.** (Continued)

Blasting Limits and Protection: No blasting shall occur within 20 feet of bridge abutments, existing pipelines, or other structures. All blasting located along adjacent the power line right-of-way shall be conducted in a manner that will not cause damage to the power company property and facilities. Advance rock excavation at locations closer than 20 feet from existing infrastructure including, but not limited to, existing bridge structures, ITS equipment, utility poles, drainage structures, etc. by drilling relief holes and using hydraulic rock splitters or hydraulic hammers.

The blast area shall be covered by blasting mats and other materials as needed to protect nearby existing facilities, structures, highways, or significant natural resources from thrown rock fragments.

Method of Measurement

Item 121. will be measured for payment by cubic yard of Type A Rock Excavation.

Basis of Payment

Item 121. will be paid for at the Contract unit price per cubic yard, which price shall include all labor, transportation, equipment, tools, necessary or incidental costs required to complete the work as specified above, as shown on the Contract Plans, and as required by the Engineer. The unit price will include all costs associated with the professional services provided.

Presplitting rock will be paid for separately under Item 122.

Any damage caused to existing structures or other infrastructure due to the Contractor's negligence or lack of adherence to these provisions and the provisions listed under Item 121.11, as determined by the Engineer shall be repaired or replaced at the Contractor's expense.



**ITEM 121.11****MONITORING FOR ROCK EXCAVATION****LUMP SUM**

The work under this Item shall conform to the relevant provisions of the latest MassDOT Survey Manual, see the link below and the following:

<https://www.mass.gov/doc/1996-survey-manual/download>

The work shall include all materials, equipment, labor, and professional services required to survey, install, protect, replace, monitor, and report on the existing structures and utilities during construction of the proposed improvements. The existing I-395 overpass will remain in service during construction and after the completion of the project. Therefore, the I-395 bridge substructures and the existing fiber optic, water main and gas main shall be monitored. The requirements for performing pre- and post-construction condition surveys and vibration monitoring during construction operations in a monitoring zone defined as within a 200-foot radius of Class A Rock Excavation operations are included in this specification. The purpose of construction condition surveys and vibration monitoring is to assist in the control of the Contractor's means and methods of construction within the monitoring zone by limiting vibrations to within established threshold values, to preserve the integrity of the existing bridges, and to protect MassDOT from baseless damage claims associated with construction.

**Definitions**

- A. Seismograph or Vibration Sensor: A triaxial geophone placed at strategic and/or convenient locations between the work and existing site features to assess ground vibrations associated with the proposed construction.
- B. Airblast: An atmospheric pressure wave of both audible high frequency sound and inaudible low frequency sound or concussion.
- C. Deformation Monitoring Point: A target that is surveyed at a specific frequency to assess vertical movements during construction.
- D. Crackmeter: An instrument designed to measure movement across surface cracks and joints.
- E. Vibration Specialist: An engineer registered in the Commonwealth of Massachusetts with demonstrable experience in vibration and deformation monitoring engaged by the Contractor to develop and implement a vibration and deformation monitoring program.
- F. Condition Survey: A survey of existing Assets to observe and record signs of distress completed by an engineer registered in the Commonwealth of Massachusetts with experience in building and structure assessments.

**ITEM 121.11** (Continued)Submittals

1. **Qualifications:** The vibration monitoring and reports shall be prepared under the direct supervision of a Monitoring Specialist that is a Civil Engineer registered in the Commonwealth of Massachusetts with more than 10 years responsible experience in similar work. The qualifications of the Monitoring Specialist must include at least three previous projects on which similar services were provided for monitoring structures, facilities, and utilities. The Contractor shall retain the services of a licensed engineer registered in the Commonwealth of Massachusetts with experience in performing condition assessments on similar Assets to complete the pre-construction survey and prepare a survey report. Submit the qualifications of the Monitoring Specialist and other instrumentation personnel to be assigned to the project to the Engineer for review and approval as soon as feasible after notice to proceed.
2. **Condition Survey:** The condition survey shall document all aspects of each Asset's condition through observations, field measurements, sketches, photographs, video, LiDAR and/or any other methods of data collection as determined to be appropriate and be completed at the start and the end of the construction effort.

The pre-construction survey shall be performed such that it can be reproduced and compared to a post-construction survey. At least 21 days before commencing construction operations, perform survey of the four existing bridge substructures, the Verizon Retailer on No. 2 Worcester Road, and the 100-foot southern section of the MAPFRE parking lot at the corner of Gore and Sutton Roads.

The pre-construction condition survey shall comply to the requirements under Subsection 121. Class A Rock Excavation for pre-blast survey. The pre-construction survey report shall be generated including all documentation collected, be submitted to the Engineer for review and must be approved prior to the beginning of Work. Before commencing construction operations, document existing site conditions including any damaged interior or exterior site improvements as follows:

- Send letters requesting access to the private building owner where the pre- and post-condition surveys are to be performed.
- Perform pre-construction condition surveys by documented existing conditions using color photographs, videos, sketches, or drawings of existing damage to tile, sheetrock, plaster, concrete, or other existing appurtenances.
- Document any signs of distress and potential location to install crackmeters.
- Identify and document locations for deformation point installation.

The scope and detail of the pre-construction survey must be sufficient to assess and document damage to existing site features existing prior to construction operations.

**ITEM 121.11** (Continued)

Submit a survey report including all pre-construction photographs, videos, sketches, drawings, and instrumentation data to the Engineer using a USB drive or by electronic file sharing (e.g. FTP, OneDrive, etc.).

3. **Monitoring Plan:** Submit a plan showing the locations of the instrumentation type, and number of sensors proposed for vibration monitoring and of the deformation points proposed for deformation monitoring. Details of protective equipment used to secure sensors and deformation points to preclude vandalism or damage of the vibration monitoring equipment. Include the type, manufacturer, model, and serial number, as applicable, of equipment used for both vibration and deformation monitoring including details of the deformation monitoring points. Include catalog cut sheets as appropriate.

The monitoring plan shall be designed based on the pre-construction survey, the contract documents, Asset characteristics, and the proposed work. Instrumentation may include sensors, crack gauges, total station surveys, noise monitors, or other device types as determined to be appropriate and approved by MassDOT.

The monitoring plan shall be prepared by a licensed engineer registered in the Commonwealth of Massachusetts and submitted for review and approval prior to the beginning of Work. The monitoring plan shall include the following components:

- Narrative including Project description, description of adjacent Assets, sequence of work and methodologies.
  - Applicable findings of the pre-construction survey.
  - Plans and sections to scale detailing the proximity of the proposed work to existing Assets and proposed locations of instrumentation.
  - Technical data for proposed instrumentation including tolerances, ranges, calibration requirements, dimensions, outputs, power requirements, operating temperatures, etc.
4. **Monitoring Reports:** Submit the baseline vibration and deformation monitoring reports at the start of the monitoring program. Submit monthly monitoring reports for both vibration and deformation with the results of the monitoring effort. Submit deformation monitoring reports with readings that exceed the proposed thresholds within an eight-hour period from occurrence.

Submit vibration and airblast monitoring reports for each blast event. The vibration and airblast blast reports shall include:

- Summary report from each sensor, including, but not limited to:
- Peak particle velocity and frequency of the peak.
- Peak particle displacement.
- Peak acceleration.
- Peak vector sum.

**ITEM 121.11** (Continued)

- Distance from blast center.
- Maximum charge weight per delay.
- Airblast overpressure.
- Confirmation that the vibration data shows is below the vibration threshold.
- Calibration verification.
- Ground vibration and airblast regression analysis, relating scaled distance (square root) to peak particle velocity, and scaled distance (cube root) to airblast pressure level.
- A dated and signed copy of records of all sensor ground vibrations and airblast readings.

**Construction Methods**

Vibration Monitoring: The Contractor shall use a minimum of three vibration sensors located in accordance with the approved Preliminary Blast Plan and the Monitoring Plan. Include one sensor behind the bridge abutments and another near the Verizon Retailer building. Relocate or remove the sensors as the rock excavation advances to provide accurate coverage of the operation. The sensor locations and relocation as the work progresses shall be included in the monitoring plan submitted for approval. The sensors shall have the following minimum features:

- Seismic range: 0.01 to 4 inches per second with an accuracy of +/- 5 percent of the measured peak particle velocity or better at frequencies between 10 Hertz and 100 Hertz, and with a resolution of 0.01 inches per second or less.
- Three channels for vibration monitoring.
- Two power sources: internal rechargeable battery and charger and 115 volts AC. Battery must be capable of supplying power to monitor vibrations continuously for up to 24 hours.
- Computer software to perform analysis and produce reports of continuous monitoring.
- Continuous monitoring mode must be capable of recording single-component peak particle velocities, and frequency of peaks with an interval of one minute or less.
- Real-time transmission via cell phone provider to the project team for all events that exceed the proposed thresholds.

Certification shall be provided to indicate that the test equipment used for this purpose is calibrated and maintained in accordance with the test equipment manufacturer's calibration requirements and that, where applicable, calibrations are traceable to the National Institute of Standards and Technology.

The Contractor shall operate the sensors for a minimum of five (5) consecutive 24-hour periods at the start of construction to establish baseline levels. Copies of the baseline report shall be submitted as outlined previously a minimum of five (5) days prior to commencement of rock excavation. Following the start of construction, the Contractor shall monitor the vibration levels on an ongoing basis during construction activities and as required by the Engineer. The Contractor shall maintain records of the vibration levels and shall submit a report of these levels as requested by the Engineer. The vibration reports shall include the requirements of the Special Provisions for Item 121. Class A Rock Excavation and be submitted as part of the Post-Blast Reports.

**ITEM 121.11** (Continued)

The threshold value for peak particle velocity vibration criteria shall be 0.75 inches per second for frequencies up to 40 Hertz and 2.0 inches per second for frequencies above 40 hertz. If measurements exceed the threshold values, the following actions shall be taken:

- 1) Stop construction operations immediately.
- 2) Verify measurement reading.
- 3) Notify the Engineer and hold a meeting with representatives of the Contractor and MassDOT immediately.
- 4) Inspect abutments or other structures for any visible change in condition.
- 5) Revise proposed blasting methods.

During all monitoring of vibration-producing construction activities the Contractor shall document all events that are responsible for the measured vibration levels and submit the documentation to the Engineer with the data.

**Airblast Monitoring:** The vibration specialist shall conduct airblast monitoring for each blast. The vibration specialist shall be responsible for guaranteeing the appropriate number of airblast monitoring instruments are used during blasting operations. Locations shall be included in the monitoring plan and be approved by the Engineer.

- 1) Location: Airblast monitoring equipment shall be installed between the main blasting area and the nearest structures subject to blast damage, annoyance, or at areas designated by the Engineer.
- 2) Equipment: The equipment used to measure the airblast shall be of the type specifically manufactured for that purpose and shall be approved by the Engineer. The equipment shall be calibrated within 12 months of the time of use and operated by properly trained personnel.
- 3) Limits. Peak overpressure shall be held below 130 decibels at the nearest structures or other designated locations when measured using a 0.1 Hz high-pass linear peak method.
- 4) Appropriate blasthole patterns, detonation systems, and stemming shall be used to prevent venting of blasts and to minimize airblast and noise levels produced by the blasting operations. The overpressure limit shall be lowered if it proves too high based on damage or complaints.

**ITEM 121.11** (Continued)

Survey Monitoring (Deformation): Survey monitoring for potential movement of the existing substructures is required under this Item. Deformation monitoring points shall be installed on the bridge abutments and outer edge of the parking lot as outlined above and using the survey targets proposed in the approved monitoring plan submittal. Monitoring points shall be used to measure horizontal displacements of these points during construction.

- 1) The number and location of monitoring points shall be per the approved monitoring plan but a minimum of eight (8) deformation points should be installed on the existing bridge substructures and two (2) along the edge of the parking lot,
- 2) A baseline report shall be prepared for the existing wall points, 2 weeks prior to the start of Construction.
- 3) Monitoring frequency on the abutments shall be daily during rock excavation operations and weekly otherwise. The accuracy of the monitoring data points shall be kept to the nearest 0.125 inch.
- 4) The following “threshold” and “limiting” movements of existing abutments shall be as follows:
  - “Threshold” Horizontal Movement: No greater than 0.25 inch.
  - “Limiting” Horizontal Movement: No greater than 0.5 inch.

The Contractor shall immediately notify the Engineer and shall take immediate steps to control further movement by revising rock excavation procedures, providing supplemental bracing or other measures as required if any of the following occur:

- 1) Field measurements indicate that any of the “threshold” movement criteria are reached or exceeded.
- 2) Field measurements or observations indicate that significant or sustained movements, beyond those reasonably expected, are occurring (total movement may be less than the “limiting” movement criteria.)

If “limiting” movements are being approached or reached, the Engineer may require the Contractor to temporarily suspend the work in the area where such movement is occurring and implement all necessary mitigation measures which are satisfactory to the Engineer to arrest the movements, at no additional cost.

Work in the area where the “limiting” values have been reached shall not be permitted until the results of surveys can be reviewed and evaluated by the Engineer.

These criteria are intended to establish a minimum basis for the Contractor’s design and procedures and does not relieve the Contractor of its responsibility for preventing detrimental movements and damage to adjacent structures, utilities, or other work.

**ITEM 121.11** (Continued)

In the event the Contractor does not comply with the approved mitigation plan or continues work in violation of “threshold” or “limiting” values being reached or exceeded, the Contractor shall not be allowed to continue work until proper mitigation procedures and corrections have been made as determined by the Engineer. No claims for schedule delays will be allowed due to the Contractor’s failure to comply with these requirements.

**BASIS OF PAYMENT**

Item 121.11 will be paid for at the Contract unit price Lump Sum, which price shall include all labor, transportation, equipment, tools, necessary or incidental cost required to complete the work as specified above, as shown on the Contract Plans and/or as required by the Engineer. The unit price will include also all costs associated with the professional services provided and the collection and processing of all data and reporting this data to the Engineer.

**ITEM 127.1**

**REINFORCED CONCRETE EXCAVATION**

**CUBIC YARD**

The work shall conform to the relevant provisions of Subsections 120 and 140 of the Standard Specifications and the following:

The work shall consist of removal of the temporary cast-in-place concrete support block on top of the precast concrete box culvert.

The Contractor's operations shall not result in any damage to the box culvert structure or adjacent pavement structure. Any damage to the box culvert or to adjacent structures that are to remain resulting from the Contractor's operations shall be repaired by the Contractor to the satisfaction of the Engineer and at the Contractor's expense.

**Method of Measurement**

Item 127.1 will be measured for payment by Cubic Yard of reinforced concrete excavated.

**Basis for Payment**

Item 127.1 will be paid for at the Contract Unit Price per Cubic Yard, which price shall include full compensation for all labor, materials, equipment, sawcutting, and incidental costs required to complete the work.

Any bituminous pavement removed during removal of the temporary concrete support block will be paid for separately under Item 120. 'Earth Excavation'.



**ITEM 140.**

**BRIDGE EXCAVATION**

**CUBIC YARD**

The work under this Item shall conform to the relevant provisions of Subsection 140 of the Standard Specifications and the following:

The work shall include removing and disposing all materials encountered during excavation performed to facilitate installation of the box culvert structure, wingwalls, highway guardrail transitions, and riprap, as shown on the Plans and as directed by the Engineer.

It shall also include over-excavation of all structurally unsuitable material from the excavation site beyond the pay limits specified by the plans and Standard Specifications. Boring logs obtained at the site in February 2020(Document A00882) indicate the presence of organic silt material below the subsurface bearing elevation for the box culvert and wingwalls. This material is not suitable for support of the proposed bridge elements and shall be excavated from the site when encountered. Excavation shall continue until a competent bearing material has been reached, to the satisfaction of the Engineer.

All over-excavated areas shall be backfilled with Crushed Stone for Bridge Foundations, as shown on the plans and in accordance with the procedures and material requirements specified in the Standard Specifications.

The top 12” of fill material within the area of excavation within the channel limits shall be filled with Natural Streambed Material, paid for under item 983.521.

The Contractor shall perform all excavation in such a manner as to maintain slopes, longitudinally and laterally, and to ensure proper and continuous drainage at all times.

Control of water during excavation shall be paid for under item 991.1 Control of water - Structure No. W-12-030 (C83)

**Method Of Measurement And Basis Of Payment**

Item 140. will be measured and paid per Subsections 140.80 and 140.81, respectively.

**ITEM 153.            CONTROLLED DENSITY FILL –EXCAVATABLE            CUBIC YARD**

Work under this Item shall conform to the relevant provisions of Subsection 150 and the following:

The Controlled Density Fill material to be used on this project for trenches within the roadway, guardrail posts set in areas of shallow ledge, and backfilling for frangible leave outs at guardrail posts set in concrete surfaces shall be Type 1E or 2E Flowable/Excavatable. The material shall meet the applicable requirements specified in Subsection M4.08.0 of the Standard Specifications. All controlled density fill shall be sourced from a producer listed on the MassDOT QCML.

Controlled Density Fill containing fly ash shall not be used at locations where it could come in contact with steel or ductile iron pipes or conduit as it could corrode the metal.

Method of Measurement

Item 153. will be measured for payment by the Cubic Yard of controlled density fill placed, complete in place.

Basis for Payment

Item 153. will be paid for at the Contract unit price per Cubic Yard, which price shall include all labor, materials, equipment, and all incidental costs required to complete the work.

**ITEM 153.1**

**CONTROLLED DENSITY FILL –  
NON-EXCAVATABLE**

**CUBIC YARD**

Work under this Item shall conform to the relevant provisions of Subsection 150 and the following:

Controlled Density Fill – Non-Excavatable material shall be used as a contingency item to backfill under the footings of the existing Mill Brook channel walls should they become undermined during construction of the proposed wingwalls.

Controlled Density Fill – Non Excavatable shall not be used to backfill utility excavations or trenches.

Controlled Density Fill – Non-Excavatable shall be Type 1 Very Flowable. The material shall meet the applicable requirements specified in Subsection M4.08.0 of the Standard Specifications.

All controlled density fill shall be sourced from a producer listed on the MassDOT QCML.

**Method of Measurement**

Item 153.1 will be measured for payment by the Cubic Yard of Controlled Density Fill – Non-Excavatable placed within the excavated areas in accordance with the details on the Plans and as accepted by the Engineer.

**Basis for Payment**

Item 153.1 will be paid for at the Contract Unit Price per Cubic Yard for Controlled Density Fill – Non-Excavatable, which price shall include all labor, tools, materials, and equipment necessary to complete the work.

**ITEM 156.5**

**CRUSHED STONE FOR FILTER BLANKET**

**CUBIC YARD**

The work under this Item shall conform to the relevant provisions of Subsections 150 and 983 of the Standard Specifications and the following:

The work shall include placing crushed stone for filter blanket to the limits shown on the Plans for as a bedding/foundation element for modified rockfill slope protection and for use the riprap scour protection proposed within the Mill Brook channel. The crushed stone shall conform to Subsection M2.01.2 of the Standard Specifications.

The crushed stone shall be placed as shown in the details on the Plans and in conformance with the Standard Specifications.

Geotextile fabric for separation will be paid for under Item 698.4 Geotextile Fabric for Permanent Erosion Control, per the details on the Plans and shall be listed on the QCML.

**Method of Measurement:**

Crushed Stone for Filter Blanket will be measured for payment per Cubic Yard, complete in place.

**Basis of Payment:**

Crushed Stone for Filter Blanket will be paid for at the Contract Unit Price per Cubic yard, which price shall include the costs of all labor, tools, materials, equipment, and all incidental costs required to complete the work..

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**ITEM 180.01 ENVIRONMENTAL HEALTH AND SAFETY PROGRAM LUMP SUM**

The work shall consist of ensuring the health and safety of the Contractor's employees and subcontracting personnel, the Engineer, their representatives, the environment, and public welfare from any on-site chemical contamination present in air, soil, water and sediment.

The Contractor shall prepare and implement a site-specific Environmental Health and Safety Plan (EHASP) which has been approved and stamped by a Certified Industrial Hygienist (CIH) and includes the preparer's name and work experience. The EHASP shall include appropriate components required by OSHA Standard 29 CFR 1910.120(b) and the Massachusetts Contingency plan (MCP) 310 CMR 40.0018 and must comply with all applicable state and federal laws, regulations, standards and guidelines, and provide a degree of protection and training appropriate for implementation on the project. The EHASP shall be a dynamic document with provision for change to reflect new information, new practices or procedures, changing site environmental conditions or other situations which may affect site workers and the public. The EHASP shall be developed and implemented independently from the standard construction HASP required to work on all MassDOT construction projects.

Health and safety procedures provided by the Contractor shall comply with all the appropriate regulations that address employee working conditions, including but not limited to standards established by OSHA and National Institute for Occupational Safety and Health (NIOSH). Equipment used for the purpose of health and safety shall be approved by and meet pertinent standards and specifications of the appropriate regulatory agencies.

A copy of the most up-to-date version of the EHASP shall be maintained on-site at all times by the Contractor. The on-site copy shall contain the signature of the Engineer and each on-site employee of the MassDOT, Contractor, and Subcontractors involved with on-site activities. The employee's signature on the EHASP shall be deemed prima facie evidence that the employee has read and understands the plan. Updated copies of signature sheets shall be submitted to the Engineer.

The EHASP shall specify a Contractor Site Safety and Health Officer responsible for implementation of the EHASP and to oversee all construction activities, including handling, storage, sampling and transport, which require contact with or exposure to potentially hazardous materials.

The level of protection, required to ensure the health and safety of on-site personnel will be stipulated in the EHASP. The Site Safety and Health Officer shall implement the EHASP based on changing site and weather conditions, type of operation or activity, chemical compounds identified on-site, concentration of the chemicals, air monitoring data, physical state of the hazardous materials, potential duration of exposure to hazardous materials, dexterity required to perform work, decontamination procedures, necessary personnel and type of equipment to be utilized.

**ITEM 180.01** (Continued)

During implementation of the EHASP, a daily log shall be kept by the Site Safety and Health Officer and a copy shall be provided weekly to the Engineer. This log shall be used to record a description of the weather conditions, levels of personal protection being employed, screening data and any other information relevant to on-site environmental safety conditions. The Site Safety and Health Officer shall sign and date the daily log.

**Method of Measurement and Basis of Payment**

Preparation and implementation of the Environmental Health and Safety Program, including the monitoring, protection and storage of all contaminated materials, as well as subsequent modifications to the EHASP, will be measured and paid for at the Lump Sum Bid Price.

Payment of 50% of the Environmental Health and Safety Program contract price will be made upon the initial acceptance of the EHASP by the Engineer. Payment of the remaining 50% of the Environmental Health and Safety Program contract price will be made upon completion of the work. The bid price shall include preparation and implementation of the EHASP as well as the cost for its enforcement by the Site Safety and Health Officer along with any necessary revisions and updates. The work of implementing the Environmental Health and Safety Program includes work involving, but not limited to, the monitoring, protection, and storage of all contaminated materials.

**ITEM 180.02**

**PERSONAL PROTECTION LEVEL C UPGRADE**

**HOUR**

The work shall consist of providing appropriate personal protective equipment (PPE) for all personnel in an area either containing or suspected of containing a hazardous environment.

Contingencies for upgrading the level of protection for on-site workers will be identified in the EHASP and the Contractor shall have the capability to implement the personal protection upgrade in a timely manner. The protective equipment and its use shall be in compliance with the EHASP and all appropriate regulations and/or standards for employee working conditions.

**Method of Measurement and Basis of Payment**

Personal Protection Level C Upgrade will be measured and paid only upon upgrade to Level C and will be at the contract unit price, per hour, per worker, required in Level C personal protection. No payment will be made to the Contractor to provide Level D PPE.

**ITEM 180.03****LICENSED SITE PROFESSIONAL SERVICES****HOUR**

Within limited areas of the project site, soils, sediments and/or groundwater may be contaminated. A Licensed Site Professional (LSP) shall be required to provide the services necessary to comply with the requirements of the MCP. These services may include sampling, analysis and characterization of potentially contaminated media, preparation of Immediate Response Action (IRA) Plans, Utility-Related Abatement Measure (URAM) and Release Abatement Measure (RAM) Plans, Imminent Hazard Evaluations, status reports, transmittal forms, release notification forms, risk assessments, completion statements, and related documents required pursuant to the Massachusetts Contingency Plan (MCP). LSP hours related to the characterization and disposal of contaminated soil and/or sediment are incidental to the disposal items. An estimate of LSP services to be provided shall be submitted to the Engineer for approval before any LSP activity begins.

The name and qualifications of the LSP and all environmental technicians to be assigned to the project shall be submitted to the Engineer for approval at least four weeks prior to initial site activities. The LSP shall have a current, valid license issued by the Massachusetts Board of Registration of Hazardous Waste Site Cleanup Professionals. The LSP shall have significant experience in the oversight of MCP activities at active construction sites. Qualification packages for the LSP and each technician shall include a resume, all recent work assignments with responsibilities identified (previous 5 years), and applicable training and certifications. A list of all Notices of Noncompliance, Notice of Audit Findings and Enforcement Orders issued by the DEP shall be submitted for all work assignments listed for the LSP and environmental technicians.

The LSP shall evaluate soil and/or sediment with discoloration, odor, and presence of petroleum liquid or sheening on the groundwater surface, or any abnormal gas or materials in the ground which are known or suspected to be oil or hazardous materials. Excavated soil and sediment which is suspected of petroleum contamination shall be field screened using the jar headspace procedures according to established DEP Guidance. All field screening equipment must be pre-approved by the Engineer. The LSP shall ensure proper on site calibration of all field screening instrumentation.

The Engineer shall be contacted immediately when observations or any field screening results verify contamination requiring further analysis, and/or enhanced management of suspect soil and/or sediment. Any enhanced management of contaminated soil to ensure proper stockpiling and storage is incidental to the LSP Services item. The LSP shall adequately characterize subsurface conditions prior to backfill in areas where contaminated material has been excavated. The Engineer shall approve the locations of the testing sites prior to the sampling.



**ITEM 180.03** (Continued)

Contaminated soil, sediment and/or groundwater shall be handled in accordance with all applicable state and federal statutes, regulations and policies. The LSP shall adequately characterize contaminated media for comparison to the requirements of the MCP. The Contractor and the LSP shall be aware of the reporting requirements for releases of oil and/or other hazardous material (OHM) as set forth in federal and state laws and regulations, and shall both be held responsible for performing the work in accordance with all applicable Federal and State laws and regulations. The LSP shall maintain written records in a clear and concise format which tracks the excavation, stockpiling, analysis and reuse/disposal of all suspect contaminated soils, sediments and groundwater. These records shall be up-to-date and available to the Engineer on a bi-weekly basis. The LSP shall review and summarize the laboratory data from any analyses performed on contaminated media. A report shall be delivered to the Engineer outlining the material sampling methods, laboratory analysis results and proposed course of action. The laboratory report together with Chain of Custody forms for all analytical results shall be submitted to the Engineer within 14 days after completion of such analyses.

The LSP and Contractor shall be held responsible for the submission of all MCP-related documents to the Engineer at least 14 days in advance of any timeframe specified in the MCP and for the timely submission of data and tracking information as noted within this Item. All documents prepared under this Item must be reviewed and signed by the approved LSP. The Contractor and LSP shall be responsible for all fines, penalties and enforcement requirements imposed by applicable regulatory agencies for failure to meet regulatory and contract timeframes. No compensation will be provided for such fines, penalties and enforcement actions.

The Contractor and the LSP shall be aware of the reporting requirements for releases of oil and/or other hazardous material (OHM) as set forth in federal and state laws and regulations, and shall both be held responsible for performing the work in accordance with all applicable Federal and State laws and regulations.

If the Contractor causes a release of OHM, the Contractor shall be responsible for assessing and remediating the release in accordance with all pertinent State and Federal regulations, including securing the services of a LSP, at his own expense.

The LSP shall coordinate all activities involving both MassDOT and the DEP through the Engineer. Any notification of release shall be approved by the Department before submittal to the DEP, except if an imminent hazard condition exists as defined in 309 CMR 4.03(4)(b).

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**ITEM 180.03** (Continued)**Laboratory Testing in Support of LSP Services**

Laboratory testing provides for analytical testing in support of LSP services related to maintaining MCP compliance, such as delineating the extent and type of contamination present. Sampling and testing for disposal purposes are not included.

To maintain compliance with the MCP or other regulatory requirements, the LSP shall request approval from the Engineer to obtain samples from various locations and depths within the project area and to perform laboratory analyses on those samples. The samples shall be delivered to a DEP-certified laboratory using proper chain-of-custody documentation for analyses which, depending upon site conditions and suspected and/or identified contaminants of concern, may include, but are not limited to, metals, polychlorinated biphenyls (PCBs), volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), pesticides, polycyclic aromatic hydrocarbons (PAHs), extractable petroleum hydrocarbons (EPHs) and volatile petroleum hydrocarbons (VPHs). Subsequent testing, depending upon initial results, may be required for Toxicity Characteristic Leaching Procedure (TCLP) analyses (EPA Method 1311) for metals.

**Method of Measurement and Basis of Payment**

LSP Services for work under this item will be measured per person, per hour of service provided by LSP, Environmental Technicians and other approved personnel. Travel time shall not be included in the billable hours. LSP hours related to soil/sediment disposal (disposal characterization, landfill acceptance, disposal package preparation, etc.) shall be incidental to disposal items.

The quantity and type of laboratory tests must be approved by the Engineer beforehand. The contractor will be reimbursed upon satisfactory written evidence of payment. The contractor may be required to obtain cost estimates from three DEP certified laboratories for the Engineer to choose the service provider. Laboratory testing related to soil/sediment disposal (disposal characterization, landfill acceptance, disposal package preparation, etc.) shall be incidental to disposal items.

LSP Services will be paid at the Contractor bid price for each hour, or fraction thereof, spent to perform the work as described above. The bid price shall be a blended rate that includes the cost of the LSP, environmental technicians and other personnel, the performance of all work tasks and field screening, including required equipment, materials and instrumentation, and production of all documentation described above. All requests for payment must be accompanied by the following information: the names of the personnel associated with the work charged under LSP Services, dates and hours worked, work conducted, including, where appropriate, locations as identified on the construction plans, and a copy of the field diary for the dates submitted.

Laboratory Testing will be reimbursed upon receipt of paid invoices for testing approved by the Engineer.

<b><u>ITEM 181.11</u></b>	<b><u>DISPOSAL OF UNREGULATED SOIL</u></b>	<b><u>TON</u></b>
<b><u>ITEM 181.12</u></b>	<b><u>DISPOSAL OF REGULATED SOIL – IN-STATE FACILITY</u></b>	<b><u>TON</u></b>
<b><u>ITEM 181.13</u></b>	<b><u>DISPOSAL OF REGULATED SOIL – OUT-OF-STATE FACILITY</u></b>	<b><u>TON</u></b>
<b><u>ITEM 181.14</u></b>	<b><u>DISPOSAL OF HAZARDOUS WASTE</u></b>	<b><u>TON</u></b>

The work under these Items shall include the transportation and disposal of contaminated material excavated, or excavated and stockpiled. It shall also include the cost of any additional laboratory analyses required by a particular disposal facility beyond the standard disposal test set.

Excavation of existing subsurface materials may include the excavation of contaminated soils. The Contractor shall be responsible for the proper coordination of characterization, transport and disposal, recycling or reuse of contaminated soils. Disposal, recycling or reuse will be referred to as “disposal” for the purposes of this specification. However, regardless of the use of the term herein, there will be no compensation under these items for reuse within the project limits. The Contractor will be responsible for coordinating the activities necessary for characterization, transport and disposal of contaminated soils. Such coordination will include the Engineer and his/her designee overseeing management of contaminated materials. Contaminated soils must be disposed of in a manner appropriate for the soil classification as described below and in accordance with the applicable laws of local, state and federal authorities. The Contractor shall be responsible for identifying disposal facility(ies) licensed to accept the class of contaminated soils to be managed and assure that the facility can accept the anticipated volume of soil contemplated by the project. The Contractor shall be responsible for hiring a Licensed Site Professional (LSP) and all ancillary professional services including laboratories as needed for this work. The Contractor will be responsible for obtaining all permits, approvals, manifests, waste profiles, Bills of Lading, etc. subject to the approval of the Engineer prior to the removal of the contaminated soil from the site. The Contractor and LSP shall prepare and submit to the Engineer for approval all documents required under the Massachusetts Contingency Plan (MCP) and related laws and environmental regulations to conduct characterization, transport, and disposal of contaminated materials.

Classes of Contaminated Soils

The Contractor and its LSP shall determine if soil excavated or soil to be excavated is unregulated soil or contaminated soil as defined in this section. Such materials shall be given a designation for purposes of reuse or disposal based on the criteria of the MCP. Soils and sediments which are not suitable for reuse will be given a designation for purposes of off-site disposal based on the characterization data and disposal facility license requirements. The Classes of Contaminated Soils are defined as follows:

**ITEMS 181.11 to 181.14 (Continued)**

UNREGULATED SOIL consists of soil, fill and dredged material with measured levels of oil and hazardous material (OHM) contamination at concentrations below the applicable Reportable Concentrations (RCs) presented in the MCP. Unregulated soil consists of material which may be reused (or otherwise disposed) as fill within the Commonwealth of Massachusetts subject to the non-degradation criteria of the MCP (310 CMR 40.0032(3), in a restricted manner, such that they are sent to a location with equal or higher concentrations of similar contaminants. Disposal areas include licensed disposal facilities, approved industrial settings in areas which will be capped or covered with pavement or loamed and seeded, and for purposes of this project should be reused as fill within the project site construction corridor whenever possible. The material cannot be placed in residential and/or environmentally sensitive (e.g. wetlands) areas. Under no circumstances shall contaminated soils be placed in an uncontaminated or less contaminated area (including the area above the groundwater table if this area shows no sign of contamination).

The Contractor shall submit to MassDOT the proposed disposal location for unregulated soils for approval. If such a disposal location is not a licensed disposal facility, the Contractor shall submit to the Engineer analytical data to characterize the disposal area sufficiently to verify that the unregulated material generated within the MassDOT construction project limits is equal to or less than the contaminant levels at the disposal site and meets the non-degradation requirements of the MCP. In addition, the Contractor shall provide written confirmation from the owner of the proposed disposal location that they have been provided with the analytical data for both the materials to be disposed as well as the disposal site characterization and that s/he agrees to accept this material. A Material Shipping Record or Bill of Lading, as appropriate, shall be used to track the off-site disposal of unregulated soil and a copy, signed by the disposal facility or property owner, shall be provided to the Engineer to document legal disposal of the unregulated material.

The cost of on-site disposal of unregulated soil within the project area will be considered incidental to the item of work to which it pertains.

**ITEMS 181.11 to 181.14 (Continued)**

REGULATED SOIL consists of materials containing measurable levels of OHM that are equal to or exceed the applicable Reportable Concentrations for the site as defined by the MCP, 310 CMR 40.0000. Regulated soil which meets the MCP reuse criteria of the applicable soil/groundwater category for this project area may be reused on site if it meets the appropriate geotechnical criteria established by the Engineer. Regulated Soil may be reused (as daily or intermediate cover or pre-cap contouring material) or disposed (as buried waste) at lined landfills within the Commonwealth of Massachusetts or at an unlined landfill that is approved by the Massachusetts Department of Environmental Protection (DEP) for accepting such material, in accordance with DEP Policy #COMM-97-001, or at a similar out-of-state facility. It should be noted that soils which exceed the levels and criteria for disposal at in-state landfills, as outlined in COMM-97-001, may be shipped to an in-state landfill, but require approval from the DEP Division of Solid Waste Management and receiving facility. An additional management alternative for this material is recycling into asphalt. Regulated Soils may also be recycled at a DEP approved recycling facility possessing a Class A recycling permit subject to acceptance by the facility and compliance with DEP Policy #BWSC-94-400. Regulated Soil removed from the site for disposal or treatment must be removed via an LSP approved Bill of Lading, Manifest or applicable material tracking form. This type of facility shall be approved/permitted by the State in which it operates to accept the class of contaminated soil in accordance with all applicable local, state and federal regulations.

HAZARDOUS WASTE consists of materials which must be disposed of at a facility permitted and operated in full compliance with Federal Regulation 40 CFR 260-265, Massachusetts Regulation 310 CMR 30.000, Toxic Substances Control Act (TSCA) regulations, or the equivalent regulations of other states, and all other applicable local, state, and federal regulations. All excavated materials classified as hazardous waste shall be disposed of at an out-of-state permitted facility. This facility shall be a RCRA hazardous waste or TSCA facility, or RCRA hazardous waste incinerator. This type of facility shall be approved/permitted by the State in which it operates to accept hazardous waste in accordance with all applicable local, state and federal regulations and shall be permitted to accept all contamination which may be present in the soil excavate. The Contractor shall ensure that, when needed, the facility can accept TSCA waste materials i.e. polychlorinated biphenyls (PCBs). Hazardous waste must be removed from the site for disposal or treatment via an LSP approved Manifest.

**Monitoring/Sampling/Testing Requirements**

The Contractor shall be responsible for monitoring, sampling and testing during and following excavation of contaminated soils to determine the specific class of contaminated material. Monitoring, sampling and testing frequency and techniques should be performed in accordance with Item 180.03 – LSP Services. Additional sampling and analysis may be necessary to meet the requirements of the disposal facility license. The cost of such additional sampling and analysis shall be included in the bid cost for the applicable disposal items. The Contractor shall obtain sufficient information to demonstrate that the contaminated soil meets the disposal criteria set by the receiving facility that will accept the material.

**ITEMS 181.11 to 181.14 (Continued)**

No excavated material will be permanently placed on-site or removed for off-site disposal until the results of chemical analyses have been received and the materials have been properly classified. The Contractor shall submit to the Engineer results of field and laboratory chemical analyses tests within seven days after their completion, accompanied by the classification of the material determined by the Contractor, and the intended disposition of the material. The Contractor shall submit to the Engineer for review all plans and documents relevant to LSP services, including but not limited to, all documents that must be submitted to the DEP.

**Waste Tracking**

Copies of the fully executed Weight Slips/Bills of Lading/ Manifests/Material Shipping Records or other material tracking form received by the Contractor from each disposal facility and for each load disposed of at that facility, shall be submitted to Engineer and the Contractor's LSP within three days of receipt by the Contractor. The Contractor is responsible for preparing and submitting such documents for review and signature by the LSP or other appropriate person with signatory authority, three days in advance of transporting soil off-site. The Contractor shall furnish a form attached to each manifest or other material tracking form for all material removed off-site, certifying that the material was delivered to the site approved for the class of material. If the proposed disposition of the material is for reuse within the project construction corridor, the Contractor shall cooperate with MassDOT to obtain a suitable representative sample(s) of the material to establish its structural characteristics to meet the applicable structural requirements as fill for the project.

All material transported off-site shall be loaded by the Contractor into properly licensed and permitted vehicles and transported directly to the selected disposal or recycling facility and be accompanied by the applicable shipping paper. At a minimum, truck bodies must be structurally sound with sealed tail gates, and trucks shall be lined and loads covered with a liner, which shall be placed to form a continuous waterproof tarpaulin to protect the load from wind and rain.

**Decontamination Of Equipment**

Tools and equipment which are to be taken from and reused off site shall be decontaminated in accordance with applicable local, state and federal regulations. This requirement shall include, but not be limited to, all tools, heavy machinery and excavating and hauling equipment used during excavation, stockpiling and handling of contaminated material. Decontamination of equipment is considered incidental to the applicable excavation item.

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**ITEMS 181.11 to 181.14 (Continued)****Regulatory Requirements**

The Contractor shall be responsible for adhering to regulations, specifications and recognized standard practices related to contaminated material handling during excavation and disposal activities. MassDOT shall not be responsible at any time for the Contractor's violation of pertinent State or Federal regulations or endangerment of laborers and others. The Contractor shall comply with all rules, regulations, laws, permits and ordinances of all authorities having jurisdiction including, but not limited to, Massachusetts DEP, the U.S. Environmental Protection Agency (EPA), Federal Department of Transportation (DOT), Massachusetts Water Resources Authority (MWRA), the Commonwealth of Massachusetts and other applicable local, state and federal agencies governing the disposal of contaminated soils.

All labor, materials, equipment and services necessary to make the work comply with such regulations shall be provided by the Contractor without additional cost to MassDOT. Whenever there is a conflict or overlap within the regulations, the most stringent provisions shall apply. The Contractor shall reimburse MassDOT for all costs it incurs, including penalties and/or for fines, as a result of the Contractor's failure to adhere to the regulations, specifications, recognized standard practices, etc., that relate to contaminated material handling, transportation and disposal.

**Submittals**

I. *Summary of Sampling Results, Classification of Material and Proposed Disposal Option.*  
The following information, presented in tabular format, must be submitted to the Engineer for review and approval prior to any reuse on-site or disposal off-site. This requirement is on-going throughout the project duration. At least two weeks prior to the start of any excavation activity, the Contractor shall submit a tracking template to be used to present the information as stipulated below. Excavation will not begin until the format is acceptable to MassDOT.

Characterization Reports will be submitted for all soil, sediment, debris and groundwater characterized through the sampling and analysis program. Each report will include a site plan which identifies the sampling locations represented in the Report. The Construction Plan sheets may be used as a base plan to record this information.

The Sampling Results will be presented in tabular format. Each sample will be identified by appropriate identification matching the sample identification shown on the Chain of Custody Record. The sample must also be identified by location (e.g. grid number or stockpile number). For each sample, the following information must be listed: the classification (unregulated, regulated, etc.), proposed disposal option for the stockpile or unit of material represented, and all analytical results.

Each Characterization Report will include the laboratory analytical report and Chain of Custody Record for the samples included in the Report.

**ITEMS 181.11 to 181.14 (Continued)**

II. *Stockpiling, Transport, and Disposal.*

At least two weeks prior to the start of any excavation activity, the Contractor shall submit, in writing, the following for review and shall not begin excavation activity until the entire submittal is acceptable to MassDOT.

Excavation and Stockpiling Protocol

Provide a written description of the management protocols for performing excavation and stockpiling and/or direct loading for transport, referencing the locations and methods of excavating and stockpiling excavated material.

Disposal and Recycling Facilities

1. Provide the name, address, applicable licenses and approved waste profile for disposal and/or recycling location(s) where contaminated soil will be disposed. Present information substantiating the suitability of proposed sites to receive classifications of materials intended to be disposed there, including the ability of the facility to accept anticipated volumes of material.
2. Provide a summary of the history of compliance actions for each disposal/recycling facility proposed to be used by the Contractor. The compliance history shall include a comprehensive list of any state or federal citations, notices of non-compliance, consent decrees or violations relative to the management of waste (including remediation waste) at the facility. Material should not be sent to facilities which are actively considered by the DEP, USEPA or other responsible agency to be in violation of federal, state or local hazardous waste or hazardous material regulations. MassDOT reserves the right to reject any facility on the basis of poor compliance history.

Transportation

The name, address, applicable license and insurance certificates of the licensed hauler(s) and equipment and handling methods to be used in excavation, segregation, transport, disposal or recycling.

III. *Material Tracking and Analytical Documentation for Reuse/Disposal.*

The following documents are required for all excavation, reuse and disposal operations and shall be in the format described. At least two weeks prior to the start of any excavation or demolition activity, the Contractor shall submit the tracking templates required to present the information as stipulated below. Excavation or demolition will not begin until the format is acceptable to MassDOT.

All soils, sediments and demolition debris must be tracked from the point of excavation to stockpiling to onsite treatment/processing operations to off-site disposal or onsite reuse as applicable.



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**ITEMS 181.11 to 181.14 (Continued)****Demolition Debris**

Demolition debris must be tracked if the debris is stockpiled at a location other than the point of origin or if treatment or material processing is conducted. Identification of locations will be based on the station-offset of the location. The tracking table will identify date and point of generation, any field screening such as PID or dust monitoring, visual observations/comments, quantity, and stockpile ID/processing operation location. For each unit of material tracked, the table will also track reuse of the material on-site, providing reuse date, location of reuse as defined by start and end station, width of reuse location by offset, the fill elevation range, quantity, and finish grade for said location. For demolition debris, which is not reused on site, the table will also track disposal of the material as defined by disposal date, quantity and disposal facility. The table must provide a reference to any analytical data generated for the material.

**Soil/Sediment**

Soil excavation will be identified based on the station-offset of the excavation location limits. The tracking table will identify date and point of generation, any field screening such as PID or dust monitoring, visual observations, quantity, and stockpile number/location. For each unit of material tracked, the table will also track reuse of the material on-site and disposal of the material off-site using the same categories identified for demolition debris above.

**Basis of Payment and Method of Measurement**

Disposal of contaminated soil shall be measured for payment by the Ton of actual and verified weight of contaminated materials removed and disposed of. The quantities will be determined only by weight slips issued by and signed by the disposal facility. The most cost-effective, legal disposal method shall be used. The work of the LSP for disposal under all of these items shall be incidental to the work with no additional compensation.

ITEM 181.11 Measurement for Disposal of Unregulated Soil shall be under the Contract Unit Price by the weight, in tons, of contaminated materials removed from the site and transported to and disposed of at an approved location or licensed facility, and includes any and all costs for approvals, permits, fees and taxes, additional testing/characterization required by the facility beyond the standard disposal test set, decontamination procedures, transportation and disposal.

ITEM 181.12 Measurement for Disposal of Regulated Soil – In-State Facility shall be under the Contract Unit Price by the weight in tons of contaminated materials removed from the site and transported to and disposed of at an approved in-state facility, and includes any and all costs for approvals, permits, fees and taxes, testing/characterization required by the facility beyond the standard disposal test set, decontamination procedures, transportation and disposal.

ITEM 181.13 Measurement for Disposal of Regulated Soil - Out-of-State Facility shall be under the Contract Unit Price by the weight in tons of contaminated materials removed from the site and transported to and disposed of at an approved out-of-state facility, and includes any and all costs for approvals, permits, fees and taxes, testing/characterization required by the facility beyond the standard disposal test set, decontamination procedures, transportation and disposal.

**ITEMS 181.11 to 181.14 (Continued)**

ITEM 181.14 Measurement for Disposal of Hazardous Waste shall be under the Contract Unit Price by the weight in tons of hazardous waste removed from the site and transported to and disposed of at the licensed hazardous waste facility, and includes any and all costs for approvals, permits, fees and taxes, testing/characterization required by the facility beyond the standard disposal test set, decontamination procedures, transportation and disposal.

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<b><u>ITEM 200.1</u></b>	<b><u>TEMPORARY SEDIMENTATION BASIN 1</u></b>	<b><u>LUMP SUM</u></b>
<b><u>ITEM 200.2</u></b>	<b><u>TEMPORARY SEDIMENTATION BASIN 2</u></b>	<b><u>LUMP SUM</u></b>

The work under these Items shall conform to the relevant provisions of Subsections 120, 150, and 170 of the Standard Specifications and the following:

The work required under each of these Items includes constructing, maintaining, and removing temporary sedimentation basins during construction as required by the Engineer for the transition between the existing drainage system and the proposed system that will include permanent infiltration basins at the locations shown on the Plans (Route 16 STA 20+00 RT and 29+00 LT).

The permanent infiltration basins and sediment forebays are not to be constructed until all of the proposed drainage system, the grading and slope work in the basin areas, and utility work in the areas of the basin have been completed and as approved by the Engineer. To provide for interim sedimentation control, the Contractor shall construct Temporary Sedimentation Basins in the approximate location of the permanent sediment forebays as shown on the Plans. The work for each Temporary Sedimentation Basin includes all materials, labor, equipment, etc. required for the excavation, lining, fill, compaction and grading of the Temporary Sedimentation Basins. The work also includes furnishing and installing temporary piping and drop inlets and any stone lining the Temporary Sedimentation Basins. The Contractor shall inspect and maintain the Temporary Sedimentation Basins throughout their use and remove and dispose accumulated sediment as required by the Engineer.

The Contractor shall submit their proposed Temporary Sedimentation Basin details, design layout, and maintenance procedures for the basins to the Engineer for approval. This submission shall also include any shop drawings for temporary outlet structures.

#### Materials

Embankment fill material for the construction of any surrounding berms shall conform to M1.01.0 of the Standard Specifications.

Any drop inlets shall be precast concrete in accordance with M4.02.14 and shop drawings shall be provided for review and approval.

#### Construction Methods

The installation of drainage structures and drainage pipes shall conform to Subsection 201 and Subsection 230, respectively of the Supplemental Specifications. The first three sections of pipe shall be wrapped in accordance with ASTM C877 to provide watertight joints.

The embankment berms shall be constructed in accordance with the relevant provisions of Section 150 of the Standard Specifications.

The Temporary Sedimentation Basins shall be lined with riprap or granite slabs as required to prevent additional sediment generation and erosion. Riprap shall conform to M2.02.0 of the Standard Specifications. Granite slabs shall conform to M9.01.1 of the Standard Specifications.

**ITEMS 200.1 and 200.2** (Continued)

The Temporary Sedimentation Basins shall not be put in service until they have been inspected and approved by the Engineer.

**BASIS FOR PAYMENT**

Items 200.1 and Item 200.2 will be paid for at the respective Contract unit prices Lump Sum, which prices shall include full compensation for excavation, installation, backfill, maintenance, removal, submittals, temporary outlet control strutters, piping, and all other materials, tools, equipment, labor and incidental cost required to complete the work as shown on the Plans and as approved in the field by the Engineer.

**ITEM 209.2****SPECIAL DROP INLET****EACH**

The work under this item shall conform to the relevant provisions of Subsection 201 of the Standard Specifications and the following:

Work shall include furnishing and installing the Outlet Control Structures (OCS's) and providing backup subdrains for outlet control as shown on the Plans at Stormwater BMP #1 and Stormwater BMP #2.

**Materials**

OCSs shall be precast cement concrete in accordance with M4.02.14.

Subdrains shall be slot perforated corrugated plastic pipe conforming to the requirements of M5.03.9, except where plans say to omit perforation in which case corrugated plastic pipe (M5.03.10 shall be used.

Schedule 80 PVC pipe conforming to the requirements of M5.03.7 shall be used to sleeve subdrains where they pass below stone check dams which may be compacted after the subdrain is installed and where they pass through the wall of the OCS.

Geotextile Fabric for Subsurface Drainage shall meet the requirements specified in MassDOT subsection M9.50.0 of Division III, Materials and be listed on the MassDOT QCML.

**Construction Methods**

OCSs shall have an inside diameter of 48" +/- 1". Base and wall thickness and reinforcement shall be in accordance with MassDOT Construction Standard Detail Drawing Number E 203.5.0. They shall be constructed with a top slab cast monolithically with the uppermost riser section. The top slab shall contain a 22" +/- 1" square opening at its center.

Once the OCS's are installed, the Contractor shall paint lines and text marking elevations on the outside (exposed) surface of the structure in 6-inch increments at every foot (###.0) and half-foot (###.5) for the full height of the exposed concrete. Paint shall be black epoxy coating intended for use in water retaining structures such as ponds or pools. Elevation markings shall be approved by the Engineer.

The metal frame and grate shall conform to MassDOT Construction Standard Detail Drawing Number E 203.5.0. Stainless steel anchor bolts, 1/2 inch in diameter, shall be cast into the top slab around the opening so the flange of the metal frame may be secured with washers and nuts. The location of the opening shall be set to allow for easy access to the valve control for the backup subdrain.

Orifices shall be cast into the uppermost riser section. Additional reinforcement shall be provided around orifices. A trash rack shall be provided at inlet orifices as shown on the Plans.

The backup subdrain shall be installed at a depth sufficient to provide at least 6" of cover over the top of the pipe and maintain a minimum pipe slope of 0.5% downwards towards the OCS. Excavation for these subdrains shall consist of a 12" wide trench, which shall be lined with Geotextile Fabric for Subsurface Drainage on all sides.

**ITEM 209.2 (Continued)**

Once the subdrain has been set in the trench, it shall be backfilled with 1½" crushed stone, which shall be placed to a depth at least 6" over the top of the subdrain. The Geotextile Fabric shall be wrapped to enclose the crushed stone on all sides, including the top. At the free end of the subdrain furthest from the OCS, the trench shall be excavated a distance of 3 feet beyond the end of the pipe. Cleanouts with covers shall be provided along the subdrain and shall be at least 8 inches in diameter. A ball valve control shall be installed at the end of the subdrain just inside the wall of the OCS structure.

Once the subdrain backup is installed, the Contractor shall test it to ensure the valve is working as intended and to verify there are no leaks around the valve or OCS wall. The Contractor shall make any corrections as required by the Engineer.

**Submittals**

The Contractor shall submit shop drawings of all Outlet Control Structures for review and approval which shall include cut sheets for all materials and required attachments (concrete, pipes, frame, grate, painted markings, etc.). The shop drawing shall detail structure dimensions, thicknesses, openings and reinforcement.

**Method of Measurement and Basis of Payment**

Item 209.2 Special Drop Inlet will be measured and paid for in accordance with the relevant provisions of Subsections 201.80 and 201.81 at a unit price per Each Outlet Control Structure installed complete in place and approved by the Engineer. The unit price shall also include the costs of design and all PVC pipe at circular orifices, anchor bolts and painted markings.

Frames and grates will be paid separately under Item 222.2 Frame and Grate – MassDOT Drop Inlet.

Payment for all work to construct the backup subdrain complete in place as approved by the Engineer, including any excavation, materials, labor, backfilling, testing, geotextile, and any incidentals required will be incidental to the unit price this Item. All pipe, fittings, valves, covers, filter fabric, crushed stone, and any other incidental costs required to complete the work shown on the BMP Detail Sheets 1 thru 3 are included under this Item.

**ITEM 220.21**

**DRAINAGE STRUCTURE REBUILT AS  
SPECIAL MANHOLE**

**EACH**

The work under this item shall conform to the relevant provisions of Subsection 220 and the following:

Work shall include rebuilding existing manholes with new top slabs and brickwork similar to a Special Manholes as detailed in MassDOT Construction Standard Drawing No. 202.5.0 and as detailed on the Plans.

Prior to commencing the work under this Item, the Contractor shall confirm all elevations for existing pipe inverts, existing pipe crowns, proposed rims and bottom of proposed barriers in the vicinity of the manholes to be rebuilt. These elevations shall be included in the shop drawing submittal for the structures to be rebuilt.

A new precast cement concrete top slab shall be installed at each manhole. Top slabs shall be sized as detailed on the plans. Final design of each top slab shall be performed by the Contractor and shall be stamped by a professional engineer registered in the State of Massachusetts. Top slabs shall be designed to support H-10 live load.

**Submittals**

The Contractor shall submit for approval shop drawings detailing the proposed top slab (including any design calculation and reinforcement), proposed frame and grate, all existing pipe elevations measured in the field, proposed brickwork and available clearance at adjacent proposed barrier.

**Method of Measurement and Basis of Payment**

Item 220.21 will be measured and paid for at the contract unit price per Each manhole rebuilt as approved by the Engineer. The unit price shall include all labor, materials, equipment, design and incidental costs required to complete the work.

**ITEM 221.1**

**FRAME AND COVER - SECURED**

**EACH**

The work under this Item shall conform to the relevant provisions of Subsection 201, 220 and the following:

The work to be done under this Item consists of the furnishing, delivering, and installing Frame and Cover – Secured as shown on the Plans, and as directed by the Engineer.

Frame and Cover – Secured assemblies shall consist of covers and frames that conform to the nominal size, weight, material and load-carrying requirements in MassDOT Construction Standard Details E 202.6.0, E 202.7.0 and E 202.8.0, and are on the relevant MassDOT Qualified Construction Materials list. Some dimensions of secured manhole covers and frames may vary slightly from those shown on the standard details to account for necessary fastening components. The Contractor shall submit shop drawings of all drainage castings for approval prior to ordering.

Covers and frames shall be held securely together by bolting to threaded holes in the frame or to nuts or tumbler devices secured by the frame, by use of hooks attached to the cover or by any other means approved by MassDOT, to prevent being dislodged under traffic loading. Gaskets and other sealing devices will not be allowed.

**Method of Measurement**

Item 221.1 will be measured per Each Frame and Cover – Secured furnished and delivered to the site.

**Basis of Payment**

Payment under this item will be at the contract unit price per Each, complete in place, which will be full compensation for all work, materials, and equipment to complete the work.



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**ITEM 222.4            LARGE HOOK LOCK BAR GRATE – FURNISHED            EACH  
AND INSTALLED**

Work under this Item shall conform to the relevant provisions of Subsection 200 and the following:

The work consists of furnishing and installing large hook lock bar grates on existing frames. The grate shall have a parallel bar configuration.

Hook lock bar grates and frame assembly shall be as shown on MassDOT Construction Standard Details Drawings E 201.10.0 and E 201.10.1.

The lock tumbler assembly shall consist of a 5/8" x 5" stainless steel hex bolt, a 5/8" stainless steel flat washer, a cast iron tumbler with a 5/8" tapped hole and a stainless-steel capture nut. All stainless steel shall be grade 304. The threads of the lock tumbler assembly shall be coated with a no-seize grease prior to installation. The grease shall be lead and copper free.

The grates shall be cast ductile iron conforming to ASTM A536 Grade 80-55-06, 55 + KSI yield strength. The grates shall meet AASHTO M306 requirements, including HS20 loading requirements, test bar testing and weigh at least 460 pounds. Proof-load testing will be performed by an independent nationally recognized testing laboratory approved by the Engineer. Seat surfaces of the grate shall be machined, and the grate shall not rock in the existing frame when installed.

The Contractor shall provide shop drawings to the Engineer for approval. Prior to final shop drawing approval, the Contractor shall perform a test installation in the presence of the Engineer at a location to be determined. The Contractor shall also provide the manufacture's Certificate of Compliance which meets the requirements of Section 6.00.

**Method of Measurement**

Item 222.4 will be measured for payment by the Each large hook lock bar grate – furnished and installed, complete in place.

**Basis of Payment**

Item 222.4 will be paid for at the Contract unit price per Each, which price shall include all labor, materials, equipment, design submittals, testing, removal of existing masonry in the drop inlets throat, and all incidental costs required to complete the work.

Removal and disposal of any existing frames and grates will be paid for separately under Item 223.2 'Frame and Grate (or Cover) Removed and Disposed.

**ITEM 224.12**

**12 INCH HOOD**

**EACH**

Work under this Item shall conform to the relevant provisions of Subsection 201 and the following:

The work consists of furnishing and installing pipe hoods at all new catch basins and drop inlets. Pipe hoods shall conform to MassDOT Construction Standard Detail Drawing No. E 201.12.0.

**Submittals**

The Contractor shall submit to the Engineer for approval cut sheets detailing the proposed pipe hoods to be installed. No materials should be ordered until the pipe hood submittal has been approved.

**Method of Measurement and Basis of Payment**

Item 224.12 will be measured and paid per Subsections 201.80 and 201.81, respectively.

**ITEM 270.01**

**PIPE REMOVED AND DISCARDED  
(24 INCH AND BELOW)**

**FOOT**

The work to be done under this item shall conform to the relevant provisions of Subsection 270 of the Standard Specifications and the following:

The work shall include the removal and discarding of water and drainage pipes with an inside diameter less than or equal to 24" as shown on the Contract Plans and/or as required by the Engineer to be removed and are located outside the pay limits of excavation required under other items of Work. The Contractor shall properly dispose of the pipes or removed in accordance with all state and local requirements. The work and any materials necessary to complete the work shall be considered as incidental to the appropriate Item based on the size of the utility removed.

Existing pipes to be removed and located within the pay limits of excavation shall be considered as incidental to their respective item (Item 120. Earth Excavation).

Removal of drain lines shown on the Plans to be existing within the same trench limits as proposed drain lines shall be removed as incidental work when proposed drain lines are relocated for the convenience of the Contractor.

Trench excavation greater than a depth of 5.0 feet and rock excavation will be measured as specified in Subsection 140.80 for Class B Trench Excavation and Class B Rock Excavation, respectively.

Backfilling of the trench shall conform to the relevant provisions of Subsection 150.64 of the Standard Specifications.

**Basis of Payment and Method of Measurement**

Item 270.01 will be measured in place by the Foot. Pipes removed and discarded, as directed, will be measured in place as the actual length of pipe removed and discarded.

Item 270.01 will be paid for at the Contract Unit Price per Foot for the Pipe Removed and Discarded (24 Inch and Below) which price shall include all labor, tools, materials, equipment, fees, existing utility support, and incidentals necessary to complete the work.

All Excavation and Backfill required for removal of pipes is incidental to the cost under this Item based on the size of the utility removed.

**ITEM 281.2**

**JUTE MESH (WATERWAYS)**

**SQUARE YARD**

The work under this item shall conform to the following.

The work shall include furnishing and installing jute mesh fabric to prevent soil erosion within proposed drainage ditches. Jute mesh shall be placed on the slopes of drainage ditches to the limits detailed in the Plans over exposed soil (after seeding) or as required by the Engineer.

**Materials**

Fabric shall be 100% biodegradable woven jute mesh with minimum 1/4" openings.

Anchoring devices shall consist of minimum 8" bio-degradable stakes. Longer stakes shall be used where loose soils or other conditions obligate, as required by the Engineer.

**Construction Methods**

Areas shall be seeded prior to installation of mesh.

Contractor shall bury ends of fabric in anchor trenches at top and bottom of slopes.

Installation of jute mesh shall be such as to ensure continuous contact with soil without folds or wrinkles. Jute mesh fabric may be joined by overlapping with a minimum 6-inch overlap. Overlap shall be such that upslope fabric is placed over lower slope fabric.

The mesh shall be anchored in place with vertically driven spikes. The spikes shall be driven until their tops are flush with the soil. Spikes shall be placed at 12-inch intervals along the top of a slope and in staggered courses along the face of the slope to achieve a minimum of 3 spikes per square yard, or as manufacturer's recommendations for given site conditions.

Reseed all trenched and otherwise disturbed areas with the applicable seed mix designated in the Plans. The Contractor shall maintain the jute mesh and make satisfactory repairs of any areas damaged until acceptance of seed establishment.

**Method of Measurement**

Item 281.2 will be measured for payment by the Square Yard, of jute mesh installed, as measured across the surface of grade and does not include buried or overlapped portions.

**Basis of Payment**

Item 281.2 will be paid for at the contract unit price per Square Yard, which price shall include all labor, materials, equipment, trenching, placing and stapling of jute fabric, reseeding of trenched and disturbed areas, and all incidental costs required to complete the work.

<u>ITEM 302.12</u>	<u>12 INCH DUCTILE IRON WATER PIPE (RUBBER GASKET)</u>	<u>FOOT</u>
<u>ITEM 302.16</u>	<u>16 INCH DUCTILE IRON WATER PIPE (RUBBER GASKET)</u>	<u>FOOT</u>
<u>ITEM 303.06</u>	<u>6 INCH DUCTILE IRON WATER PIPE (MECHANICAL JOINT)</u>	<u>FOOT</u>
<u>ITEM 303.12</u>	<u>12 INCH DUCTILE IRON WATER PIPE (MECHANICAL JOINT)</u>	<u>FOOT</u>
<u>ITEM 303.16</u>	<u>16 INCH DUCTILE IRON WATER PIPE (MECHANICAL JOINT)</u>	<u>FOOT</u>
<u>ITEM 350.06</u>	<u>6 INCH GATE AND BOX</u>	<u>EACH</u>
<u>ITEM 350.12</u>	<u>12 INCH GATE AND BOX</u>	<u>EACH</u>
<u>ITEM 356.16</u>	<u>16 INCH BUTTERFLY VALVE AND BOX</u>	<u>EACH</u>
<u>ITEM 358.06</u>	<u>6 INCH GATE BOX REMOVED AND DISCARDED</u>	<u>EACH</u>
<u>ITEM 358.101</u>	<u>10 INCH GATE BOX REMOVED AND DISCARDED</u>	<u>EACH</u>
<u>ITEM 358.20</u>	<u>20 INCH GATE BOX REMOVED AND DISCARDED</u>	<u>EACH</u>
<u>ITEM 376.</u>	<u>HYDRANT</u>	<u>EACH</u>
<u>ITEM 376.3</u>	<u>HYDRANT - REMOVED AND STACKED</u>	<u>EACH</u>

Work performed under these items shall conform to the relevant provisions of Section 300 of the Standard Specifications and the following:

**Materials**

General

All fittings shall be as manufactured by American Cast Iron Pipe Company, U.S. Pipe, McWane or approved equal. **All fittings shall be American made.**

Ductile Iron Pipe

All ductile iron pipe shall be Class 52 for diameters unless otherwise indicated or specified. The ductile iron pipe shall be in accordance with AWWA C150 and C151 and shall have push-on joints, furnished in accordance with AWWA C111 unless otherwise specified or shown on the drawings. Two (2) bronze wedges of approved design and composition shall be provided for each push-on joint. **Ductile iron pipe shall be American made.**

Pipe and fittings shall be cement mortar lined and seal coated on the interior in accordance with AWWA C104. Cement mortar lining shall be twice the standard thickness; tolerance shall be minus 0 inches, plus 1/8 inch. Inside seal-coat shall be such as not to impart taste or odor to the water contained therein. Outside of pipe shall be bituminous coated in accordance with AWWA C151.

Each pipe shall have cast on it or stamped on it by means of a hand die stamp, the maker's name or mark, and the year in which the pipe was cast. Also, the weight, thickness class and sampling period shall be painted on each pipe.

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**ITEMS 302.12 to 376.3** (continued)**Ductile Iron Fittings**

All fittings shall conform to ANSI/AWWA C110/A21.10, ANSI/AWWA C111/21.11, or ANSI/AWWA C153/A21.53 and shall have a 350-psi pressure rating, unless otherwise specified or modified herein. **Ductile iron fittings shall be American made.**

All fittings except sleeves, caps, and plugs shall be cement-lined, tar-coated and sealed as specified under paragraph 1 above.

All fittings shall have mechanical joints in accordance with ANSI/AWWA C111/A21.11, or AWWA C153.

The branch of tees for hydrants or stubs shall be mechanical joint anchoring tees.

**Sleeve-Type Couplings/Compression Couplings**

Sleeve-type couplings shall be ductile iron solid sleeve type with mechanical joint ends or restrained joint ends, as applicable, and shall be pressure rated as specified under ductile iron fittings. **Sleeve-type couplings shall be American made.**

To ensure correct fitting of pipe and couplings, all sleeve-type couplings and accessories shall be furnished by the supplier of the pipe. Sleeve-type couplings shall be used where couplings are required, unless otherwise approved by the Engineer.

When connecting to existing pipe and the outside pipe diameters are out of range for solid sleeves, transition compression couplings shall be used. Compression couplings shall be Smith-Blair model 441, Romac model 501, Power Seal model 3501 or approved equal.

**Gaskets, Glands, Nuts, and Bolts**

Gaskets, glands, nuts, bolts and accessories shall conform to ANSI/AWWA C111/A21.11 or C153/A21.53, as appropriate.

Gaskets shall be of plain tipped rubber, suitable for exposure to the liquid within the pipe. Lubricants must be suitable for the type of fluid to be carried by the pipeline. Glands shall be ductile or cast iron. Bolts shall be high strength, low alloy.

Gaskets for flanged joints shall be full faced red rubber, 1/8 inches thick. Gaskets shall conform to the dimensions of Table A.1 of ANSI/AWWA C115/A21.15. Ring gaskets shall be utilized for joints 14 inches in diameter and larger.

Assemble flanged joints with bolts and nuts, bolt studs with nut on each end, or studs with nuts in tapped flanges. Bolts and nuts shall be of low carbon steel conforming to the chemical and mechanical requirements of ASTM A307, 60,000 psi tensile strength, Grade B. Bolts, nuts and studs shall be cadmium plated.

**ITEMS 302.12 to 376.3** (continued)**Thrust Blocks/Anchor Blocks/Joint Restraints**

Joint restraints shall be used at all bends, fittings, hydrants, valves and piping as specified in the paragraphs mentioned below and in accordance with restraint as indicated on the Drawings. Where indicated on the Drawings, provide restrained joints suitable for a 200-psi working pressure. Gaskets shall meet the material requirements of ANSI/AWWA A21.11/C111 for mechanical joint gaskets.

Restrained joints for rubber-type push-on joint pipe shall be Lok-Ring® Joint by American Cast Iron Pipe Company, TR FLEX® by US Pipe and Foundry Co., Snap-Lok® by Griffin Pipe Products Co., or equal.

Mechanical joint retainer glands shall be installed on all mechanical joints, except where rodding is used. Retainer glands shall be specifically designed to fit standard mechanical joint bells with corrosion resistant, high strength, low-alloy T-head bolts conforming to ANSI/AWWA A21.11/C-111 and ANSI/AWWA A21.53/C-153. Retainer glands shall be manufactured of ductile iron conforming to ASTM A536-80 grade 60-42-10. Wedges shall be of hardened ductile iron and require the same torque in all sizes. These devices shall have a minimum 250 psi pressure rating with a minimum safety factor of 2:1 and shall be EBAA IRON, Inc., series 1100. Glands shall be listed with Underwriters Laboratories and/or approved by Factory Mutual.

Evidence of joint restraint materials shall be the manufacturer's certification or certified test results indicating conformance with the requirements of these Specifications.

Rods, clamps with washers, straps and other harnessing hardware shall be stainless steel type 304 or 316 and installed in accordance with the manufacturer's recommended installation procedures, as approved.

After each "locking" joint is assembled, the pipe shall be extended until the locking system "bottoms out" in order to avoid accumulated joint movement when the system is pressurized.

Retainer glands, Tyler Union - TUFGRIP, EBBA IRON, Inc. - Megalug Series 1100, or ROMAC Industries, Inc. - ROMAGRIP, or approved equal, shall be installed in accordance with the manufacturers' written instructions.

Thrust blocks and anchor blocks, shall be installed in addition to the above-mentioned joint restraints and shall be used at all hydrants. Minimum bearing area of thrust blocks shall be as indicated on the drawings. Anchor block sizes shall be as shown on the Drawings. Felt roofing paper shall be placed to protect pipe joints. Concrete shall not be placed over bolts, nuts or to prevent the removal of joints.

Concrete for thrust blocks and anchor blocks shall have a minimum strength of 3,000 psi. All cement concrete must be from an approved ready-mix producer listed on the QCML. Transit mix concrete may be used subject to approval. Straps and anchors shall be cold-rolled steel, painted with bitumastic.

**ITEMS 302.12 to 376.3** (continued)Gate Valves

Gate valves shall be resilient seat type suitable for underground service complying with the requirements of AWWA C509.

Gate valves shall be designed to be bubble tight for 250 psig water working pressure with no leakage past the seat from either side of the disc and shall be hydrostatically tested to 500 psig. **Gate valves shall be American made.** Gate valves shall be of the non-rising stem (N.R.S.) design and shall be set vertically (spur gearing). Gate valves shall open right (clockwise). Buried gate valves shall be furnished with 2-inch square operating nuts.

Gate valves shall be ductile iron. Cast iron shall meet the specifications of ASTM A126, Class B. Castings shall be clean and sound without defects that will impair their service. No plugging or welding of such defects will be allowed. Ductile iron shall meet the standards of ASTM A536.

The resilient-seated disc wedge shall be of the resilient wedge fully supported type, either cast iron or ductile iron. Solid guide lugs shall travel within channels in the body of the valve. The disc and guide lugs shall be fully encapsulated in SBR (styrene butadiene rubber) or EPDM rubber. Disc wedges that are not 100% fully encapsulated shall not be acceptable. Provide guide caps of an acetal copolymer bearing material to protect the rubber-encapsulated solid guide lugs from abrasion for long life and ease of operation.

The seat shall be SBR or EPDM rubber, matching the disc encasement. The seating surface (rubber) shall be specially designed so as to provide a smooth waterway, without depressions or cavities, which might trap debris and interfere with tight closures.

The body, bonnet, and gate shall be cast/ductile iron, constructed in accordance with AWWA C-509. The bonnet to body seal shall incorporate a flat neoprene gasket. Bonnet and body flanges shall be fully machined to assure proper sealing of the gasket.

Gate valve stems shall be of bronze rolled bar stock in accordance with ASTM B584, and shall have a forged thrust collar. The thrust collar shall be factory lubricated, and the thrust collar and its lubrication shall be isolated by the O-Rings from the water way and from outside contamination, providing permanent lubrication for long term ease of operation. An anti-friction thrust washer shall be provided both above and below the thrust collar for ease of operation.

Gate valves shall have O-Ring sealed stems with one O-Ring located below the thrust collar and two O-Rings located above the thrust collar. The two O-Rings located above the thrust collar shall be replaceable with the valve still in service in the fully open position.

Coat internal and external exposed ferrous surfaces of the valve with a fusion-bonded, thermosetting powder epoxy coating suitable for potable water service conforming to AWWA C550. Coating shall be non-toxic and shall impart no taste to water. Coating thickness shall be nominal 5/10 mils. Gate valves for water distribution systems shall be certified to NSF 61.



**ITEMS 302.12 to 376.3** (continued)

Gate valves shall be as manufactured by Clow, Mueller, Kennedy, American-Darling, or approved equal.

**Butterfly Valves**

Butterfly valves shall be rubber-seated, tight-closing type suitable for underground service complying with the requirements of AWWA C504. Butterfly valves shall be manufactured in accordance with the latest revision of AWWA Standard C504.

Butterfly valves shall be designed to be bubble tight for 250 psig water working pressure with no leakage past the seat from either side of the disc, and shall be hydrostatically tested to 500 psig.

Butterfly valves shall be bubble-tight at rated pressures with flow in either direction, and shall be satisfactory for applications involving throttling service and/or frequent operation and for applications involving valve operation after long periods of inactivity.

Butterfly valves shall open right (clockwise).Bearings shall be self lubricating.

Valves shall be equipped with a standard AWWA square nut (traveling type) operator, short operating rod, requiring a maximum of 150 foot-pounds at the maximum rated pressure. The stem shall be squared for the entire length of its insertion into a fully squared female portion of the operating nut.

Butterfly valve operators shall be fully grease-packed, suitable for underground service and be of the manual, totally enclosed, worm gear or traveling nut type. Adjustable stops shall be built into the operator to prevent over-travel in either direction. Operators shall be enclosed in a protective housing and designed to transmit twice their rated torque without permanent damage or distortion. The operator shall have a 450 foot-pound torque rating.

The valve shaft shall be one piece (attached to the valve disc), constructed of corrosion-resistant stainless steel in accordance with ASTM A564. Diameter of the valve shafts and the connections to the valve disc shall be suitable for the service connections specified.

The shaft bearings shall be self-lubricating corrosion-resistant sleeve type. Thrust bearings shall keep the disc centered regardless of valve position. Shaft seals shall be standard, self-adjusting (replaceable without removing the valve shaft) split V-type packing, standard O-Ring seals or pull down packing gland, complying with the requirement of AWWA C504.

**ITEMS 302.12 to 376.3** (continued)

Butterfly valves shall be cast iron or ductile iron, with fully rubber-lined body. Cast iron shall meet the specifications of ASTM A126, Class B. Castings shall be clean and sound without defects that will impair their service. No plugging or welding of such defects will be allowed. Ductile iron shall meet the standards of ASTM A536. Butterfly valve shall have elastomeric body seat constructed of Buna-N rubber bonded to the valve body (in accordance with ASTM D429) with an integral stainless steel clamp ring, and stainless steel self-locked screws. No metal-to-metal seating surfaces will be permitted. Discs shall be concentric design, of cast iron or ductile iron conforming to the requirements of AWWA C504. The disk seating edge shall be stainless steel and shall mate with the rubber seat.

The discs must be able to fully open when connected to Class 52 ductile iron pipe with double cement mortar lining.

Valve discs shall rotate 90° from the full open position to the tight shut position. Coat internal and external exposed ferrous surfaces of the valve with a fusion-bonded, thermosetting powder epoxy coating suitable for potable water service conforming to AWWA C550.

Coating shall be non-toxic and shall impart no taste to water. Coating thickness shall be nominal 8 mils. Butterfly valves for water distribution systems shall be certified to NSF 61. Seal internal and external exposed ferrous surfaces of the valve with 2 coats of asphaltic varnish (5 mils) suitable for potable water service conforming to AWWA C550. Coating shall be non-toxic and shall impart no taste to water. Coating thickness shall be nominal 5/10 mils. Butterfly valves for water distribution systems shall be certified to NSF 61.

Butterfly valves shall be Henry Pratt (Model HP-250), M&H (Series 4500), Mueller (Lineseal XP), equivalent by DeZurik, or equal.

**Valve Boxes**

Unless otherwise specified or required, each buried valve shall be provided with a valve box. Valve boxes shall be of tough, even-grain cast iron and of the adjustable, slip, heavy-pattern type with bell-cast bottoms. They shall be so designed and constructed as to prevent the direct transmission of traffic loads to the pipe or valve. An example of the minimum required weight of a complete heavy-pattern box is 85 LBS for a 3.5-foot unit.

The upper section of the box shall have a nominal inside diameter of 5 inches and the lengths shall be as necessary for the depth of the valves with which the boxes are to be used. The lower section of the box shall be designed to enclose the operating nut and stuffing box of the valve and shall have a minimum 8-inch inside diameter and maximum 9-inch diameter.

Covers shall be close fitting and substantially soil-tight. The top of the cover shall be flush with the top of the box rim. The word “water” shall be cast in the top cover.

**Valve boxes shall be American made.**

**ITEMS 302.12 to 376.3** (continued)**Hydrant**

Hydrants shall meet requirements of AWWA standard C-502, latest edition. Approved hydrants shall be Kennedy Model 81D or approved equal. **Hydrants shall be American made.**

The operating nut shall open right (clockwise). The material shall be either ductile iron or bronze. The operating nut shall be sized as 1-3/8" inch diameter, pentagon in shape.

All hydrants shall have 3 operating nozzles. Two nozzles shall be 2-1/2 inch National Standard Thread. One nozzle shall be 4-1/2 inch National Standard Thread. Provide nozzle caps without chains and with the same size pentagon operator as specified directly above.

All hydrants shall be traffic model with breakaway feature.

Hydrant shoe/ base feature shall be ductile iron with 6 inch mechanical joint inlet. 5-1/4 inch valve opening with draining bronze seat and drain ports to allow water within the hydrant barrel to drain to the exterior. Valve seat and sub-seat arrangement shall be bronze to bronze.

All bolts and nuts shall be stainless steel. Buried mechanical joint bolts and nuts (T-head) shall be Cor-Ten, American, Tyler Union or equal. Buried flange joint bolts shall be 304 stainless steel silicone bronze.

Protective coatings shall be provide for all internal and external items. Provide a minimum of 3 mils total dry film thickness for all paintings and coatings. The internal components of the hydrant shall be fusion-epoxy coated. Coat internal and external cast iron or ductile iron components with an approved bituminous sealer, 3 mils minimum.

Hydrants shall comply with all requirements of AWWA standard C502-80 and the following requirements.

The hydrant shall be a compression type shut off with valve opening against the pressure. A negligible amount of water shall occur with breakage of the hydrant, whether breakage occurs in the open position or the closed position.

The main valve seat shall be 5-1/4 inches in diameter.

The inlet connection shall be 6-inch mechanical joint furnished with gasket, gland, and bolts.

The color of the hydrant above ground shall be yellow with silver caps and reflective silver top to match the Town's standard color.

Connecting pipe and pipe nipples between the main line tee ad hydrant shall be 6 inch ductile iron, Class 52, conforming to requirements set above for ductile iron pipe.

**ITEMS 302.12 to 376.3** (continued)

6 inch hydrant valves and valve boxes shall conform to requirements set above for valve and valve box.

Anchoring tees shall have main run ends as indicated on the Drawings or as required for installation. The 6 inch branch shall have plain end with an integral gland and rotating mechanical joint gland to provide a restrained connection to the valve.

Minimum working pressure shall be 200 psi

The hydrant tee shall be designed so that the hydrant valve can be securely attached to the main line.

Thoroughly clean and paint with two shop or field coats in accordance with AWWA C502 and the instructions of the paint manufacturer. If the hydrants are delivered with the Town's standard color, paint with one matching field coat of an alkyd gloss enamel. If the hydrants are delivered with the Town's standard color, paint with two coats of an alkyd gloss enamel. Alkyd gloss enamel shall be 801 DTM by Sherwin-Williams, 2H-Tneme by Tenemc, Inerlac 665 by International, or equal. Reflective paint shall be Sctochlite #7211 by 3M.

Hydrant tees shall be "anchoring" type and shall have mechanical joint bells conforming to the requirements of the main pipe. The anchoring tee outlet shall be 6 inch mechanical joint, equipped to anchor the hydrant valve to the tee.

Anchoring tees shall have mechanical joint main run ends. The branch shall have a plain end with an integral gland and rotating mechanical joint gland to provide a restrained connection.

Supply a minimum of 2 operating wrenches compatible with hydrants as well as a minimum of 2 repair kits compatible with hydrants being supplied that includes all special tools required to maintain the hydrants (e.g., hose nozzle insertion tool, pumper nozzle insertion tool, hydrant disassembly wrench , etc.)

**Test Connections**

Install air release, test connections, and blow offs in the piping for pressure testing and disinfection at locations to be determined by the Contractor and approved by the Engineer.

Corporation cocks shall be in accordance with ANSI/AWWA C800 and shall be ¾ inch diameter with CC thread on inlet by iron pipe thread flare on outlet as manufactured by Mueller, Ford, McDonald or equal.

Copper tubing shall be annealed Type K soft tubing and shall conform to the requirements of ASTM B88.

Upon completion of testing and disinfection, remove the corporation cock and replace with a brass plug and the copper tubing removed. Field swab the brass plug for disinfection in accordance with AWWA C651.

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**ITEMS 302.12 to 376.3** (continued)**Submittals**

The Contractor shall submit to the Engineer for approval, a “Certificate of Compliance” for every component of the water system to be used in the project, showing that the manufacturers meet the above-mentioned requirements. Water system components shall not be delivered to the project site unless the Contractor has an approved “Certificate of Compliance” by the Engineer.

**Installation**

Thrust blocks and restraining joint assemblies shall be installed in conformance with Drawings and/or the manufacturer’s specifications and Section 301.60 I of the Standard Specifications.

Minimum depth of cover over the top of the water pipe shall be five (5) feet unless otherwise directed by the Engineer. Maximum depth of cover to the top of the water pipe shall be six (6) feet unless otherwise directed by the engineer or as indicated on the Drawings.

Prevent foreign material from entering the pipe while it is being placed in the line. During laying operations, no debris, tools, clothing or other materials shall be placed in the pipe.

When laying pipe, the spigot end shall be centered in the bell, the pipe forced home and the joint completely assembled. The pipe shall be adjusted to correct line and grade and secured in place with approved backfill material, properly tamped under and around the pipeline.

When laying the pipe, remove and replace fittings that do not allow a sufficient and uniform space for joints at no additional cost to the Owner.

Furnish pipe in full lengths. Cut ductile iron pipe without damage to the pipe or cement lining. The cutting shall be done to leave a smooth end at right angles to the axis of the pipe.

Cut ductile iron pipe either by the use of compression-type chain cutters which exert an even continuous force on the wall of the pipe or by power driven abrasive wheels.

On ductile iron pipe using rubber joints, the outside edge of the cut end must be tapered back approximately ¼ inch at an angle of about 30 degrees so as to provide for the proper assembly of this joint.

Wherever it is necessary to deflect pipe from a straight line, either in the vertical or horizontal plane, to avoid obstructions or where long-radius curves are permitted, the maximum amount of deflection allowed shall not exceed that of what is included in AWWA C600 and shall be approved by the Engineer.

**ITEMS 302.12 to 376.3** (continued)

Radius curves indicated on the Drawings or approved during Shop Drawing review shall be made using full lengths of pipe. The use of short lengths of pipe and extra joint in order to make a smaller radius turn will not be allowed without the written approval of the Engineer.

Push-on joints shall be made in accordance with the manufacturer's instructions. Install gaskets in the pipe bell after lowering the pipe into the trench for installation. Thoroughly clean the bell and spigot of dirt and tar blisters in the trench utilizing a wire brush or bristle brush. Insert rubber gasket in the groove of the bell end of the pipe beginning at the bottom of the bell and working to the top of the bell. Apply lubricant per the manufacturer's recommendations utilizing a paint brush to the pipe gasket and the pipe spigot to be joined. Place a clean rag under the joint to protect the joint from dirt caused by unintentional grounding of the pipe during jointing. Upon completion, remove the rags. Align the plain end of the pipe to be laid and insert in the bell of the pipe to which it is to be joined and push home with a jack or by other means. After joining the pipe use a metal feeler to make certain that the rubber gasket is correctly located.

All excavation except for depths below 5 deet and Class B Rock necessary for the installation of water system shall be included in the unit price of the items mentioned above.

**Disinfection and Testing**

The water system shall be tested and chlorinated in conformance with Sections 301.60 J and K of the Standard Specifications, and the following. Where conflict arises, the Special Provisions shall take precedence:

**Disinfection**

Before being placed into service, all new water pipelines shall be chlorinated using the Continuous Feed Method specified in AWWA C651 – Section 4.4.3. The Engineer shall approve the procedure in advance.

The Contractor will determine the location of the chlorination and sampling points in the field. The Contractor shall install taps for chlorinating, sampling and expulsion of air and shall uncover, backfill and plug the taps as required.

Prior to disinfecting the water main, the main shall be completely filled to remove all air pockets and then flushed to remove particulate. The flushing velocity in the main shall not be less than 2.5 ft/s unless the Engineer and/or Owner determine that the conditions do not permit the required flow to be discharged to waste.

**ITEMS 302.12 to 376.3** (continued)**TABLE 1**

Required Flow to Flush Pipelines (40 psi residual pressure in water main)\*

<b>Pipe Diameter (in)</b>	<b>Flow Required to Produce 2.5 ft/s (Approximate) Velocity in Main</b>	<b>Number of 2 ½ inch Hydrant Outlets</b>
4	120 gpm	1
6	260 gpm	1
8	470 gpm	1
10	730 gpm	1
12	1060 gpm	2
16	1880 gpm	2

\*AWWA C651, AWWA Standard for Disinfecting Water Mains

At a point not more than 10 feet downstream from the beginning of the new main, water entering the new main shall receive a dose of chlorine fed at a constant rate such that the water will not have less than 25 mg/L (PPM) free chlorine throughout the entire section of pipe to be chlorinated.

**TABLE 2**

Chlorine Required to Produce 25-mg/L Concentration in 100 Feet of Pipe – By Diameter\*

<b>Pipe Diameter (in)</b>	<b>100 % Chlorine (Pounds)</b>	<b>1% Chlorine Solution (Gals.)</b>
4	0.013	0.16
6	0.030	0.36
8	0.054	0.65
10	0.085	1.02
12	0.120	1.44
16	0.217	2.60

\*AWWA C651, AWWA Standard for Disinfecting Water Mains

The chlorinated water is to remain in the new pipeline for at least 24-hours. After a contact time of 24-hours there should be a free chlorine concentration of not less than 10 mg/L (PPM). During this period, proper precautions are to be taken to prevent this chlorinated water from flowing back into the existing system.

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**ITEMS 302.12 to 376.3** (continued)

All valves and hydrants within the treated section shall be operated to ensure disinfection of the appurtenances.

The Tablet Method consisting of placing calcium hypochlorite granules or tablets in the water main as it is being installed and then filling the main with potable water and allowing it to set for a contact period is not acceptable.

The interior of all pipe, fittings and valves used in making a repair or tie-in shall be swabbed or sprayed with a one percent (1%) hypochlorite solution before they are installed.

**Final Flushing**

Following the chlorination period, all treated water shall be flushed from the lines at their extremities and replaced with water from the distribution system.

Flushing the main is to be accomplished at as high a velocity as possible consistent with the ability of the Contractor to collect the discharge water for proper disposal.

All treated water flushed from the lines shall be disposed of by discharging to the nearest sanitary sewer or by other approved means provided in AWWA C651 and acceptable to the Town.

Flushing shall be done in strict conformance with all applicable local, state and federal regulations. No discharge of chlorinated water to any storm sewer or natural watercourse will be allowed.

**Bacteriological analyses**

After the 24-hour disinfection period and all chlorine solution has been thoroughly flushed, the bacteriological sampling and analysis of the replacement water may then be performed.

Bacteriological sampling shall be made by the Contractor's competent person(s) in full accordance with AWWA C651- Section 5, *Bacteriological Tests* and under the supervision of the Department.

Analysis shall be performed by an independent commercial laboratory certified by the State Department of Environmental Protection and U.S. Environmental Protection Agency for analyzing public drinking water supplies. All results shall be provided to the Department for review.

Two consecutive sets of acceptable samples, taken at least 24-Hours apart, are required prior to placing the main into service. Failure of any one of the bacteriological test samples shall require re-chlorination and retesting by the Contractor.

The line shall not be placed in service until the bacteriological requirements of AWWA C651 are met.



**ITEMS 302.12 to 376.3** (continued)

Hydrostatic Testing

For water mains, the pressure test shall not be conducted until the new main has been flushed clean, disinfected in accordance based on information above and the chlorinated water properly disposed of. After acceptable completion of the water system disinfection, the Contractor may commence pressure testing of the new water main.

Test Parameters

The Contractor shall complete interim pressure testing of the pipelines prior to tapping for services. The contractor shall pressure test again up to the closest curb stops after installing services and prior to final acceptance.

For water mains, the pressure test shall not be conducted until the new main has been flushed and clean, disinfected in accordance with standards above and the chlorinated water properly disposed of. After acceptable completion of the water system disinfection, the Contractor may commence pressure testing of the new water main.

Run pressure test and leakage test simultaneously in accordance with ANSI/AWWA C600.

Test pressure shall be 200 psi for the first five minutes or the test followed by 150 psi for the next 2-hours. No leakage or pressure drop shall be allowed during the test period. Test pressure shall not exceed pipe or thrust-restraint design pressures.

The hydrostatic test shall be of at least 2-hour duration or until such time as the Engineer indicates acceptance of the pipeline.

Test pressure shall not vary during the duration of the test.

On pipelines where the elevation along the route of the construction varies substantially, the Engineer reserves the right to valve off and test portions of the line.

On extensive construction jobs, the Engineer reserves the right to require testing of individual portions of the line as construction proceeds rather than await completion of the entire project in order to undertake a pressure leakage test.

Do not operate valves in either direction at differential pressure exceeding the rated valve working pressure. Use of a test pressure greater than the rated valve pressure can result in trapped test pressure between the gates of a double-disc gate valve. For tests at these pressures, the test setup should include a provision, independent of the valve, to reduce the line pressure to the rated valve pressure on completion of the test. The valve can then be opened enough to equalize the trapped pressure with the line pressure, or fully opened if desired.

Test pressures shall not exceed the rated pressure of the valves when the pressure boundary of the test section includes closed, resilient-seated gate valve or butterfly valves.

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**ITEMS 302.12 to 376.3** (continued)**Time for Making Tests**

If cast-in-place thrust blocks are installed, no pipeline is to be placed under pressure or subjected to hydrostatic pressure until at least 5 days have elapsed after the concrete thrust block have been installed. If high early strength concrete is used in the concrete thrust blocks, the hydrostatic pressure can be applied to the main after 2 days have elapsed form time of construction of the thrust blocks.

The Contractor will be allowed to complete backfilling as herein before specified, prior to undertaking the leakage and pressure tests. Backfilling prior to conducting tests will be at the option of the Contractor with the exception of intersections, driveways, crosswalks, and other such locations where holding open the trench may adversely affect the public.

Pipelines may be subjected to hydrostatic pressure and inspected for leakage at any convenient time after the trench has been partially backfilled. Partial backfilling shall consist of filling along the center of the pipe length and leaving the joint open for inspection.

The Contractor shall complete interim pressure test again up to the closed curb stops after installing services and prior to final acceptance. Both pressure tests are required to pass.

**Operation of Existing Water System**

Do not operate any valve or other control device on the existing water system for any purpose. Do not make any tap or cut-ins to the existing water system without the approval of the Engineer and unless an authorized representative of the Owner is present.

When the Contractor's operations require the adjustment of any hydrant, valves, or other control device on the existing system, the Owner will provide authorized personnel for the purpose of

supervising the operation of these control devices. Provide the personnel for the operation of these devices.

**Preparation**

Conduct connections to the existing system under the Engineer's direction.

Foreign materials left in pipelines during installation often results in valve or hydrant seat leakage during pressure tests. Thorough flushing is recommended prior to a pressure test by partially opening and closing valves and hydrants several times under expected line pressure, with flow velocities adequate to flush foreign material out of the main, valves and hydrants.

**ITEMS 302.12 to 376.3** (continued)Procedure

On completion of the pipeline or any valved section thereof, fill pipeline with water and test. Draw water from the existing water system under the direction of the Engineer and the Water Department.

Before applying the specified test pressure, expel air completely from the pipe, valves, and hydrants. If permanent air vents are not located at all high points, install corporation cocks at such points so that the air can be expelled as the line is filled with water. After all the air has been expelled, close the corporation cocks and apply the test pressure. At the conclusion of the pressure test, either remove and plug or leave in place the corporation cocks at the discretion of the Owner.

Slowly fill each valved section of pipe with water and apply the specified test pressure by means of a pump connected to the pipe in a manner satisfactory to the Engineer. Valves shall not be operated in either the opening or closing direction at differential pressures above the rated pressure. The system shall be stabilized at the test pressure before conducting the leakage test.

Examination Under Pressure

Examine exposed pipes, fittings, valves, hydrants, and joints carefully during the test.

Repair or replace any cracked or defective pipe, fittings, valves, hydrants, or joints that are discovered following the pressure tests with sound material and repeat the test until it is satisfactory to the Engineer.

Leakage Test

Leakage is defined as the quantity of water that must be supplied into the newly laid pipe, or any valved section thereof to maintain pressure after the pipe has been filled with water and the air has been expelled. Testing shall include all hydrants, hydrant branches, and services to the curb stop. Leakage shall not be measured by a drop in pressure in a test section over a period of time.

No pipe installation will be accepted if any leakage occurs.

When hydrants are in the test section, the test shall be made against the closed main valve in the hydrant.

Acceptance of Installation – If any test of laid pipe discloses leakage, locate and make approved repairs as necessary until there is no leakage, at no additional cost of the Owner.

Visible leaks are to be repaired, regardless of the amount of leakage.

**ITEMS 302.12 to 376.3** (continued)

**Method of Measurement and Basis of Payment**

Items 302.12, 302.16, 303.06, 303.12 and 303.16 will be measured and paid for at the respective contract unit price per Foot, for the performance and completion of the work as herein specified, which prices shall include all labor, materials, equipment, and all incidental costs required to complete the work..

Items 350.06, 350.12, 356.16, 358.06, 358.101, 358.20, 376. And 376.3 will be measured and paid for at the respective contract unit price per Each, for the performance and completion of the work as herein specified, which prices shall include all labor, materials, equipment, and incidentals necessary to complete the work.

No separate payment will be made for sawcutting, excavation regardless of depth (excluding rock), dewatering, connection to existing systems, fitting, bends, plugs/couplings, pipe bedding, testing, replacing existing pipe damaged during construction, removal and disposal of existing pipe, or plugging abandoned pipe ends, but all costs in connection therewith shall be included in the Contract unit price bid.

No separate payment will be made for work efforts associated with transferring service from the existing water main to the proposed water main. The costs for coordination with the Webster Water and Sewer Department, contingency plans, temporary bypassing (if required), and any other incidentals shall be included in the Contract unit price bid of the items included under this special provision.

Rock excavation will be measured and paid for under Item 144. – Class B Rock Excavation.

THERE IS NO SEPARATE PAY ITEM FOR THRUST BLOCKS, AND JOINT RESTRAINTS. THE COST OF MATERIALS AND THE INSTALLATION SHALL BE AT INCIDENTAL TO THE RESPECTIVE ITEMS.

**ITEM 315.01    20 INCH WATER MAIN REMOVED AND DISCARDED                      FOOT**

The work under this Item shall conform to the relevant provisions of Subsection 301 of the Standard Specifications and the following:

The work shall include removing and disposing a portion of the existing 20” cast iron water main to the limits required for construction of the Bridge No. W-12-030 reinforced concrete box culvert. Removal of the existing water main shall be coordinated with installation of the new water main and shall be coordinated through the Town of Webster. Disposal shall be in accordance with all local, state, and federal requirements.

**Basis of Payment**

Item 315.01 will be measured for payment by Foot, of water main removed and discarded.

**Method of Measurement**

Item 315.01 will be paid for at the contract unit price per Foot completed as approved by the Engineer, which price shall include all labor, material, equipment, and incidental costs required to complete the work.

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**ITEM 325.30      30 INCH STEEL PIPE CASING FOR WATER PIPE      FOOT**

The work under this Item shall conform to the relevant provision of Subsection 301 of the Standard Specifications and the following:

Work under this Item consists of furnishing and installing a steel pipe casing below the proposed Bridge W-12-030 (C83) box culvert structure for use as a sleeve to allow the passage of the relocated water utility below the structure.

The Contractor shall coordinate with the Town of Webster Water and Sewer Department regarding final placement of the pipe casing.

A minimum cover of 18" shall be provided between the top of steel casing and underside of the proposed box culvert structure. The steel pipe casing shall extend a minimum of 5' beyond the box culvert structure at each side.

**Materials**

Steel pipe casing shall conform to the material and coating requirements of Section M5.05.3 of the Standard Specifications.

**Construction Methods**

The sequence of installing the steel pipe casing shall align with the staged construction of Bridge W-12-030 (C83) and the sequence of temporary water control. The steel pipe casing shall be installed during the complete stoppage of flow through Mill Brook described within the Item 991.1 Special Provision, prior to final grading and compaction of the crushed stone base course below the proposed box culvert units.

The Contractor shall ensure the installed steel pipe casing is free of debris which could prevent the future installation of the water utility. Installation of the water main through the steel pipe casing shall be as required by the Town of Webster Water and Sewer Department. The Contractor shall be prepared to either install the casing with a length of water main pre-installed, or to keep the casing free of debris to allow for future installation of the water main at a later point during construction. Coordination with the Town of Webster Water and Sewer Department is the responsibility of the Contractor.

The Contractor shall maintain and facilitate access to the site to allow for the future installation of the water and gas utilities through the steel pipe casings.

**Basis of Payment**

Item 325.30 will be measured for payment by Foot, of steel pipe casing furnished and installed.

**Method of Measurement**

Item 325.30 will be paid for at the contract unit price per Foot completed, which price shall include all labor, material, equipment, and incidental costs required to complete the work.

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**ITEM 402.13**      **PAVEMENT MILLING MULCH FOR SHOULDERS**      **FOOT**

Work to be done shall conform to the relevant provisions of Subsection 769 of the Standard Specifications and the following:

The work consists of earthworks to install pavement millings mulch for shoulders at the edge of pavement. The existing shoulder shall be prepared for pavement milling mulch as necessary and directed by the Engineer. The work shall consist of excavation and leveling shoulder area to be mulched. The excavation and leveling of shoulder shall be pushed back down slope on embankment and/or excavated and disposed of on-site level and compacted as directed by the Engineer. Milling mulch shall be graded and compacted to a width of 3 feet and a depth of 4 inches level with the edge of the pavement, top of edging or curb or as directed by the Engineer. No geotextile fabric under the pavement millings shall be installed.

**Materials**

Pavement milling mulch shall be smaller than the Standard 1-1/2 inch sieve.

The on-site recycling of pavement millings sourced from the project is encouraged. All pavement milling mulch for shoulders will be accepted based on visual inspection by the Engineer. Mulch material greater than 1 ½ inch shall be removed off-site by the Contractor.

**Method of Measurement**

Item 402.13 will be measured per FOOT in the longitudinal direction parallel to the edge of road, complete in place.

**Basis of Payment**

Item 402.13 will be paid per FOOT of material installed which price includes materials, excavation, grading and leveling and disposing on site, compacting and all incidental costs required to complete the work to the satisfaction of the Engineer.

At locations where the Plans show more than 3' width of pavement millings mulch at shoulders, additional length shall be paid to account for the extra width. Each additional Foot paid will constitute payment per Foot of the total additional millings mulch width (beyond 3'), regardless of the actual additional width.

**ITEM 476.01****STAMPED CONCRETE PAVEMENT****SQUARE YARD**

The work under this Item shall conform to the relevant provisions of Subsection 476 of the Standard Specifications and the following:

Stamped cement concrete pavement shall consist of red colored stamped cement concrete around the central island and perimeter of the roundabout as shown on the plans. The cement concrete shall be 9 inches in thickness. A stamp pattern of 'New Brick Running Bond' shall be utilized.

Cement concrete shall be reinforced with 6"x6"x10-gauge welded steel fabric. Reinforcement shall be placed approximately 1" from the bottom of the concrete.

Expansion joints shall be provided in accordance with Subsection 476.68 and shall be spaced no more than 24 feet as measured along the face of the adjacent Mountable Granite Curb.

The cement concrete shall be an integrally colored cast in place concrete admixture formulated by L. M. Scofield (201-672-9050), Davis Colors (800-638-4444), Butterfield Color (1-800 282-3388), or approved equal. The color shall be a 'Brick Red' color and a sample color shall be submitted for approval by the Engineer.

The Contractor shall submit for approval, the complete technical data sheets for the colored admixture, curing compound, design mixes, color sample, and stamped brick pattern.

The Installer shall have a minimum of 5 years of experience installing colorized cast in place concrete in similar applications.

The Contractor shall install in place, an integrally colored concrete mockup for the cement concrete truck aprons. The mockup shall be a minimum of 3 square yards. For accurate color, the quantity of concrete mixed to produce the sample should not be less than 3 cubic yards (or not less than 1/3 the capacity of the mixing drum on the ready-mix truck) and should always be in full cubic yard increments. The constructed mockup shall use processes and techniques intended for use on the permanent work, including curing procedures.

The Contractor shall include samples of control, construction, stamped brick pattern, and expansion joints in sample panels. Mockup shall be produced by the individual workers who will perform the work. The accepted mockup provides the visual standard for work and shall remain through completion of the work for use as a quality standard for the finished work.

Concrete materials and design shall be per Manufacturer's recommendations. Admixture shall be added per Manufacturer's recommendations.

Concrete mockup shall be allowed to cure for one month prior to review for color acceptance. Construct as many mockups as required by the Engineer until satisfactory colors and patterns are provided. The mockup will not be part of the finished work.



**ITEM 476.01** (Continued)

After pouring and finishing, the concrete shall be protected from traffic during the initial cure period as specified in Subsection 476.71 of the Standard Specifications.

**Method of Measurement and Basis of Payment**

Item 476.01 will be measured and paid for at the contract unit price per Square Yard, complete in place. This price shall include all labor, materials, equipment, steel fabric, reinforcement, mockup(s). Preformed joint filler and Smooth Dowel Bars , and all incidental costs required to complete the work..

**ITEM 476.22**

**SCORED CONCRETE PAVEMENT**

**SQUARE YARD**

The work under this item shall conform to the relevant provisions of Subsection 476 of the Standard Specifications and the following:

The work shall include construct areas of scored cement concrete pavement at roundabout as shown on the plans, or as required by the Engineer, and

**Construction Methods**

The scored cement concrete pavement shall be constructed as shown on Construction Standard Detail E105.2.0 and to the dimensions shown on the plans.

**Method of Measurement**

Item 476.22 will be measured for payment by the square yard, complete in place.

**Basis of Payment**

Item 476.22 will be paid for at the Contract unit price per square yard which price shall include all labor, materials, equipment and incidental costs required to complete the work.

Gravel borrow will be paid for under Item 151.

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<b><u>ITEM 507.10</u></b>	<b><u>GRANITE CURB TYPE T-100 - STRAIGHT</u></b>	<b><u>FOOT</u></b>
<b><u>ITEM 507.15</u></b>	<b><u>GRANITE CURB TYPE T-100 - CURVED</u></b>	<b><u>FOOT</u></b>

The work under these Items shall conform to the relevant provisions of Subsection 501 of the Standard Specifications and the following:

Modified granite curbing shall be installed as shown on the Plans. Any designated cement concrete that is acceptable to the Department under Section M4 of the Standard Specifications shall be used for the concrete collar and shall be placed on three (3) sides of the curbing as shown in the Plans.

Modified granite curbing shall be supplied in consistent lengths of approximately 6 feet. No pieces shorter than 4 feet shall be allowed. Where the radius of the curb is 100 feet or less, the curb shall be cut to the required curvature. The beveled edge of the mountable granite curb should be clean cut at an angle as detailed. Surface wind marks or jagged edges will not be allowed.

#### Method of Measurement

Item 507.10 and Item 507.15 will be measured for payment by the Foot, of curbing installed, complete in place.

#### Basis of Payment and

Item 507.10 and Item 507.15 will be paid for at the respective Contract unit prices per Foot, which prices shall include all labor, materials, equipment, and incidentals required to complete the work, including cement concrete.

**ITEM 509.2    GRANITE TRANSITION CURB (TYPE VB TO TYPE SB)                      FOOT**

The work under this Item shall conform to the relevant provisions of Subsection 501 of the Standard Specifications and the following:

The Granite Transition Curb (Type VB to Type SB) shall match the profile of the adjoining Granite edging on either end of the transition and shall have a finish matching that of the adjoining curbing. The Contractor shall submit a shop drawing of the proposed transition curbs to the Engineer for approval. These transition curbs shall be 6 feet minimum in length.

Materials

Granite materials used for the transition curb shall conform to the requirements of Subsection M9.04.1, of the Standard Specifications.

Method of Measurement

Item 509.2 will be measured for payment by Foot, of granite Transition Curb (Type VB to Type SB) installed.

Basis of Payment and

Item 509.2 will be paid for at the Contract Unit Price per Foot, which prices shall include all labor, materials, equipment, and incidental costs required to complete the work.

**ITEM 580.1****CURB REMOVED, RELOCATED AND RESET****FOOT**

The work under this Item shall conform to the relevant provisions of Subsection 580 of the Standard Specifications and the following:

The work included under this Item consists of removing, relocating, and resetting the existing granite curb as shown on the Plans or as directed by the Engineer. The Contractor shall replace any existing curb that is to be reset, which is lost or damaged because of their operations, or due to their failure to store and protect it in a manner that would eliminate its loss or damage.

The length of any section of curb, shall be altered by cutting to fit closures as necessary. The ends of all stones shall be square with the planes of the top faces so that when the stones are placed end-to-end as closely as possible no space shall show in the joint at the top and face of more than  $\frac{3}{4}$  inch for the full width of the top and for 8 inches down the face.

Any curb not damaged through lack of protection or carelessness by the Contractor but deemed by the Engineer as unsatisfactory for relaying or stacking, will be discarded. It will be the Contractor's responsibility to dispose of any discarded curb without additional compensation.

Any interim stockpiling of curb shall be located outside of the roadway clear zone such that it is not exposed to traffic. The location for interim stockpiling of curb shall be approved by the Engineer before starting any work under this Item.

**Method of Measurement**

Item 580.1 will be measured for payment by Foot, of curb removed, relocated and reset.

**Basis of Payment and**

Item 580.1 will be paid for at the Contract Unit Price per Foot, which prices shall include all labor, materials, tools, equipment, removal, interim stockpiling, relocation, cutting and resetting of curbing and incidental costs required to complete the work as specified on the Plans or as required by the Engineer.

**ITEM 628.24**

**TRANSITION TO BRIDGE RAIL**

**EACH**

The work to be done under this Item shall conform to the relevant provisions of Subsection 601 of the Standard Specifications and the following:

The Transition to Bridge Rail assembly proposed at STA. 16+94 RT to STA. 17+29 RT shall have one (1) short timber breakaway post with timber offset block added at the leading end of the transition, marked 'BEGIN TRANSITION' on MassDOT Construction Detail Drawing No. 400.3.5. This post shall be set in a steel tube foundation and a rounded end unit shall be installed at the leading end. The timber breakaway post, steel tube foundation and rounded end unit shall be in accordance with the details shown in MassDOT Construction Standard Drawing No. 400.4.1. No cable assembly shall be added.

The Transition to Bridge Rail assembly proposed at STA. 17+35 LT to STA. 17+51 LT shall be curved as shown on the Plans.

**Method of Measurement and Basis of Payment**

Item 628.24 will be measured and paid for in accordance with the relevant provisions of Subsections 601.80 and 608.81 and the following:

All work to install the timber breakaway post, timber offset block, steel tube foundation, and rounded end unit at the Transition to Bridge Rail at STA. 16+94 RT to STA. 17+29 RT as shown in the Plans shall, including all materials, labor, equipment, and incidental costs will be incidental to this pay item. No additional payment will be made related to this work.

Work to furnish and install curved Transition to Bridge Rail will be incidental to this pay item. No additional payment will be made related to this work.

**ITEM 629.1**      **PRECAST CONCRETE BARRIER - SINGLE FACED**      **FOOT**

The work to be done under this Item shall conform to the relevant provisions of Subsection 629 and M4.02.14 of the Standard Specifications and the following:

Single-faced precast concrete barrier is specified along Route 16 at the bridge abutments as shown on the Plans. The barrier shall be constructed with the dimensions and reinforcing matching the details shown on the Plans. No “shelf” for concrete median barrier cap shall be cast into the barrier.

Sections to transition between the single-faced 42” high barrier and single-faced 54” high barriers will be required at the locations shown on the Plans. These transition pieces shall be precast concrete in accordance with the details shown on the Plans.

A 20-inch-wide cast-in-place concrete heel shall be constructed behind sections of 54” high barrier and barrier height transitions as detailed in the Plans. Heel reinforcing shall be cast into the precast barrier sections during fabrication as required. The cast-in-place concrete heel shall be 4000 PSI, 3/4 Inch, 610 cement concrete and shall be formed, poured, and cured using approved methods outlined in Subsection 901 of the Standard Specifications.

**Method of Measurement and Basis of Payment**

Item 629.1 will be measured and paid for in accordance with subsection 629.80 and 629.81 of the Standard Specifications.

Cast-in-place concrete heel will be paid for separately under Items 904. ‘4000 PSI, 3/4 Inch, 610 Cement Concrete’ and Item 910.1 ‘Steel Reinforcement for Structures – Epoxy Coated’.

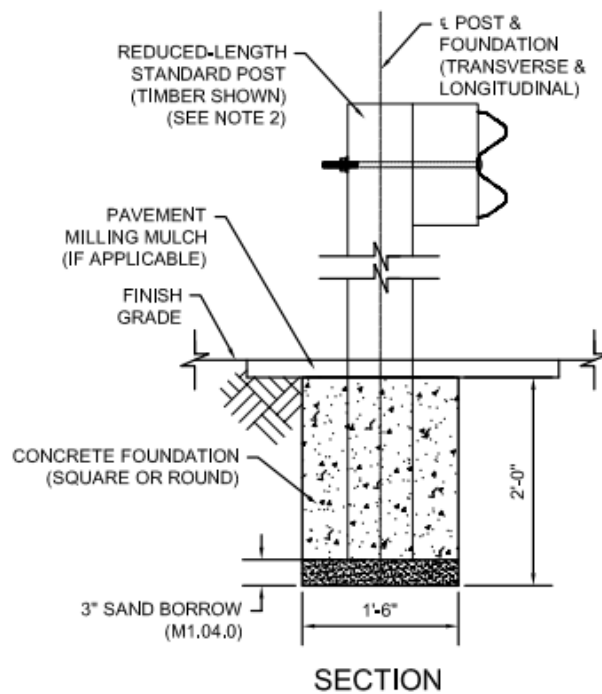
**ITEM 631.      SPECIAL BASE ANCHOR FOR GUARDRAIL POST      EACH**

Work under this Item shall conform to the relevant provision of Subsection 601 of the Standard Specifications and the following:

Work shall include installing encased guardrail posts for shallow mount as required for proposed guardrail due to unavoidable obstruction such as crossing utilities, as approved by the Engineer.

Removal of ledge for guardrail post installation shall be paid separately under Item 144. 'Class B Rock Excavation'.

Encased shallow guardrail posts shall be installed as detailed in MassDOT Construction Standard Drawing 400.5.1 (copied below)



**NOTES:**

1. WHEN THE CONSTRUCTION OF GUARDRAIL AT THE REQUIRED POST SPACING RESULTS IN POST(S) CONFLICTING WITH UNDERGROUND UTILITIES OR OTHER UNDERGROUND OBSTRUCTIONS, AN ENCASED POST MAY BE USED WHERE A 2'-0" DEPTH WILL AVOID THE CONFLICT. INSTALL WHERE SHOWN IN THE PLANS AND/OR AS-NEEDED.
2. USE A STANDARD POST WITH REDUCED LENGTH SUCH THAT THE PANEL HEIGHT IS MAINTAINED WHILE THE POST BOTTOM TERMINATES AT THE BOTTOM OF THE CONCRETE FOUNDATION AT THE TOP OF THE 3" (MIN) SAND BORROW.
3. CONCRETE FOUNDATION SHALL BE 3500 PSI, CEMENT CONCRETE (M4.02.00). AFTER CASTING THE CONCRETE, ENSURE THE SURROUNDING SOIL MATERIAL IS COMPLETELY BACKFILLED AND TAMPED TO PROVIDE FULL PASSIVE RESISTANCE.
4. ENCASED POSTS ARE NOT PERMITTED FOR CONSECUTIVE POSTS UNLESS OTHERWISE SHOWN IN THE PLANS.

**ENCASED POST FOR SHALLOW MOUNT**

Cement concrete shall be 3500 PSI, 1.5 Inch, 520 Cement Concrete and shall conform to the requirements of Subsection 901 of the Standard Specifications.

**Method of Measurement and Basis of Payment**

Item 631. will be measured and paid for at the contract unit price per Each special base anchor for guardrail post installed, complete in place and accepted by the Engineer. The unit price shall include all labor, materials including concrete and sand, equipment and incidental costs required to complete the work.



**ITEM 638.11     PROTECTIVE SCREEN (CHAIN LINK) WITH HANDRAIL     FOOT**

This work under this item shall conform to the relevant provision of Subsection 644 of the Standard Specifications and the following:

The work shall include furnishing and installing 48” high chain link fence with timber rub rail beside the shared use path as detailed on the Plans.

Chain link fence shall be constructed with a pipe top rail.

All fence posts shall be placed with concrete bases in accordance with MassDOT Standard Detail Drawing E 404.5.0. Posts shall be typically spaced at 6’-0” on center.

Timber rub rails shall be mounted to each post. Timber rails shall be standard 2X8 lumber cut to 12’-0” lengths and shall conform to the requirements of M9.05.1 and M9.05.5.

At each fence post, the timber rail shall be set inside a 12-inch-long section of HSS 8X2X0.125 steel tubing and the entire assembly connected to the post via bolted flanged connectors. The rails shall be set so that the bottom of the rail is parallel to the edge of the paved shared use path and set 36” above the path. HSS tubing and all connecting hardware shall be either galvanized or stainless steel in accordance with the details on the Plans.

**Method of Measurement and Basis of Payment**

Item 638.11 will be measured and paid for at the Contract unit price per Foot, which price shall include all labor, materials, equipment, timber rub rails, and all incidental costs required to complete the work.

Concrete foundations for fence posts will be paid separately under Item 901.3 ‘4000 PSI, 1.5 Inch, 565 Cement Concrete for Post Foundation’.

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<b><u>ITEM 657.</u></b>	<b><u>TEMPORARY FENCE</u></b>	<b><u>FOOT</u></b>
<b><u>ITEM 657.5</u></b>	<b><u>TEMPORARY FENCE REMOVED AND RESET</u></b>	<b><u>FOOT</u></b>

The work under these Items shall conform to the relevant provisions of Subsection 644 of the Standard Specifications and the following:

The work under these Items consists of furnishing, installing, removing and resetting, and final removal of 6-foot-high temporary fence to separate construction activities from public access.

The temporary fence shall be installed at locations as shown on the plans or required by the Engineer. The Contractor shall install and maintain temporary construction fences around the construction site, stockpile areas, and all exposed excavations located outside the defined roadway area, accessible to the public until such time it is no longer necessary as determined by the Engineer. Protect all areas of the site from intrusion and trespass.

Unless otherwise indicated, the type of temporary chain link fencing shall be Contractor's option. Following types are acceptable:

1. New materials or previously used salvaged chain link fencing in good condition.
2. Posts: Galvanized steel pipe of diameter to provide rigidity. Post shall be suitable for setting in concrete footings, driving into ground, anchoring with steel base plates, or inserting in precast concrete blocks.
3. Fabric: Woven galvanized steel wire mesh. Provide in continuous lengths to be wire tied to fence posts or prefabricated into modular pipe-framed fence panels.
4. Gates: Provide personnel and vehicle gates of the quantity and size required for functional access to site.
  - a. Fabricate of same material as used for fencing.
  - b. Vehicle gates:
    - Minimum width: 20 feet to allow access for emergency vehicles.
    - Capable of manual operation by one person.

Fence fabric shall be fastened to posts by means of No. 6 gauge zinc coated wire clips. No post tops are required.

Installation of temporary fencing shall not deter or hinder access to existing or proposed fire hydrants. Maintain 3 feet diameter clear space around fire hydrants. Where a fire hydrant is blocked by fencing, provide an access gate. Access to fire hydrants shall be coordinated with the Resident Engineer and local Fire Department.

**ITEMS 657. & 657.5** (Continued)

**Method of Measurement and Basis of Payment**

Item 657. will be measured and paid for at the Contract Unit Price per Foot, which price shall include all labor, materials, equipment, all posts including end, corner, and intermediate brace posts, all gates and gate posts, the replacement and/or restoration of fence damaged due to construction accidents, vandalism and/or any other manner, final removal, and incidental costs required to complete the work.

The removing and resetting of temporary fencing to facilitate the Contractor's operations shall be considered as incidental to the work required under these Items and no separate payment shall be made.

The fence shall not be removed without prior approval of the Engineer.

Item 657.5, Temporary Fence Removed and Reset will be measured and paid for at the Contract Unit Price bid per Foot, which price shall include all tools, equipment, materials and labor costs necessary to relocate the temporary fence to the locations shown on the plans for the various stages of construction.

**ITEM 697.1****SILT SACK****EACH**

Work under this item shall conform to the relevant provisions of Subsections 227 and 670 of the Standard Specifications and the following:

The work under this item includes the furnishing, installation, maintenance and removal of a reusable fabric sack to be installed in drainage structures for the protection of wetlands and other resource areas and the prevention of silt and sediment from the construction site from entering the storm water collection system. Devices shall be ACF Environmental (800)-448-3636; Reed & Graham, Inc. Geosynthetics (888)-381-0800; The BMP Store (800)-644-9223; or approved equal.

**Construction**

Silt sacks shall be installed in retained existing and proposed catch basins and drop inlets within the project limits and as required by the Resident Engineer.

The silt sack shall be as manufactured to fit the opening of the drainage structure under regular flow conditions and shall be mounted under the grate. The insert shall be secured from the surface such that the grate can be removed without the insert discharging into the structure. The filter material shall be installed and maintained in accordance with the manufacturer's written literature and as directed by the Engineer.

Silt sacks shall remain in place until the placement of the pavement overlay, or top course and the graded areas have become permanently stabilized by vegetative growth. All materials used for the filter fabric will become the property of the Contractor and shall be removed from the site.

The Contractor shall inspect the condition of silt sacks after each rainstorm and during major rain events. Silt sacks shall be cleaned periodically to remove and disposed of accumulated debris as required. Silt sacks, which become damaged during construction operations, shall be repaired or replaced immediately at no additional cost to the Department.

When emptying the silt sack, the contractor shall take all due care to prevent sediment from entering the structure. Any silt or other debris found in the drainage system at the end of construction shall be removed at the Contractors expense. The silt and sediment from the silt sack shall be legally disposed of offsite. Under no condition shall silt and sediment from the insert be deposited on site and used in construction.

All curb openings shall be blocked to prevent stormwater from bypassing the device.

All debris accumulated in silt sacks shall be handled and disposed of as specified in Section 227 of the Standard Specifications

**ITEM 697.1** (Continued)

**Method of Measurement and Basis of Payment**

Silt sacks will be measured and paid at the Contract unit price per each, complete in place, which price shall include all labor, materials, equipment and incidental costs required to complete the work. No separate payment will be made for removal and disposal of the sediment from the insert, but all costs in connection therewith shall be included in the Contract unit price bid.

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<b><u>ITEM 698.3</u></b>	<b><u>GEOTEXTILE FABRIC FOR SEPARATION</u></b>	<b><u>SQUARE YARD</u></b>
<b><u>ITEM 698.4</u></b>	<b><u>GEOTEXTILE FABRIC FOR PERMANENT EROSION CONTROL</u></b>	<b><u>SQUARE YARD</u></b>

The work under these Items shall include furnishing and installing geotextile fabric for permanent erosion control or separation to be used in conjunction with the temporary french drains shown on the plans and as required by the Engineer.

#### Materials

The geotextile fabric used for separation shall be selected from the MassDOT Qualified Construction Materials List at <https://www.mass.gov/service-details/qualified-construction-materials-list>. The geotextile fabric shall conform to the requirements of Subsection M9.50.0 of the Standard Specifications and AASHTO M 288, Class 2, for fabric used for separation.

The geotextile fabric used for permanent erosion control shall be selected from the MassDOT Qualified Construction Materials List at <https://www.mass.gov/service-details/qualified-construction-materials-list>. The geotextile fabric shall conform to the requirements of Subsection M9.50.0 of the Standard Specifications and AASHTO M 288, Class 4, for fabric used for permanent erosion control.

Construction and installation shall of all geotextile fabric be in accordance with AASHTO M 288 including Appendix A and the following.

#### Construction

Atmospheric exposure of the geotextile fabric to the elements following lay down shall be a maximum of 14 days.

For seams that are sewn in the field, the Contractor shall provide at least a six-foot length of sample sewn seam for the approval of the Engineer before the geotextile fabric is installed. The seams sewn for sampling shall be sewn using the same type of equipment and procedures as will be used for the production seams. If seams are sewn in both the machine and cross machine direction, samples of seams for both directions shall be provided. The seam assembly description shall be submitted by the Contractor along with the seam samples. This description shall include the seam type, stitch type, sewing thread, and stitch density. If the Contractor elects to sew seams instead of overlap, colored thread must be used.

Geotextile shall be placed in intimate contact with soils without wrinkles or folds and shall be anchored on a smooth graded surface approved by the Engineer. The geotextile shall be placed in such a manner that placement of the overlaying materials will not excessively stretch or tear it.

**ITEM 698.3 & 698.4** (Continued)

Adjacent geotextile sheets shall be joined by either sewing or overlapping. At roll ends, overlapped seams shall overlap a minimum of 12 inches, except when placed under water, where they shall overlap a minimum of 3 feet. Adjacent rolls shall overlap a minimum of 12 inches.

Care shall be taken during installation to prevent damage to the geotextile in the installation process. Should the geotextile be damaged, a geotextile patch shall be placed over the damaged area extending a minimum of 3 feet beyond the limits of the damage.

The crushed stone placement shall begin at the toe of slope and proceed up the slope. Placement shall take place so as to avoid stretching and subsequent tearing of the geotextile. Crushed stone shall not be dropped from a height exceeding 3 feet.

Field monitoring shall be performed to verify that the crushed stone placement does not damage the geotextile. Any geotextile damaged during backfill placement shall be replaced as required by the Engineer, at the Contractor's expense.

The Contractor shall take care not to allow more than two weeks of exposure to direct sunlight. Fabric rolls shall not be dropped more than two feet.

**Method of Measurement**

Item 698.3 and Item 698.4 will be measured for payment respectively by the Square Yard, complete in place. No additional measurements will be made for overlapping material.

**Basis of Payment**

Item 698.3 and Item 698.4 will be paid for at the respective Contract unit prices per Square Yard, which prices shall include all labor, materials, equipment, Overlaps and fold-overs, and incidental costs required to complete the work.

**ITEM 701.01****STAMPED CEMENT CONCRETE MEDIAN****SQUARE YARD**

The work under this item shall conform to the relevant provisions of Subsection 476 of the Standard Specifications and the following:

Stamped cement concrete pavement shall consist of 4-inch-thick colored, stamped cement concrete at traffic islands as shown on the Plans. Concrete shall be stamped pattern of NEW BRICK RUNNING BOND.

Cement concrete shall be an integrally colored cast in place concrete admixture formulated by L. M. Scofield (201-672-9050), Davis Colors (800-638-4444), Butterfield Color (1-800 282-3388), or approved equal. The color shall be a RED BRICK color and a sample color shall be submitted for approval by the Engineer.

The Contractor shall submit for approval, the complete technical data sheets for the colored admixture, curing compound, design mixes, color sample, and stamped brick pattern.

The Installer shall have a minimum of 5 years of experience installing colorized cast in place concrete in similar applications.

The Contractor shall install in place, an integrally colored concrete mockup for the cement concrete medians. The mockup shall be a minimum of 3 square yards. For accurate color, the quantity of concrete mixed to produce the sample should not be less than 3 cubic yards (or not less than 1/3 the capacity of the mixing drum on the ready-mix truck) and should always be in full cubic yard increments. The constructed mockup shall use processes and techniques intended for use on the permanent work, including curing procedures.

The Contractor shall include samples of control, construction, stamped brick pattern, and expansion joints in sample panels. Mockup shall be produced by the individual workers who will perform the work. The accepted mockup provides the visual standard for work and shall remain through completion of the work for use as a quality standard for the finished work.

Concrete materials and design shall be per Manufacturer's recommendations. Admixture shall be added per Manufacturer's recommendations.

Concrete mockup shall be allowed to cure for one month prior to review for color acceptance. Construct as many mockups as required by the Engineer until satisfactory colors and patterns are provided. The mockup will not be part of the finished work.

**Method of Measurement and Basis of Payment**

Item 701.01 will be measured and paid for at the contract unit price per Square Yard, complete in place. The unit price shall include all labor, materials, equipment and incidental costs required to complete the work.



<b><u>ITEM 701.21</u></b>	<b><u>DETECTABLE WARNING PANEL</u></b>	<b><u>SQUARE FOOT</u></b>
<b><u>ITEM 701.22</u></b>	<b><u>DIRECTIONAL TACTILE WARNING PANEL</u></b>	<b><u>SQUARE FOOT</u></b>

The work under these items shall conform to the relevant provisions of Subsection 701 of the Standard Specifications and the following:

Detectable Warning Panels at Splitter Islands shall be set at locations shown on the Plans. They shall be set 6” from the edge of the adjacent roadway pavement and shall extend the full width of the curb opening in the splitter island. Detectable Warning Panels shall conform to MassDOT Construction Standard Detail Drawing No. E 107.6.5, shall be “safety yellow” color, and shall be a minimum of 2’-0” wide in the direction of the pedestrian path of travel.

Directional Tactile Warning Panels shall be located at all bicycle curb ramps along the shared use path (SUP) as shown on the plans. The bosses / bar tiles of the panels shall be oriented longitudinally to the direction of the SUP.

The Contractor shall submit for approval, the complete technical data sheets for the Directional Tactile Warning Panels.

The Contractor may contact and procure the Directional Tactile Warning Panel from one of the following companies, or an approved equal:

- ADA Solutions
- Armor-Tile
- Vanguard ADA Systems of America

**Installation**

The Contractor shall install the panels as directed by the manufacturer and meet ADA standards. The Contractor shall caulk all seams.

**Method of Measurement and Basis of Payment**

Items 701.21 and 701.22 will be measured and paid for at the contract unit prices per Square Foot, complete in place. These prices shall include all labor, materials, equipment and incidental costs required to complete the work.

**ITEM 707.8**

**STEEL BOLLARD**

**EACH**

The work shall consist of furnishing and installation of galvanized steel bollards as shown on the plans. Bollards shall be 6 inches in diameter and made of schedule 40 steel pipe. Bollards shall be hot-dip galvanized and prime painted (safety yellow color) after fabrication.

**Installation**

Concrete base shall be crowned for drainage away from bollard.

Finish elevation of concrete base top shall be held down to accommodate installation of finish grade material.

Pipe bollards shall be concrete filled. Top of concrete fill shall be crowned for drainage.

Pipe bollards shall be installed plumb in all directions.

**Method of Measurement and Basis of Payment**

Item 707.8 will be measured and paid for at the Contract unit price per each, which price shall include all labor, materials, equipment, concrete foundations, rebar, backfill, excavation, and incidental costs required to complete the work.

**ITEM 734.**

**SIGN REMOVED AND RESET**

**EACH**

Work under this item shall consist of removing, stacking during construction and resetting of the large private ‘Welcome to Webster’ sign and the associated landscaping stonework at the location indicated on the Plans.

The Contractor is responsible for coordinating removal, stacking and resetting of this sign with the owner and the Town of Webster prior to the start of any work that may impact the sign. The new location of the sign is indicated on the Plans. The owners of this sign is:

Galaxy Development, LLC  
862 Southbridge Street, Suite 120  
Auburn, MA 01501

who is also the owner of the property:

N/F East Village Square, LLC  
2 Worcester Road

Prior to the removal of any private signs, the Contractor shall satisfy themselves through their own investigation as to the associated components of the sign (including any lighting, landscaping, plantings, etc.) and whether the sign can be adequately removed, temporarily stacked and reset without requiring additional materials or repairs to the sign structures or their supports or whether new foundations will be required. The Contractor shall photograph the existing sign prior to beginning the work. These photographs shall be shared with the Engineer, the Owner, and the Town to serve as documentation of the existing condition of the sign.

When resetting the sign, the Contractor shall rebuild the sign to match its existing configuration (accounting for any changes in topography), including all lighting and plantings. The Engineer shall have final approval of the rebuilding of the sign.

**Basis of Payment and Method of Measurement**

Item 734. will be measured and paid for at the Contract Unit Price per Each sign removed and reset. This price shall include all materials, equipment, landscaping stonework, material or work required to remove and reset the sign including new supports, foundations, plantings, plantable soil, lighting, labor and all incidental costs required to complete the work.

**ITEM 740. ENGINEERS FIELD OFFICE AND EQUIPMENT (TYPE A) MONTH**

Work under this item shall conform to the relevant provisions of Subsection 740 and the following:

Three (3) computer system, printer system and a digital camera meeting the requirements set forth below including installation, maintenance, power, paper, disks and other supplies shall be provided at the Resident Engineer's Office:

All equipment shall be UL approved and Energy Star compliant.

The Computer System shall meet the following minimum criteria or better:

Processor:	Intel, 3.5 GHz
System Memory (RAM):	12 GB
Hard Drive:	500 GB
Optical Drive:	DVD-RW/DVD+RW/CD-RW/CD+RW
Graphics Card:	8 GB
Network Adapter:	10/100 Mbit/s
USB Ports:	6 USB 3.0 ports
Keyboard:	Generic
Mouse:	Optical mouse with scroll, MS-Mouse compliant
Video/Audio	the computer system shall be capable of allow video calling and recording:
Video camera	shall be High Definition 1080p widescreen capable video calling and recording with built in microphone. The microphone system shall capture natural audio while filtering out background noise.
Audio	shall be stereo multimedia speaker system delivering premium sound.
OS:	Latest Windows Professional with all security updates
Web Browser:	Latest Internet Explorer with all security updates
Applications:	Latest MS Office Professional with all security updates Latest Adobe Acrobat Professional with all security updates Latest Autodesk AutoCAD LT Antivirus software with all current security updates maintained through the life of the contract.
Monitors:	Two 27" LED with Full HD resolution. Max. resolution 1920 x 1080
Flash drives:	2 (two) - 128GB USB 3.0
Internet access:	High Speed (min. 24 mbps) internet access with wireless router.

**ITEM 740.** (Continued)

The Multifunction Printer System shall meet the following minimum criteria or better:

Color laser printer, fax, scanner, email and copier all in one with the following minimum capabilities:

- Estimated volume 8,000 pages per month
- LCD touch panel display
- 50 page reversing automatic document feeder
- Reduction/enlargement capability
- Ability to copy and print 11" x 17" paper size
- email and network pc connectivity
- Microsoft and Apple compatibility
- ability to overwrite latent images on hard drive
- 600 x 600 dpi capability
- 30 pages per minute print speed (color),
- 4 Paper Trays Standard (RADF) (not including the bypass tray)
- Automatic duplexing
- Finisher with staple functions
- Standard Ethernet. Print Controller
- Scan documents to PDF, PC and USB
- ability to print with authenticated access protection

The Contractor shall supply a maintenance contract for next day service, and all supplies (toner, staples, paper) necessary to meet estimated monthly usage.

The Engineer's Field Office and the equipment included herein including the computer system, printer, camera and smart level shall remain the property of the Contractor at the completion of the project. Disks, flash drives, and card readers with cards shall become the property of the Department.

**Basis of Payment and Method of Measurement**

Compensation for this work will be made at the contract unit price per Month which price includes full compensation for all services and equipment, and incidentals necessary to provide equipment, maintenance, and insurance as specified and as directed by the Engineer.

**ITEM 751.7****COMPOST BLANKET****CUBIC YARD**

The work under this Item shall conform to the relevant provisions of Subsection 751 and M1.06.00 Organic Soil Additives of the Standard Specifications and the following:

Work shall consist of furnishing and pneumatically applying compost as a thin mulch blanket (1/2- 1 inch depth) over prepared soil to provide temporary soil stabilization and organic matter for plant growth.

**Submittals and Materials**

No materials shall be delivered until the required submittals have been approved by the Engineer. Delivered materials shall match the approved samples. Approval of test results does not constitute final acceptance.

Contractor shall submit to the Engineer samples and certified test results no sooner than 60 days prior to application of compost. Vendor certification that material delivered meets the test results shall be submitted if requested.

Compost may be a blended product of compost and fine wood chips. No kiln-dried wood, construction debris or ground pallet is allowed. Material shall meet the following criteria:

- Organic matter content shall be minimum 30 percent (dry weight basis)
- Moisture content shall be 30-60 percent (wet weight basis)
- Bulk Density <1000 lb/cy
- pH shall be 5.5-7.5
- Conductivity shall be a maximum of 4 mmhos
- Stability test shall produce a maximum of 8mg CO<sub>2</sub>-C/gram of organic material per day
- Particle size shall not exceed 3/4 inch
- Compost may be a blended product of compost and fine wood chips.

Compost testing shall be by a laboratory approved by the US Compost Council using the Testing Method for the Examination of Compost and Composting (TMECC) protocols.

The Engineer shall approve the Contractor's equipment for application.

**Construction Methods**

Application of compost material shall not begin until the Engineer has approved the site and soil conditions. Soil preparation shall be as specified under the applicable item for soil placement or for seeding. The Contractor shall notify the Engineer when areas are ready for inspection and application of compost.

**ITEM 751.7** (Continued)

Compost blanket shall be pneumatically applied (blown on) to a minimum depth of one half to one inch. Where shown on the plans or when directed by the Engineer depth may be increased to provide berms for sediment control or to otherwise prevent slope erosion.

When compost blanket is proposed with seeding, seed shall be broadcast and shall occur in conjunction with compost blanket, as specified under the relevant item for seeding.

When compost blanket is proposed for areas with planting, compost (and seed if applicable) shall be applied after planting. If compost and seed occur prior to planting, areas shall be regraded, and compost and seed reapplied to the satisfaction of the Engineer and at the Contractor's expense.

**Method of Measurement and Basis of Payment**

Item 751.7 will be measured and paid for at the Contract unit price per Cubic Yard which price shall include all labor, materials, equipment, and all incidental costs required to complete the work of pneumatically applying compost.

Surface preparation of substrate receiving compost blanket shall be compensated under the applicable item for placement of loam, ordinary borrow, filter soil, or other specified substrate.

Seeding will be compensated for under the appropriate seeding items.

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**ITEM 756. NPDES STORMWATER POLLUTION PREVENTION PLAN LUMP SUM**

This Item addresses the preparation and implementation of a Storm Water Pollution Prevention Plan required by the National Pollutant Discharge Elimination System (NPDES) and applicable Construction General Permit (CGP) issued by the U.S. Environmental Protection Agency (EPA).

Pursuant to the Federal Clean Water Act, construction activities which disturb one acre or more are required to apply to the EPA for coverage under the NPDES General Permit for Storm Water Discharges from Construction Activities. The Contractor shall be fully responsible for compliance with the most recently issued CGP and any subsequent revisions. Should a fine or penalty be assessed against it, or MassDOT, as a result of a local, state, or federal enforcement action due to non-compliance with the CGP, the Contractor shall take full responsibility.

The NPDES CGP requires the submission of a Notice of Intent (NOI) to the EPA prior to the start of construction (defined as any activity which disturbs land, including clearing and grubbing). There is a fourteen (14) day review period commencing from the date on which EPA enters the Notice into their database. Based on the review of the NOI, EPA may require additional information, including but not limited to, the submission of the Storm Water Pollution Prevention Plan (SWPPP) for review. Work may not commence on the project until final authorization has been granted by EPA. Any additional time required by EPA for review of submittals will not constitute a basis for claim of delay.

In addition, if the project discharges to an Outstanding Resource Water, vernal pool, or is within a coastal ACEC as identified by the Massachusetts Department of Environmental Protection (DEP), a separate notification to DEP is required. DEP may also require submission of the Storm Water Pollution Prevention Plan for review and approval. Filing fees associated with the notification to DEP and, if required, the SWPPP filing to DEP shall be paid by the Contractor.

The CGP also requires the preparation and implementation of a SWPPP in accordance with the afore-mentioned statutes and regulations. The Plan will include the CGP conditions and detailed descriptions of controls of erosion and sedimentation to be implemented during construction. The Contractor shall prepare the SWPPP and update it as necessary. The Contractor shall submit the Plan to the Engineer for approval at least four (4) weeks prior to any site activities. It is the responsibility of the Contractor to comply with the CGP conditions and the conditions of any state Wetlands Protection Act Order, Water Quality Certification, Corps of Engineers Section 404 Permit and other environmental permits applicable to the project and to include in the SWPPP the methods and means necessary to comply with applicable conditions of said permits.



**ITEM 756.** (Continued)

It is the responsibility of the Contractor to complete the SWPPP in accordance with the EPA CGP, provide all information required, and obtain any and all certifications as required by the CGP. Any amendments to the SWPPP required by site conditions, schedule changes, revised work, regulations, construction methodologies, and the like are the responsibility of the Contractor. Amendments will require the approval of the Engineer prior to implementation.

Included in the CGP conditions is the requirement for inspection of all erosion controls and site conditions on a weekly basis as well as after each incidence of rainfall exceeding 0.25 inches in twenty-four hours. For multi-day storms, EPA requires that an inspection must be performed during or after the first day of the event and after the end of the event. The CGP requires that inspections be performed by a qualified individual as outlined in the CGP. MassDOT requires proof of completion of a 4 hour minimum sedimentation and erosion control training class current to the latest CGP. This individual can be, but not limited to, someone that is either a certified inspector, certified professional, or certified storm water inspector. The documentation shall be included as an appendix in the SWPPP. The inspector's qualifications shall be submitted to the Engineer for approval prior to beginning any work. This individual shall be on-site during construction to perform these inspections. In addition, if the Engineer determines at any time that the inspector's performance is inadequate, the Contractor shall provide an alternate inspector. Written weekly inspection forms, storm event inspection forms, and Monthly Summary Reports must be completed and provided to the Engineer. Monthly Summary Reports must include a summary of construction activities undertaken during the reporting period, general site conditions, erosion control maintenance and corrective actions taken, the anticipated schedule of construction activities for the next reporting period, any SWPPP amendments, and representative photographs.

The Contractor is responsible for preparation of the Plan, all SWPPP certifications, inspections, reports and any and all corrective actions necessary to comply with the provisions of the CGP. The Standard Specifications require adequate erosion control for the duration of the Contract. All control measures must be properly selected, installed, and maintained in accordance with manufacturer specifications and good engineering practices. If periodic inspections or other information indicates a control has been used inappropriately or is no longer adequate, it is the responsibility of the Contractor to replace or modify the control for site conditions at no additional cost to the Department. Contractor must maintain all control measures and other protective measures in effective operating condition and shall consider replacement of erosion controls for each construction season.

This item addresses acceptable completion of the SWPPP, any revisions/amendments required during construction, and preparation of monthly reports. In addition, any erosion controls beyond those specified in bid items which are selected by the Contractor to facilitate and/or address the Contractor's schedule, methods and prosecution of the work shall be considered incidental to this item.

**ITEM 756.** (Continued)

The CGP provides specific requirements for temporary and final stabilization. This shall be incorporated into the project schedule. The permit defines specific deadline requirements for Initial Stabilization (“immediately”, i.e., no later than the end of the next work day following the day when earth-disturbing activities have temporarily or permanently ceased) and for Complete Stabilization Activities (no later than 14 calendar days after the initiation of stabilization). Stabilization criteria for vegetative and non-vegetative measures are provided in the CGP.

The CGP requires the submission of a Notice of Termination (NOT) from all operators when final stabilization has been achieved, as well as removal and proper disposal of all construction materials, waste and waste handling devices, removal of all equipment and construction vehicles, removal of all temporary stormwater controls, etc. Approval of final stabilization by the Engineer and confirmation of submission of the NOT will be required prior to submission of the Resident Engineer’s Final Estimate. The permittee shall use EPA’s website to prepare and submit the NOT.

**Method of Measurement and Basis of Payment**

Payment for all work under this Item shall be made at the contract unit price, lump sum, which shall include all work detailed above, including Plan preparation, required revisions, revisions/addenda during construction, monthly reports and filing fees.

Payment of fifty (50) % of the contract price shall be made upon acceptance of the Stormwater Pollution Prevention Plan. Payment of forty (40) % of the contract price shall be made in equal installments for implementation of the Stormwater Pollution Prevention Plan. Payment of the final ten (10) % of the contract price shall be paid upon satisfactory submission of a Notice of termination (NOT) when final stabilization has been achieved.

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**ITEM 765.21      ANNUAL COVER CROP FOR NATIVE SEEDING      POUND**

Work under this item shall be in according with Subsection 765 of the Standard Specifications and the following.

Description

Work consists of furnishing and applying the appropriate annual grass to be seeded as a cover crop in conjunction with upland native seeding (Short Grassland Mix) and at the rate specified herein.

A cover crop shall be used for following conditions:

- when specified under Application Rate for the permanent native upland seed mix
- for slopes 2:1 or steeper and an annual is not already specified as part of the permanent mix
- when seeding out of season and the native seed mix does not already specify an annual
- as required to prevent erosion until the permanent seed establishes.

A cover crop is not necessary for wetland seeding and is not typically necessary for soil stabilization when seeding in conjunction with a compost blanket application.

Annual rye (*Lolium multiflorum*) will not be accepted as an annual cover crop.

Using annual rye or exceeding the application rate such that a dense stand of annual grasses prevents germination of the native grasses will require mowing of annual grasses. In this instance, mowing of cover crop will be incidental to this item.

*Seed and Application Rate*

Add 30 pounds/acre of the following seed based on seeding season:

<i>Avena sativa</i> (Grain Oats):	1 January to 31 July
<i>Cecale cereale</i> (Grain Rye):	1 August to 31 December

**Method of Measurement and Basis of Payment**

Annual Cover Crop will be measured for payment per pound of seed per pound of seed, complete in place.

Annual Cover Crop will be paid at the contract unit price per pound upon approval of seed bag tags or other documentation of correct application rate and species, and upon acceptance of a satisfactory stand of annual grasses three weeks following seeding.

Application and care of cover crop will be paid for separately under Item 765.635 Native Seeding and Establishment

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<b><u>ITEM 765.411</u></b>	<b><u>SHORT GRASSLAND MIX</u></b>	<b><u>POUND</u></b>
<b><u>ITEM 765.415</u></b>	<b><u>URBAN NATIVE MEADOW SEED MIX</u></b>	<b><u>POUND</u></b>
<b><u>ITEM 765.553</u></b>	<b><u>WETLAND REPARIAN MIX</u></b>	<b><u>POUND</u></b>

Work under this item shall consist of furnishing the mix(es) specified below in the required quantity.

Submittals

- 1) Pre-Verification of Seed Availability. Within 30 days after the Notice to Proceed, the Contractor shall submit to the Engineer the supplier's verification of availability of seed species in the required quantities and for the anticipated date of seeding. Verification shall be on the supplier's letterhead and notarized by the supplier's notary. Species not expected to be available should be noted and substitutions recommended.
- 2) Final Verification of Seed Availability. No earlier than 21 days prior to ordering, the Contractor shall submit to the Engineer the supplier's verification of availability of seed species and in the required quantities. Verification shall be on the supplier's letterhead and notarized by the supplier's notary. A copy of this submittal shall be forwarded to the MassDOT Landscape Design Section. Substitutions or changes in the mix at this time must be approved by MassDOT Landscape Design Section.
- 3) Seed Worksheet provided herein shall be submitted to the Engineer prior to ordering seed to determine the number of pounds of Pure Live Seed required.
- 4) Seed Tags. The contractor shall submit original seed tags from each bag of seed used on the project or ensure that each tag is photo documented by the Engineer while on the unopened bag.

Number of tags submitted must correspond to number of bags delivered.

Species listed on the seed tag shall match the Final Verification of Seed Availability (Submittal #2) unless approved otherwise. Tag must include: variety and species name; lot number; purity; percentage of inert matter; percentage of weeds, noxious seeds, and other crop seeds; germination, dormant or hard seed; total viability; origin of seed; germination test date, net weight, and name and address of seller. The origin of seed must be listed on the seed tag for all species in the mix to provide verification of original (generation 0) seed source. The smallest known geographic area (township, county, ecotype region, etc.) shall be listed. Ecotypes and cultivars shall be as close to Massachusetts as possible and appropriate to the site conditions.

A copy of this submittal shall be forwarded to the MassDOT Landscape Design Section.

**ITEMS 765.411, 765.415 & 765.553** (Continued)

- 5) Verification of Seed Delivery. Prior to payment, contractor shall submit the Seed Delivery Verification form contained within the contract or the Supplier's Verification on company letterhead or a bill of lading. Supplier verification must include all information requested on the Verification form within this contract. The bill of lading must include variety and species name, lot number, net weight shipped, date of sale, invoice, project or seeding location, and name and address of Supplier. All information must be filled in and complete for acceptance. Information must match the seed tags and quantity of seed used on the job. A copy of this submittal shall be forwarded to the MassDOT Landscape Design Section
  
- 6) Seed Sample. If requested or if seed is from a previously opened bag, the contractor may be asked to submit to the Engineer a sample of seed from the seed bag (1-2 cups) at the time of seeding.

**Seeding Season**

The appropriate seeding seasons are:

Spring: April 1 - May 15

Fall: October 1 - December 1 for dormant seeding

**Permanent Seed Mix(es)***Calculating Pure Live Seed (PLS)*

Quantities specified are PURE LIVE SEED. Greater quantities of ordered seed may be required to achieve actual specified seeding rates.

Pure Live Seed (PLS) is defined as a percentage calculated by multiplying the percent of pure seed by the percent of viable seed (total germination, hard seed, and dormant seed). For example:

If a seed label indicates 90% purity, 78% germination, 10% hard seed, and 2% dormancy, it is calculated to be  $90\% \times [78 + 10 + 2]\% = 81\%$  PLS.

Therefore, each pound of PLS would need  $1 \text{ pound} / 0.81 = 1.2$  pounds of seed with a 90% purity and 90% total germination

**Seed Mix(es)** shall be as specified below. Ecotypes and cultivars shall be as close to Massachusetts as possible and appropriate to the site conditions.

**ITEMS 765.411, 765.415 & 765.553** (Continued)

Short Grassland Seed Mix shall be applied to upland areas as shown on the plans.

**765.411 Short Grassland Mix**

	<u>Botanical Name</u>	<u>Common Name</u>	<u>% PLS by Weight</u>
Grass	Schizachyrium scoparium 'Albany Pine'	Little Bluestem 'Albany Pine'	57.00%
	Elymus virginicus	Virginia Wild Rye	27.00%
	Festuca rubra	Creeping Red Fescue	9.00%
	Agrostis perennans	Upland Bentgrass	1.20%
	Dichanthelium clandestinum 'Tioga'	Deertongue grass 'Tioga'	1.00%
	Eragrostis spectabilis 'RI Ecotype'	Purple Lovegrass 'RI Ecotype'	1.00%
			96.20%
Herb/ Forb	Chamaecrista fasciculata	Partridge Pea	2.30%
	Penstemon digitalis	Beard-tongue	0.50%
	Solidago nemoralis	Grey Goldenrod	0.30%
	Aster pilosus	Heath Aster	0.10%
	Pycnanthemum tenuifolium	Slender Mountain Mint	0.10%
	Oenothera fruticosa var. fruticosa	Sundrops	0.10%
	Achillea millefolium	Common Yarrow	0.10%
	Aster lateriflorus	Calico Aster	0.10%
	Solidago bicolor	White Goldenrod	0.10%
	Aster laevis NY Ecotype	Smooth Aster NY Ecotype	0.10%
			3.80%
			<b>100.00%</b>

*Seeding Rate: 15.0 lbs PLS/Acre.*

**ITEMS 765.411, 765.415 & 765.553** (Continued)

Upland Seed Mix to be applied in the Roundabout shall be Urban Native Seed Mix.

**765.415 Urban Native Meadow Seed Mix**

<u>Botanical Name</u>	<u>Common Name</u>	<u>% PLS by Weight</u>
<b>Grass</b>		
Festuca ovina 'Covar Dwarf'	Sheep Fescue 'Covar Dwarf'	25.00%
Schizachyrium scoparium 'Albany Pine'	Little Bluestem 'Albany Pine'	15.00%
Eragrostis spectabilis	Purple Lovegrass	2.00%
Agrostis perennans	Upland Bentgrass	5.00%
		47.00%
<b>Herb/Forb</b>		
Gaillardia pulchella	Firewheel	10.00%
Coreopsis lanceolata	Lance-leaf Coreopsis	10.00%
Chamaecrista fasciculata	Partridge Pea	6.00%
Rudbeckia hirta	Black-eyed Susan	6.00%
Coreopsis tinctoria	Red Plains Coreopsis	6.00%
Achillea millefolium	Common Yarrow	6.00%
Asclepias tuberosa	Butterfly Milkweed	3.00%
Aster laevis	Smooth Aster	2.00%
Pycnanthemum tenuifolium	Slender Mountain Mint	2.00%
Solidago nemoralis	Grey Goldenrod	1.00%
Aster oblongifolius	Aromatic Aster	1.00%
		53.00%
		100.00%

*Mix shall be applied at 20 lbs/acre PLS.* No cover crop shall be applied.

**ITEMS 765.411, 765.415 & 765.553** (Continued)

Infiltration Basin Bottoms shall be applied to basin bottoms as shown on the plans.

**Mix 765.553 Wetland – Riparian Mix**

<u>Botanical Name</u>	<u>Common Name</u>	<u>% PLS By Weight</u>
<b>Grass</b>		
Sorghastrum nutans NY Eco	Indiangrass NY Ecotype	14.00%
Schizachyrium scoparium	Little Blue Stem	14.00%
Elymus riparius	Riverbank Wild Rye	10.00%
Elymus virginicus	Virginia Wild Rye	10.00%
Panicum clandestinum 'Tioga'	Deer Tongue 'Tioga'	9.00%
Andropogon gerardii NY Eco	Big Bluestem NY Eco	8.00%
Carex vulpinoidea	Fox Sedge	7.00%
Panicum virgatum	Switchgrass	3.00%
Juncus effusus	Soft Rush	2.00%
Agrostis perennans	Upland Bentgrass	2.00%
Scirpus atrovirens	Green Bulrush	<u>1.00%</u>
		80.00%
<b>Herb/Forb</b>		
Chamaecrista fasciculata	Partridge Pea	3.00%
Verbena hastata	Blue Vervain	3.00%
Asclepias incarnata	Swamp Milkweed	3.00%
Heliopsis helianthoides	Ox-Eye Sunflower	2.00%
Eupatorium perfoliatum	Boneset	2.00%
Aster umbellatus	Flat Topped White Aster	1.00%
Aster prenanthoides	Zig Zag Aster	1.00%
Aster puniceus	Aster – Swamp	1.00%
Aster novae-angliae	New England Aster	1.00%
Eupatorium maculatum	Joe-pye Weed	1.00%
Monarda fistulosa	Wild Bergamot	1.00%
Vernonia noveboracensis	New York Ironweed	<u>1.00%</u>
		<u>20.00%</u>
		100.00%

***Apply this mix at 20 lbs PLS/acre.*** Species ecotype shall be as native to New England region as possible.



**ITEMS 765.411, 765.415 & 765.553** (Continued)

**FOR USE WITH SLOPES:** Add 30 lbs/acre of a cover crop if erosions is a concern. For a cover crop use either grain oats (1 Jan to 31 July) or grain rye (1 Aug to 31 Dec). Cover crop shall be incidental to seeding Mix.

*Application Rate*

Wetland riparian mix: 20 lbs/acre PLS. In addition, apply 30 pounds of cover crop (grain oats or grain rye) as appropriate to the season.

Any species substitutions shall be with a species having similar characteristics and function. Substitutions must be approved by MassDOT Landscape Design Section per the documentation submittal process.

**50% Increase Adjustment for Field Conditions**

Seeding under the following conditions requires a 50% increase in the permanent mix at the time of construction:

- Seeding out of season  
OR
- Seeding after Compost Blanket has been applied (unless already increased for out of season).

Method of Measurement and Basis of Payment

Wetland riparian mix will be measured for payment by the pound of Pure Live Seed delivered and complete in place.

Wetland riparian mix will be paid at the contract unit price per pound of Pure Live Seed delivered upon approval of all Seed Submittal Documentation. Overseeding required to correct poor germination or establishment shall be incidental to the item.

Cover crop not included as part of the permanent mix composition will be paid for under Item 765.21, Annual Cover Crop.

Application and care of native seed mix will be paid for separately under Item 735.635 Native Seeding and Establishment.

**ITEMS 765.411, 765.415 & 765.553 (Continued)**

***NATIVE SEED WORKSHEET***

Project Description: \_\_\_\_\_

Project No: \_\_\_\_\_

Contractor: \_\_\_\_\_

Contract No: \_\_\_\_\_

Seed Mix Number & Description: \_\_\_\_\_

**Contractor: Complete Prior To Ordering**

Pounds of Seed Required Per Contract:

\_\_\_\_\_ lbs./acre for \_\_\_\_\_ Acre(s) OR \_\_\_\_\_ SY

Additional 50% increase if required (out of season or seeding over compost blanket):

\_\_\_\_\_ **lbs. Total Seed Required**

Calculated Quantity for **Pure Live Seed (PLS<sup>1</sup>)**:

\_\_\_\_\_ **Total Pounds PLS**

**Engineer: Verification at Time of Application**

Number pounds delivered to site<sup>2</sup>: \_\_\_\_\_ Date(s): \_\_\_\_\_

Actual Seed Bag Tag/s Received or photo documented by Engineer: \_\_\_\_\_

<sup>1</sup> *PLS=% pure seed x % viable seed (total germination, hard seed, and dormant seed).*

<sup>2</sup> *Quantity delivered should match pounds **Total Pounds PLS** and **Verification of Seed Delivery**. Pounds should be shown on each Seed Tag.*

**ITEMS 765.411, 765.415 & 765.553** (Continued)

***SUPPLIER VERIFICATION OF SEED DELIVERY FOR  
MASSDOT PROJECTS***

Date \_\_\_\_\_

We hereby certify that (*Seed Supplier*): \_\_\_\_\_

Furnished to (*Contractor*): \_\_\_\_\_

For use on: (*Project Description*) \_\_\_\_\_

Project #: \_\_\_\_\_ Contract #: \_\_\_\_\_

Pounds of Pure Live Seed: \_\_\_\_\_

Of Mix (*Description*): \_\_\_\_\_

Lot Number \_\_\_\_\_

The material was delivered on (*Date*) \_\_\_\_\_.

The labels and contents meet all State and Federal regulations. The mixture consists of the following species, including cultivars (as applicable) and ecotype region, and at the following percentages (may be attached separately):

Name (print): \_\_\_\_\_ Title: \_\_\_\_\_

Supplier: \_\_\_\_\_

Signature and Seal: \_\_\_\_\_

**ITEM 765.635****NATIVE SEEDING AND ESTABLISHMENT****SQUARE YARD**

Work shall conform to the relevant provisions of Subsections 765 and 767 of the Standard Specifications and the following:

The work under this item shall consist of seeding, mowing, and other care to establish a stand of grass in the areas shown on the plans or as required by the Engineer. For the purposes of these specifications, the term “grass” shall apply to all the forbs, grasses, sedges, and rushes included in the materials.

**Qualifications**

Seeding shall be done by a company having a minimum of five years of experience with native seed establishment. Prior to beginning work, the seeding Contractor shall furnish proof of qualifications to the Engineer for approval. Proof of qualifications shall include providing documentation (photos and contacts) to demonstrate knowledge and expertise with native seeding and establishment and proof of having completed successful native seeding projects.

**Seeding Season**

Seeding seasons for native mixes is April 1 – May 15 and October 1 – December 1 for dormant seeding. Written approval must be obtained for seeding outside the seeding season and, if approved, the permanent seed rate shall be increased by 50%.

Seeding season for cover crops shall be grain oats January 1 – July 31 and grain rye August 1 – December 1.

**Material and Submittals**

*Seed Mixes and Submittals* shall be per the item(s) for permanent and annual (cover crop) seed mixes.

*Compost Blanket*, if used, shall meet the material and submittal requirements for that item.

*Hydromulch* shall be wood fiber or straw applied per the Standard Specifications and at the rates specified below and per the manufacturer.

A certified statement shall be furnished, prior to start of work, to the Engineer by the Contractor as to the number of pounds of hydromulch, tackifier, and seed, per 100 gallons of water and as applicable to products used. This statement should also specify the number of square yards of seeding that can be covered with the solution specified above.

***Fertilizer***

No fertilizers shall be applied.

**ITEM 765.635** (Continued)*Water*

Water, including hose and all other watering equipment required for the work, shall be furnished by the Contractor to the site at no additional cost. Water shall be suitable for irrigation and free from ingredients harmful to plant life. All plants injured or work damaged due to the lack of water or the use of too much water shall be the Contractor's responsibility to correct.

Seeding

Hand broadcast method shall be used for all areas smaller than half an acre and when specified on the plans for areas over half an acre.

Seeding shall occur within 72 hours of placement of loam and final grading, or the Contractor shall propose a reasonable, alternative schedule that shall be approved by the Engineer.

*Surface Preparation*

No seeding or soil preparation shall be done if soils are muddy or dry and compacted. Bare soils shall be raked to remove large stiff clods, lumps, brush, roots, stumps, litter and other foreign matter. Ruts and depressions shall be filled with additional loam or compost and the soil shall be re-graded to a smooth finish corresponding to the required grades.

When seeding over existing or compacted soil or soil that has sat bare for more than 30 days, surface will be prepared by tilling or raking to a minimum depth of 2 inches prior to seeding and prior to Compost Blanket application (when applied).

Surface preparation shall be compensated for under for loam placement or topsoil rehandled and spread as appropriate to the project.

Jute or coir mesh, when specified in the contract, shall be placed after seeding and per the Standard Specifications and the manufacturer's instruction.

Surface preparation shall be approved by the Engineer prior to seeding.

*Seeding over Various Substrates*

Loam: Seeding shall occur within 72 hours of loam placement to prevent loss of topsoil. Seed shall be manually broadcast for areas less than half an acre (each area, not cumulative area) and when specified on the plans. Broadcasting shall be immediately followed by hydromulching as specified below. When not specified on the plans, larger areas may be hydroseeded as specified below.

**ITEM 765.635** (Continued)

Compost Blanket: Compost Blanket shall be applied as specified under that item. Seed should be hand broadcast at the same time as compost application to ensure a thin cover of compost over seed.

When seeding is done after application of Compost Blanket the rate shall be increased by 50%. If the Compost Blanket is applied after December 1, seed shall be broadcast or hydroseeding over the compost in the Spring and the rate increased by 50% specified under Seed Application.

Compost Mulch over Modified Rock: Compost Mulch and seed shall be applied as specified under that item. No hydromulch is required.

*Cover Crop*

Cover crop shall be used when seeding out of season, when specified with the permanent native seed mix under that item, and as required to prevent erosion until the permanent seed establishes. A cover crop should not be used with a steep slope mix or other permanent mix which already contains either cereal rye or oats in the composition of the mix. A cover crop is not necessary for wetland seeding and is not typically necessary for soil stabilization when seeding in conjunction with a compost blanket application.

*Seed Application*

All seed shall be mulched as specified herein.

Seed application shall be by broadcast seeding or by hydroseeding as described below.

Broadcast Seeding

Seed shall be broadcast spread using a cyclone or whirlwind seeder or hand broadcast. Small or light-seeded species such as bluestem may be mixed with approved filler to achieve an even distribution. Seed shall not be broadcast when wind velocities are greater than 15 mph.

Broadcast seeding shall be undertaken in two separate passes at ninety degrees to each other. One-half the seeding rate shall be applied in each direction (horizontally and vertically). To ensure seed to soil contact with broadcasting of seed, seeding shall be followed by rolling or tracking with equipment approved by the Engineer.

Broadcast seed shall be mulched with weed-free straw mulch unless seeding is done as part of Compost Blanket in which case it shall be as specified above under seeding with Compost Blanket application. Hydromulching shall be as specified under Hydromulching.

Hydroseeding and Hydromulching

Hydroseed and mulching shall be per the manufacturer's directions and as follows.

Hydroseeding shall only be used for sites over half an acre in size or with permission of the Engineer.

**ITEM 765.635** (Continued)

Tank and hoses shall be cleaned from all previous hydroseeding and hydromulching projects. Seed shall be mixed into the slurry immediately before application and slurry applied within 30 minutes after seeds have been placed in the tank. Once seed has been placed in the tank, tank shall be agitated only enough to mix the seeds and keep slurry from separating.

A 2-step process shall be used for seeding in conjunction with hydromulch. Seed shall be applied with 500 lbs/acre of hydromulch in the first pass. A second pass with 1,000 lbs/ acre of hydromulch shall be applied in a second pass. Each pass shall be applied in a different direction.

Once the seed has been added to the tank mixture a one-hour time limit is set for spreading the mixture on the soil. Once the one hour has passed the excess mixture must be discarded.

For broadcast seeding, hydromulch shall be applied immediately following seeding at a rate of 1,000 lbs/acre. Tank shall be cleaned from any previous hydroseeding.

**Care During Germination and Establishment**

Contractor shall care for seeded areas as necessary for successful germination. Care will include watering and weed control as necessary to achieve establishment of the specified seeded species after one growing season as specified below.

The contractor shall maintain the stand of grasses to ensure healthy growth of the seeded species. Work shall include mowing or weed whacking for weed control, watering if necessary, and removal of invasive plants.

Watering shall be sufficient to achieve soil moisture to a depth of 2 inches or more and such moisture is uniform. Method of watering shall not erode or damage soil or grassed surfaces.

General Weed Control: Unless otherwise directed, mowing shall be as specified under Mowing for Weed Control for seed establishment. Weeds shall be mowed prior to weeds setting seed (by the end of July unless otherwise approved).

Control of Invasive and Aggressive Weeds: Invasive and aggressive weeds, including but not limited to mugwort, ragweed, knapweed, foxtail, crabgrass, and chicory must be cut or treated prior to going to seed. Herbicide treatment must be coordinated with MassDOT. Undesired species (such as chicory) introduced due to use of incorrect seed mix shall be removed at the Contractor's expense.

**ITEM 765.635** (Continued)

Mowing For Weed Control

Mowing for weed control shall be completed after weeds have sprouted and show leaf and bud growth, but prior to setting seed, generally between July 7<sup>th</sup> and August 1<sup>st</sup>, unless directed otherwise by the MassDOT Landscape Architect and the Engineer.

Mowing height shall be as needed for weed control, generally to a height of 8 inches and not below 4 inches, unless directed otherwise. Mowing shall be with a brush hog mower or string trimmer other approved equipment. Conventional lawn mowers which cannot achieve the appropriate cut shall not be used.

Contractor shall give 48-hour notice prior to mowing work. Mowing shall only occur in dry sunny weather. Litter pickup should occur prior to mowing in all areas. If required, cut grass shall be raked and removed. Litter pickup and raking and removal of grass shall be incidental to the work.

Mowing equipment shall be approved by the Engineer prior to work.

Over-seeding

Areas of bare ground greater than 2-3 feet in diameter shall be over-seeded with the specified mix during the appropriate season for seeding. Where required for overseeding mowing shall be as close to the soil as possible. Soil that is compacted shall be raked or otherwise roughened prior to over-seeding.

Over-seeding rates and methods shall those specified above under Materials and Methods. Following over-seeding, soil shall be lightly tamped to ensure seed to soil contact and areas shall be mulched with straw mulch and watered with a fine mist to moisten soil to a depth of at least 2 inches.

Over-seeding, mulch, watering, and all work for over-seeding shall be incidental.



**ITEM 765.635** (Continued)**Determining Satisfactory Grass Establishment**

A well-established stand of the specified seeded species as determined by the Engineer and the MassDOT Landscape Architect will be required for Final Acceptance. The expectation is that an acceptable number and variety of the desired permanent seeded species (not the cover crop) will be visible. Generally:

- A minimum of 75% coverage by the specified permanent seeded species after one growing season. Of that percentage, generally, depending on the mix species:
  - At least 3 types of the permanent seeded grass species shall be visible.
  - At least 3 species of wildflowers shall be visible.
- There will be no significant gaps or bare soil (generally 2-3 feet in diameter or greater).
- There will be no more than 25% coverage by weed species.
- All soil shall be stabilized and there shall be no channeling or erosion.
- There will be no invasive or aggressive species within the stand at the time of acceptance.
- There shall be no evidence of seed from non-native mixes (i.e., clover) due to failure to clean the hydroseeding tank or using incorrect mix.

Invasive and aggressive weeds (such as mugwort, ragweed, knapweed, and chicory) must be cut or treated prior to going to seed for Interim Acceptance. Herbicide treatment must be coordinated with MassDOT.

A warm-season grass mix with perennials will not have uniform growth. A uniform stand of grass may indicate use of an incorrect mix.

**Acceptance of Seeding and Establishment Work**

*Conditional Acceptance* shall be based on proper application of seed as specified herein.

*Interim Acceptance of Care.* Seeding will be inspected by mid-July to assess germination and Establishment conditions as described above. When necessary for Interim Acceptance, areas shall be mowed prior to weed species producing seed and as specified above under Weed Control. ***Areas requiring weed control that are not mowed prior to weed seed dispersal will not be approved for Interim Acceptance.*** Seeding that shows good germination and is determined by the Engineer and landscape Architect to not require weed control at time of inspection shall be accepted for Interim Acceptance payment.

*Final Acceptance of Establishment* shall be given upon satisfactory Establishment as described above.

If the seeded area fails to meet the requirements of Establishment by the end of the growing season, contractor shall propose and implement remediations and site shall be inspected during the following growing season after July 1<sup>st</sup>. All remediation shall be at the contractor's expense.

**ITEM 765.635** (Continued)

Method of Measurement and Basis of Payment

Native Seeding and Establishment will be measured for payment by the square yard, complete in place.

Native Seeding and Establishment will be paid at the Contract unit price by the square yard upon Conditional, Interim, and Final Acceptances as described above. This price shall include all submittals, seeding, rolling to ensure seed-to-soil contact, weed control other than mowing, water, over-seeding, labor, materials, equipment, and all incidental costs required to complete the work of establishing a satisfactory stand of grass.

Native seed and cover crop mixes shall be compensated under the respective items.

Site preparation, including raking, tilling, removal of debris and stones, and other work to the prepare site for seeding shall be compensated under loam placement or topsoil rehandled and spread as relevant to the project. If used, Compost Blanket shall be compensated under the respective item.

Mowing for weed control will be incidental to this item.

Schedule of payment shall be as follows:

30% upon Conditional Acceptance

20% upon Interim Acceptance of Care, except this amount will be reduced to zero and final payment will be reduced accordingly when areas requiring weed control are not mowed as specified in the Interim Acceptance criteria.

50% upon Final Acceptance of Establishment

**ITEM 767.121****SEDIMENT CONTROL BARRIER****FOOT**

The work under this item shall conform to the relevant provisions of Subsections 670, 751 and 767 of the Standard Specifications and shall include the furnishing and placement of a sediment control barrier. Sediment control barrier shall be installed prior to disturbing upslope soil.

The purpose of the sediment control barrier is to slow runoff velocity and filter suspended sediments from storm water flow. Sediment barrier may be used to contain stockpile sediments, to break slope length, and to slow or prevent upgradient water or water off road surfaces from flowing into a work zone. Contractor shall be responsible for ensuring that barriers fulfill the intent of adequately controlling siltation and runoff.

Twelve-inch diameter (after installation) compost filter tubes with biodegradable natural fabric (i.e., cotton, jute, burlap) are intended to be the primary sedimentation control barrier. Photo-biodegradable fabric shall not be used.

For small areas of disturbance with minimal slope and slope length, the Engineer may approve the following sediment control methods:

- 9-inch compost filter tubes
- Straw bales which shall be trenched

No straw wattles may be used. Additional compost filter tubes (adding depth or height) shall be used at specific locations of concentrated flow such as at gully points, steep slopes, or identified failure points in the sediment capture line.

When required by permits, additional sediment barrier shall be stored on-site for emergency use and replacement for the duration of the contract.

Where shown on the plans or when required by permits, sedimentation fence shall be used in addition to compost filter tubes and straw bales and shall be compensated under that item.

Sediment control barriers shall be installed in the approximate location as shown on the plans and as required so that no excavated or disturbed soil can enter mitigation areas or adjacent wetlands or waterways. If necessary to accommodate field conditions and to maximize effectiveness, barrier locations may be shifted with approval from the Engineer. Barriers shall be in place prior to excavation work. No work shall take place outside the barriers.

**Materials and Construction**

Prior to initial placement of barriers, the Contractor and the Engineer shall review locations specified on the plans and adjust placement to ensure that the placement will provide maximum effectiveness.

**ITEM 767.121** (Continued)

Barriers shall be staked, trenched, and/or wedged as specified herein and according to the Manufacturer's instructions. Barriers shall be securely in contact with existing soil such that there is no flow beneath the barrier.

*Compost Filter Tube*

Compost material inside the filter tube shall meet M1.06.0, except for the following: no peat, manure or bio-solids shall be used; no kiln-dried wood or construction debris shall be allowed; material shall pass through a 2-inch sieve; and the C:N ratio shall be disregarded.

Outer tube fabric shall be made of 100% biodegradable materials (i.e., cotton, hemp or jute) and shall have a knitted mesh with openings that allow for sufficient water flow and effective sediment capture.

Tubes shall be tamped, but not trenched, to ensure good contact with soil. When reinforcement is necessary, tubes shall be stacked as shown on the detail plans.

*Straw Bales*

Straw bales shall be used if shown on the plans or when specified by Orders of Condition or other permit requirements.

Bales should be placed in a single row, lengthwise on the contour, with ends of adjacent bales tightly abutting one another. All bales should be either wire-bound or string-tied. Straw bales should be installed so that bindings are oriented around the sides (rather than along the tops and bottoms) of the bales to prevent deterioration of the bindings.

The barrier should be entrenched and backfilled. A trench should be excavated the width of a bale and the length of the proposed barrier to a minimum depth of 4 inches. The trench must be deep enough to remove all grass and other material which might allow underflow. After the bales are staked and chinked (filled by wedging), the excavated soil should be backfilled against the barrier. Backfill soil should conform to the ground level on the downhill side and should be built up to 4 inches against the uphill side of the barrier.

Each bale should be securely anchored by at least 2 stakes or re-bars driven through the bale. The first stake in each bale should be driven toward the previously laid bale to force the bales together. Stakes or re-bars should be driven deep enough into the ground to securely anchor the bales. For safety reasons, stakes should not extend above the bales but should be driven in flush with the top of the bale.

The gaps between the bales should be chinked (filled by wedging) with straw to prevent water from escaping between the bales. Loose straw scattered over the area immediately uphill from a straw bale barrier tends to increase barrier efficiency. Wedging must be done carefully in order not to separate the bales.

**ITEM 767.121** (Continued)

When used in a swale, the barrier should be extended to such a length that the bottoms of the end bales are higher in elevation than the top of the lowest middle bale to assure that sediment-laden runoff will flow either through or over the barrier but not around it.

*Sedimentation Fence*

Materials and Installation shall be per Section 670.40 and 670.60 of the Standard Specifications and the following:

Sedimentation fence shall only be used if shown on the plans or when specified by Orders of Condition or other permit requirements.

When used with compost filter tubes, the tube shall be placed on a minimum of 8 inches of folded fabric on the upslope side of the fence. Fabric does not need to be trenched.

When used with straw bales, an 8-inch deep and 4-inch-wide trench or V-trench shall be dug on the upslope side of the fence line. One foot of fabric shall be placed in the bottom of the trench followed by backfilling with compacted earth or gravel. Stakes shall be on the down slope side of the trench and shall be spaced such that the fence remains vertical and effective.

Width of fabric shall be sufficient to provide a 36-inch-high barrier after fabric is folded or trenched. Sagging fabric will require additional staking or other anchoring.

Maintenance

Maintenance of the sediment control barrier shall be per Section 670.60 of the Standard Specifications or per the Stormwater Pollution Prevention Plan (SWPPP), whichever is more restrictive.

The contractor shall inspect the sediment barrier in accordance with relevant permits. At a minimum, barriers shall be inspected at least once every 7 calendar days and after a rain event resulting in 0.25 inches or more of rainfall. Contractor shall be responsible for ensuring that an effective barrier is in place and working effectively for all phases of the Contract.

Barriers that decompose such that they no longer provide the function required shall be repaired or replaced as directed. If the resulting berm of compost within the fabric tube is sufficiently intact (despite fabric decay) and continues to provide effective water and sediment control, barrier does not necessarily require replacement.

Dismantling & Removing

Barriers shall be dismantled and/or removed, as required, when construction work is complete and upslope areas have been permanently stabilized and after receiving permission to do so from the Engineer.

**ITEM 767.121** (Continued)

Regardless of site context, nonbiodegradable material and components of the sediment barriers, including photo-biodegradable fabric, plastic netting, nylon twine, and sedimentation fence, shall be removed and disposed off-site by the Contractor.

For naturalized areas, biodegradable, natural fabric and material may be left in place to decompose on-site. In urban, residential, or other locations where aesthetics is a concern, the following shall apply:

- Compost filter tube fabric shall be cut and removed, and compost shall be raked to blend evenly (as would be done with a soil amendment or mulch). No more than a 2-inch depth shall be left on soil substrate.
- Straw bales shall be removed and disposed off-site by the Contractor. Areas of trenching shall be raked smooth and disturbed soils stabilized with a seed mix matching adjacent seeding or existing grasses (i.e., lawn or native grass mix).
- Sedimentation fence, stakes, and other debris shall be removed and disposed off-site. Site shall be restored to a neat and clean condition.

**Method of Measurement and Basis of Payment**

Item 767.121 will be measured and paid for at the contract unit price per foot of sediment control barrier which price shall include all labor, equipment, materials, maintenance, dismantling, removal, restoration of soil, and all incidental costs required to complete the work.

Additional barrier, such as double or triple stacking of compost filter tubes, will be paid for per foot of tube installed.

Barriers that have been driven over or otherwise damaged by construction activities shall be repaired or replaced as directed by the Engineer at the Contractor's expense.

<u>ITEM 772.160</u>	<u>ARBORVITAE - TECHY AMERICAN 4-5 FEET</u>	<u>EACH</u>
<u>ITEM 774.637</u>	<u>SPRUCE - WHITE 4-5 FEET</u>	<u>EACH</u>
<u>ITEM 775.021</u>	<u>ELM - PRINCETON 1-1.5 INCH CALIPER</u>	<u>EACH</u>
<u>ITEM 777.133</u>	<u>OAK - PIN 4-5 FEET</u>	<u>EACH</u>
<u>ITEM 778.161</u>	<u>BIRCH - RIVER 'HERITAGE' 1-1.5 INCH CALIPER</u>	<u>EACH</u>
<u>ITEM 778.411</u>	<u>CRABAPPLE - ADIRONDACK 1.5-2 INCH CALIPER</u>	<u>EACH</u>
<u>ITEM 781.263</u>	<u>HAWTHORN - WINTER KING 1.5-2 INCH CALIPER</u>	<u>EACH</u>
<u>ITEM 783.046</u>	<u>SERVICEBERRY – SHADBLOW 4-5 FEET</u>	<u>EACH</u>
<u>ITEM 783.461</u>	<u>TUPELO - 4-5 FEET</u>	<u>EACH</u>
<u>ITEM 786.031</u>	<u>JUNIPER - ANDORRA 18-24 INCH</u>	<u>EACH</u>
<u>ITEM 786.079</u>	<u>JUNIPER - COMMON 2-3 FEET</u>	<u>EACH</u>
<u>ITEM 789.333</u>	<u>BAYBERRY SHRUB - NORTHERN 2-3 FEET / #3</u>	<u>EACH</u>
<u>ITEM 789.723</u>	<u>CHOKEBERRY - BRILLIANT RED - 2-3 FEET / #3</u>	<u>EACH</u>
<u>ITEM 790.533</u>	<u>DOGWOOD - GRAY TWIG 2-3 FEET</u>	<u>EACH</u>
<u>ITEM 790.719</u>	<u>DOGWOOD - SILKY 2-3 FEET / #3</u>	<u>EACH</u>
<u>ITEM 794.319</u>	<u>SUMAC - FRAGRANT - 'GRO LOW' 18-24 INCH SPREAD</u>	<u>EACH</u>
<u>ITEM 794.733</u>	<u>SUMMERSWEET 2-3 FEET</u>	<u>EACH</u>
<u>ITEM 795.011</u>	<u>VIBURNUM - ARROWWOOD 2-3 FEET</u>	<u>EACH</u>
<u>ITEM 795.085</u>	<u>VIBURNUM - 'BAILEY COMPACT' 2-3 FEET</u>	<u>EACH</u>
<u>ITEM 795.150</u>	<u>WITCH HAZEL - FALL BLOOMING 3-4 FEET</u>	<u>EACH</u>
<u>ITEM 795.156</u>	<u>WINTERBERRY FEMALE 2-3 FEET</u>	<u>EACH</u>
<u>ITEM 796.679</u>	<u>DAYLILY - HAPPY RETURNS 1 GALLON</u>	<u>EACH</u>
<u>ITEM 796.716</u>	<u>BLACK-EYED SUSAN 1 GALLON</u>	<u>EACH</u>
<u>ITEM 796.722</u>	<u>MOUNTAIN MINT 1 GALLON</u>	<u>EACH</u>
<u>ITEM 796.726</u>	<u>SMOOTH ASTER 1 GALLON</u>	<u>EACH</u>

The work under these items shall conform to the applicable requirements of Subsection 771, PLANTING TREES, SHRUBS AND GROUND COVER, of the latest edition of the Standard Specifications.

Plant locations shown on the plans are schematic. Plants shall be located as directed by the MassDOT Landscape Architect or the Landscape Architect for the Designer of Record.

Planting at Roundabout and Planting Shown on Landscape Plan Sheet 4 surrounding Stormwater Basin #2 may be reduced or eliminated based on whether a maintenance agreement is in place prior to the time of planting and/or as reviewed in the field by MassDOT landscape architect.

Tree trunk guards shall be supplied and installed at all deciduous trees. Tree trunk guards shall be expandable, made of corrugated plastic, 2 feet in length and a diameter that is a minimum of one-half inch larger than the caliper of the tree. Tree trunk guards shall not be tied or otherwise secured in a manner that does not allow for expanded tree trunk growth. Tree guards will be incidental to this item.

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**ITEMS 772.160 through 796.726** (Continued)**Planting**

As shown in the Details, soil shall be carefully removed to expose the root flare of all B&B and container plants. Container plants shall be scored and girdled roots shall be teased out and pruned as necessary.

Plants planted incorrectly (too deep, girdled roots, root balls not scored) shall be deemed unacceptable for payment. The problem shall be remediated, and the plants re-planted to the satisfaction of the Landscape Architect. Plants with root systems that cannot be untangled or that require such severe pruning that the plant is compromised shall be rejected on site and replaced at the contractor's expense.

Plants shall be watered prior to backfilling of planting pits and again after backfilling.

**Watering**

Watering shall meet the requirements for the MassDOT Standard Specifications. In addition, a Watering Log (available online: [Watering Log for MassDOT Plantings](#)) shall be submitted to the Engineer at the end of each week or as requested by the Engineer. Watering and submitting of the weekly Watering Log shall commence immediately following planting and shall continue until the end of the plant warranty. The Engineer shall be notified prior to watering.

Failure to submit the watering log and/or notify the Engineer will result in deductions or non-payment for plants at the Interim and Final Acceptance inspections. This may include rejection of plants that have healthy foliage at the time of inspection but have been compromised (root system loss) due to lack of water during establishment.

**Acceptance of Planting and Plant Establishment**

Inspections and acceptance of planting and plant establishment shall be as follows:

**Conditional Acceptance**

Following planting, the Contractor shall request an inspection for Conditional Acceptance of the plants and planting beds. The Engineer, the MassDOT Landscape Architect, and the Contractor shall inspect the plants, planting methods, and planting beds. Approval of plants and planting shall mark the beginning of the Plant Establishment Period and the one-year warranty period. Plants shall be watered and cared for as specified in the MassDOT Standard Specifications.

**Interim Acceptance**

Following Conditional Acceptance, plants and planting beds shall be cared for as specified in the standard specifications. Plants shall show healthy growth per the Standard Specifications. All weeds shall be removed (including roots) or, if approved by the Landscape Architect, weed-whacked. Watering log submissions shall be submitted and reviewed.



**ITEMS 772.160 through 796.726** (Continued)

Plants that are dead or that fail to show healthy growth will not be approved for Interim Acceptance. As determined by the Engineer, those plants shall be immediately replaced, or shall be deducted from the contract and there shall be no further payments made.

Inspections for Interim Acceptance shall be conducted by the Contractor, the Engineer, and the MassDOT Landscape Architect and shall be according to the following schedule:

**Spring Planting:** Plants and planting beds shall be inspected following the first full growing season (June – August) after planting.

**Fall Planting:** Plants and planting beds shall be inspected the following spring (April– June) for Spring Interim Acceptance. Plants and planting beds shall be inspected again at the end of the growing season for Fall Interim Acceptance. This inspection shall take place between August 15 - September 10 or as otherwise determined by the Engineer, in order to allow for place replacements.

**Final Acceptance:** One year following Conditional Acceptance (end of the plant warranty period), plants shall be inspected by the Contractor, MassDOT Landscape Architect and the Engineer. Plants shall show healthy growth meeting the MassDOT Standard Specifications and planting beds shall be free of weeds. Formal planting beds shall be weed-free (no roots) and have a neat appearance.

No payment will be made for plants that are dead or that fail to show healthy growth.

**Payment Schedule**

Upon approval of plants at each inspection, payment shall be as follows:

**Spring Planting:**

- 40% upon Conditional Acceptance
- 40% upon Interim Acceptance which will include submission and approval of watering logs
- 20% upon Final Acceptance

**Fall Planting:**

- 35% upon Conditional Acceptance
- 10% upon Spring Interim Acceptance
- 35% upon Fall Interim Acceptance which will include submission and approval of watering logs
- 20% upon Final Acceptance

**ITEMS 772.160 through 796.726** (Continued)

**Basis of Payment and Measurement**

Items 772.160 through 796.726 will be measured and paid for at the respective contract unit prices per each for planting of the types, species and sizes called for in the bid schedule. The unit prices per planting item shall include furnishing and delivering all plants, furnishing and delivering prepared backfill soil, mulch, fertilizer, excavation for plant pits, backfilling, planting, pruning, guying and staking, tree trunk guards, mulching, weeding, watering, cleanup, plant establishment work and care including replacements, and for all labor, equipment, tools and incidental costs required to complete the work prescribed in this section.

Mulching will be paid for under Item 767.6 Aged Pine Bark Mulch.

**ITEM 801.42**

**4 INCH ELECTRICAL CONDUIT**  
**- TYPE NM (DOUBLE)**

**FOOT**

The work under this item shall conform to the relevant provisions of Subsection 801 of the Standard Specifications.

The work under Item 801.42 includes the procurement and installation of 4” diameter Cable TV conduits as shown on the Plans. All hangers, connection hardware, and other appurtenances required for installation will be incidental to Item 801.42.

Installation of the conduit shall be in accordance with the requirements and design specifications of the utility owner (Charter). All materials procured for the work shall be from a supplier approved by the utility owners, or from an approved equal supplier whose products meet all specifications of the utility owners. No design of the conduits themselves (expansion joint locations, anchors, adapters, elbows, etc.) has been performed at this time. The Contractor is responsible for coordination of any design and approval of the chosen conduit system through the utility owners or material suppliers. No additional payments will be made for material or installation which is rejected by the utility owners for failure to comply with their specifications.

Design and coordination with the utility owner is incidental to Item 801.42.

Any concrete encasement required to encapsulate the conduits as noted on the plans is incidental to Item 801.42.

**Wiring**

Procurement and installation of all wiring is the responsibility of the utility owners, who will perform the work at a later date after the Contractor completes installation of the conduits. The Contractor shall coordinate his/her activities with the utility owners to allow for installation of the wiring.

**METHOD OF MEASUREMENT AND BASIS OF PAYMENT:**

Item 801.42 will be measured and paid for as per Subsections 801.80 and 801.81.

**ITEM 804.31****3 INCH SCHEDULE 80 PVC CONDUIT****FOOT**

Work under this Item shall conform to the applicable provisions of Subsection 801 of the Standard Specifications and the following, Schedule 80 pipes shall be used for this item.

Conduits installed crossing under existing guardrail shall be installed at a minimum depth to top of conduit of 7.5 feet below the top of guardrail post elevation resulting in a minimum burial depth of 1 foot below the bottom of guardrail post depth.

Conduits installed crossing under proposed guardrail shall be installed at a minimum depth to top of conduit of 4.5 feet below existing ground level resulting in a minimum burial depth of 1 foot below the bottom of guardrail post depth.

Clearing and grubbing as required for the proposed conduit installation area shall be included in the conduit item. Clearing and grubbing shall conform to the applicable standard provisions of Subsection 101.

Removing and disposing existing chain link fence as required for the proposed conduit installation shall be included in the conduit item.

Patching and surface restoration of the disturbed concrete sidewalks, loam borrow, seed, and fine grading, etc. to match the surrounding surfaces in kind shall be included in the conduit item. Concrete islands and sidewalks that are disturbed shall be replaced with 4" cement concrete and a minimum of 8" gravel as detailed in the plans.

Saw cutting concrete as required shall be included in the conduit items.

Paved waterways that are disturbed or removed in the installation of electrical conduit shall be replaced under Item 804.31 and shall adhere to Construction Standard E 211.3.0 in the MASSDOT Construction Standard Details.

**Method of Measurement and Basis of Payment**

Item 804.31 will be measured and paid for at the Contract unit price per Foot, complete in place, which price shall include all labor, materials, equipment, excavation, surface restoration and incidental costs for conduit furnishing and installation.

All required or incidental work including saw cutting, excavation of trench, installation of conduit, detectable warning tape, adhesive, couplings, elbows and other fittings, sand, backfill, compaction, concrete, tack coat, and loam and seed will be incidental to Item 804.31, 3 Inch Schedule 80 PVC Conduit for complete in-place conduit.

Excavation for ledge or obstructions required to install conduits will be paid for separately under Item 144. 'Class B Rock Excavation'.

**ITEM 811.23**

**ELECTRIC HANDHOLE – SD2.023**

**EACH**

Work under these Items shall conform to the relevant provisions of Subsection 801 of the Standard Specifications and the following:

The handholes shall be installed as indicated on the plans and as directed by the engineer.

- a. The handholes shall be heavy duty meeting HS-20 loading requirements.
- b. The covers shall have “MASSDOT ELECTRIC” professionally engraved into the cover on the electric handholes.
- c. The handholes shall have at least one 4-inch knockout on each side of the handhole.
- d. 6 inches of  $\frac{3}{4}$ ” crushed stone shall be placed at the bottom of the handholes.
- e. All conduits entering the handholes shall be grouted with shrink proof cement grout.
- f. Patching and surface restoration of the disturbed area including loam borrow, seed, and fine grading, etc. to match the surrounding surfaces in kind shall be included in the handhole item.
- g. All handholes shall have recessed hex head #316 stainless steel cap screws or bolts to secure the cover in place.

**Method of Measurement and Basis of Payment**

Items 811.23 will be measured and paid for at the Contract unit price per Each handhole furnished and installed, complete in place, which price shall include all excavation, crushed stone, grout, fittings, fasteners, and all incidental costs required to complete the work..

**ITEM 813.40**  
**ITEM 813.41**  
**ITEM 813.435**

**WIRE TYPE 8 NO. 10 DIRECT BURIAL**  
**WIRE TYPE 8 NO. 8 DIRECT BURIAL**  
**WIRE TYPE 8 NO. 3 DIRECT BURIAL**

**FOOT**  
**FOOT**  
**FOOT**

The work under this item shall conform to the relevant provisions of Subsection 813 of the Standard Specifications and the following:

The work shall include furnishing and installing wiring systems for highway lighting system in accordance with the plans and as required by the Engineer.

Materials

- Description: Single conductor insulated wire, stranded (for No. 8 and larger), solid (for No. 10).
- Conductor: Copper
- Insulation: ANSI/NFPA 70, Type XHHW-2

Wire and Cable

Wiring for the new lighting system shall be type XHHW-2 rated at 600 volts with a maximum conductor temperature of 90°C in dry and wet locations. Connection at each lighting pole and fixtures shall utilize fused quick disconnects.

Fuse in the Pole Base

Install an In-line fuse holder in the pole base as specified in the plans and as directed by Engineer/ MassDOT D3 Electrician.

Circuit Identification

Provide all material, equipment and labor to install the electric wires and cables as indicated and as specified. Perform work in accordance with the NEC and local and state codes and requirements. The Contractor shall furnish and install colored tapes and identification tags on all lighting conductors at the points where they connect to equipment and on cables in all handholes. The colored tapes shall cover a 6-in. portion of the conductor at these points and shall be identified as follows:

SYSTEM VOLTAGE	PHASE A	PHASE B	PHASE C	NEUTRAL	GROUND
480/277V	Brown	Orange	Yellow	White	Green
240/120V	Black	Red	-	White	Green

Identification tags shall be nylon or other suitable non-metallic material, not less than 3/4 in. in diameter, and not less than 1/32 in. thick. Identification markings shall be stamped on the tags by means of small tool dies. Each tag shall be securely tied to the proper conductor by nylon or other suitable non-metallic cord (plastic or nylon).

**ITEMS 813.40, 813.41 & 813.435** (Continued)

Installation

The contractor shall:

- Unless otherwise indicated, use no conductor smaller than No. 12 AWG for power.
- Pull all conductors into raceway at the same time.
- Use suitable cable fittings and connectors.
- Neatly train and lace wiring inside junction boxes, equipment and panelboard.
- Make splices, taps and terminations to carry full ampacity of conductors with no perceptible temperature rise.
- No wires or cables are to be installed prior to submittal and acceptance of material specified. Support cables in riser conduits at intervals as required by the NEC.

Testing of cables

The following test procedure shall be performed by the contractor in the presence of the Engineer in accordance with the Standard Specifications. The cost of equipment, labor and materials to perform such testing and similar retesting following repairs replacement or adjustment shall be at no additional cost to the total sum bid.

The ground rod resistance to earth ground shall be tested to meet MassDOT minimum requirements of not more than 25 ohms. If ground rod does not pass the test, then additional ground rods shall be driven and connected in parallel. Field cable shall be checked for isolation resistance between all wires with a 1000 V.D.C Merger test device. This reading shall not be less than 2000 mega-ohms. The contractor shall perform testing of the equipment grounding system in the presence of the Engineer in accordance with the Standard Specifications.

Method of measurement

Items 813.40, 813.41 and 813.435 will be measured for payment by Foot as specified in MassDOT standard specification subsection 813.80.

Basis of Payment

Items 813.40, 813.41 and 813.435 will be paid for at the respective contract unit prices per Foot as specified in MassDOT standard specification subsection 813.81.

**ITEM 813.801 POWER SERVICE CONNECTION – I-395NB-CCTV-2.4 LUMP SUM**

Work under this Item shall conform to the relevant provisions of Subsection 813 of the Standard Specifications and the following:

As soon as notice to proceed with construction is given, the Contractor shall submit a request to the servicing utility companies for electrical service on behalf of the MassDOT in accordance with the NEW ELECTRICAL SERVICE section within these Special Provisions. The Contractor must obtain an electrical work permit from the City or Town in which electrical work will be performed in/or on MassDOT Facilities and roadways.

The Contractor shall arrange to complete the power service connections identified in the plans and be responsible for all permit fees incidental thereto.

All unknown utility costs shall be considered reimbursable costs to be paid under Non-Bid Item (Specialty Services) included in this Contract.

The unknown utility costs include only the fees the power company will charge to make the connection at the proposed service point defined as the work required for the utility to connect service to the contractor's installed

- 1) service riser on the power service pole or
- 2) conduit within the utility power manhole. The cost for this item includes, but not limited to, work not shown on the plans that is required by the power company such as upgrading existing poles, installing new poles and/or transformers.

The Contractor shall be responsible for payment to each utility for the actual costs incurred for the labor, material, and equipment necessary to perform the above work and seek reimbursement from the Department. Reimbursement will not be made to the Contractor until after the site is powered and a detailed item and installation cost is submitted to MassDOT. The Contractor shall submit proof that payment has been made to the utility and the Department will reimburse the Contractor under -Non-Bid Item – Specialty Services included on this Contract for all such costs as approved by MassDOT. Within two weeks from issuance of payment by MassDOT, the Contractor shall submit proof that payment has been made to the utility. Failure of the contractor to provide proof of payment within the two-week period will result in the following: (a) the removal of the prior payment from the subsequent estimate; and (b) all future payments will be made on a reimbursement basis, based upon the receipt of a cancelled check. The department shall not pay any administrative charges, nor shall pay charges for debit accounts if such accounts are required by the utility.

A meter socket approved by the servicing utility company shall be furnished and installed at the location identified in the plans for new public utility services. The meter socket for National Grid sites shall be in accordance with the 2022 National Grid Specifications for Electrical installers and include a by-pass lever.



**ITEM 813.801** (Continued)

The service connection shall include the items identified in the plans to establish a power service connection to each equipment site. Items shall include a meter socket; a three wire single phase or four wire three phase solid neutral disconnect(s) of the size noted; breakers and panels, step-up and step-down transformers, breaking into existing ground transformers, wood poles as identified on plans (poles will be installed by the power company), the power wires from the identified power service point to the ITS equipment cabinet regardless of the meter location; cable and ground assembly, and all miscellaneous conduit and connections not specifically itemized for separate payment; all installed in accordance with the NEC, servicing utility and the Department requirements. Wiring shall be Type XHHW-2 with XLP jacket between the power service connection points and the ITS controller cabinet meeting the applicable requirements of the National Electric Code (NEC) and the MassDOT Standard Specifications. Wire and cable size shall be as specified in the Contract Plans or as directed by the utility company, unless otherwise specified.

All enclosures shall be made of Grade 316 stainless steel.

All costs associated with obtaining electrical service for this project, including the above-mentioned reimbursable costs and the non-reimbursable costs of both monthly electrical service fees and permits, shall be paid by the Contractor until Final System Acceptance is obtained from MassDOT.

Cable for power distribution shall be plastic covered cable. Grounding conductors shall be the size and type specified in the Contract Documents. Connection to equipment grounding system shall be made with suitable lugs at all grounding bushings.

The Contractor shall arrange a meeting with the Engineer and the local utility company representatives to establish a schedule for utility connections before any equipment or material is ordered. The Contractor shall make the necessary arrangements with the utility companies or the Engineer to ensure needed power service is available at the time of equipment testing and turn-on. Any utility energizing, connection, or disconnection delays will not be a valid reason for a time extension. Difficulties in securing utility company services are to be reported to the Engineer at the earliest possible time.

The Contractor shall furnish and install a service riser on the power service pole in conformity with the plans and in accordance with the local utility company's requirements paid as part of this work. All exposed conduits shall be galvanized rigid steel unless otherwise noted in the plans. For underground connections, the Electric Company servicing the area will provide a stub out from their facility and perform the actual connection of the service at its power source. All steel sweeps, ducts, wiring, and all necessary labor, materials and equipment required to install the electric service, complete in place, shall be furnished by the Contractor.

National Grid Poles – The Contractor shall not install a weatherhead atop the service pole mounted disconnect switch. Instead the contractor shall install a weathertight 3 wire sealing bushing in the top of the disconnect or within a small section of conduit above the disconnect for straight wire path. The bushing shall have a neoprene sealing ring and consist of galvanized steel or stainless steel disc and locking collar.

**ITEM 813.801** (Continued)

The Contractor shall install a ground rod and ground wire at each new pole and any existing service pole that does not include a ground rod and wire. Contractor shall coordinate with the Utility Company and shall leave 30 feet of coiled ground wire at the base of the pole for installation by the servicing utility company.

**Basis of Payment**

Item 813.801 will be paid for in accordance with the NEW ELECTRICAL SERVICE section within these Special Provisions and at the respective Contract unit price Lump Sum for all service connections and equipment listed above with all appurtenances in acceptable operating condition, which price shall include all labor, materials, equipment, monthly electrical service fees, permits, and all incidental costs required to complete the work. All additional work called for herein which is required to complete the service connections shall be considered incidental to the construction. The Contractor will be reimbursed for any unknown utility cost under Non-Bid Item -Specialty Services included on this Contract and as clarified in the special provisions.

**ITEM 813.81****SERVICE CONNECTION (UNDERGROUND)****LUMP SUM****General**

The work under this item shall conform to the relevant provisions of Subsection 813 of the Standard Specifications and the following:

This work consists of furnishing and installing underground service connection, meter socket, panelboard with main breaker, contactors, and all miscellaneous equipment necessary to provide a power distribution and control center for load center located at Gore Road. Existing utility company is National Grid. The contractor shall coordinate with National Grid for service connection from the nearest utility pole to the proposed load center location.

The service shall be rated 277/480 Volt, three phase 4 wire. An exterior main circuit breaker and panelboard with main lug only and 18 spaces for branch circuit breakers shall be provided. A 277V rated 30A 1-pole (total of 12 poles) mechanically held lighting contactors shall be provided and shall be activated by photocell and astronomical timeclock control. Photocell shall be installed inside the cabinet behind a lexan window, facing North.

Any conduit, hardware, wiring and incidentals necessary to construct a complete functional load center shall be furnished and installed by the Contractor.

The lump sum price for 823.60 shall include photocell and incidentals to provide a complete and functional load center.

A National Grid work request #30777332 was generated for design purposes on this project. This number is provided for reference only and should not be used for construction.

**Service Cabinet Housing**

The housing for the highway lighting load center shall be a free-standing double door enclosure mounted to concrete pad with a minimum height of 36" as per MassDOT standard drawing SD3.020. The enclosure shall be manufactured from 12-gauge 316 stainless steel with all seams continuously welded and ground smooth. The enclosure shall be UL 508A listed and NEMA 3R. The enclosure roof shall be sloped to provide rainwater run-off. Enclosure doors shall open to a minimum of 150 degrees. Door handles shall use a 3-point latching system and can lock by padlock.

The interior of the enclosure shall have two (2) 24" strip mounted LED light fixtures mounted to the interior top portion of the enclosure to provide convenience lighting. These lighting fixtures shall be controlled by a standard 15 ampere toggle switch mounted to the load center enclosure's interior. A 500-watt (minimum) heater shall be installed within the enclosure to minimize condensation within the enclosure. The heater shall have a variable thermostat to allow for automatic operation.

The enclosure shall be constructed with copper ground busses as shown on the Contract Documents with proper standoffs.

Work to furnish and install the Lighting Load Center shall be paid for under Item 823.60.

**ITEM 813.81** (Continued)

The enclosure shall have a minimum of eighteen (18”) of free gutter space at the bottom to allow for transition of cable from underground raceways to load centers above. The enclosure shall house all circuit breakers, transformers, contactor assemblies, thermostats, switches, and all appurtenances to provide a complete system. All devices that have exposed live parts shall be concealed by stainless steel (type 316) panels. Device handles, enclosures, and housings that are not live shall protrude through these panels to provide a finished look.

The exterior door of the load center shall have an identification panel that displays the MassDOT logo, load center number, and corresponding voltages of available interior services.

The exterior door of the load center shall provide a sleeve (on the interior portion of the door) for circuit directory of each load center. All circuits are to be defined in the circuit directory with cable size.

**Submittals**

Contractor shall submit a single document for review, detailing the full interior and exterior layout of load center along with conduit penetration details.

**Basis of Payment**

Item 813.81 will be paid for as per Subsection 813.80 and to the requirements of these specifications.

The lump sum amount will include all labor, tools, equipment, materials, including wiring, conduit, disconnect switches, fuses, mounting hardware, bolt covers, connections, on new foundations and all incidental costs required to complete the work.

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<b><u>ITEM 815.1</u></b>	<b><u>TRAFFIC CONTROL SIGNAL</u></b>	<b><u>LUMP SUM</u></b>
	<b><u>LOCATION NO. 1</u></b>	
<b><u>ITEM 816.02</u></b>	<b><u>TRAFFIC SIGNAL RECONSTRUCTION</u></b>	<b><u>LUMP SUM</u></b>
	<b><u>LOCATION NO. 2</u></b>	

The work to be done under these items shall consists of furnishing and installing Traffic Signal Control Devices in accordance with the applicable portions of Section 800 of the Standard Specifications, the 2009 Manual on Uniform Traffic Control Devices (MUTCD), and the MassDOT amendments to the MUTCD, as amended and supplemented by the following:

The work shall include the furnishing and installation of all or part of the following items at the two locations listed below: traffic signal controller and cabinet mounted on a foundation; signal posts and foundations; mast arm assemblies with anchor bolts and foundations; vehicle signal heads; non-louvered backplates; 360 degree video detection; pedestrian signal heads and push button assemblies; ethernet radio units; managed ethernet switches; all cable and wiring; ground rods, equipment grounding and bonding; pull boxes; power service connections; and all other equipment, materials and incidental costs necessary to provide a complete, fully operational traffic control signal system as specific herein and as shown on the plans.

This contract includes the following locations:

**Location 1:** East Main Street (Rte. 16) at I-395 SB Ramps

**Location 2:** East Main Street (Rte. 16) at Worcester Road (Rte. 12)/Thompson Road (Rte. 193)

Work at Location 1, East Main Street at I-395 SB Ramps which currently is a stop-controlled intersection, consists of installation of a new traffic control signal system, complete in place and operational, as shown on contract plans and as specified herein.

Work at Location 2, East Main Street at Worcester Road/Thompson Road which currently operates under signalized conditions, consists of installing ethernet radio unit with antenna, managed ethernet switch and modifying existing controllers, as shown on contract plans and as specified herein.

A list of the major components of the traffic signal system is included on the plans. Traffic signal operation and signalized intersection approaches shall be in conformance with the MUTCD throughout construction except when the intersections are under police control. The Contractor shall submit any proposed interim traffic lane and traffic signal arrangements at intersections that deviate from the existing or proposed arrangements to the Resident Engineer for approval.

#### Shop Drawings

Within 30 days following the Notice to Proceed, the Contractor shall submit shop drawings for signal supports, a list of equipment, and manufacturer's equipment specifications to the Engineer in accordance with the relevant provisions of Section 815.20.

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**ITEMS 815.1 & 816.02** (Continued)

No work shall commence by the Contractor until approval of the shop drawings and manufacturer's data has been received in writing from the Engineer. Approval of these drawings will be general in character and shall not relieve the Contractor from the responsibility of, or the necessity of, furnishing materials and workmanship conforming to the plans, standard specifications, and these special provisions.

The Contractor shall deliver to the Engineer a certificate of compliance with the manufacturer for all materials purchased from the manufacturer.

**Existing Installations**

Existing signal installations to be reconstructed under Item 816.02 shall be maintained in operation throughout construction and until the new signals are ready for operation. The Contractor may use temporary supports for signal heads as necessary to allow construction activities.

Any temporary installations shall be always in conformance with the MUTCD. If an existing signal is to be turned off temporarily to allow controller switch over or rewiring, police detail shall be used to control traffic at the intersection.

Once construction is completed and the new signals are in operation, unused items of the old signals shall be completely removed and stacked as directed by the Engineer in accordance with Section 815.65. Old cable and unusable materials shall be disposed of by the Contractor.

**Service Connections**

Existing service connection (shown on the plans) for the traffic control signal shall be utilized. The Contractor shall coordinate with the servicing utility to complete service connections and be responsible for all charges incidental thereto including installation of transformers if required.

**Testing of Grounding System**

The Contractor shall perform testing of the equipment grounding system in the presence of the Engineer in accordance with MassDOT Standard Specifications.

**Flashing Operation**

Changes from automatic flashing to stop-and-go operation and from stop-and-go to automatic flashing operation shall occur as set forth in Section 4D-12 of the MUTCD. Flashing yellow arrow operations shall be in conformance with Section 4D.18 and 4D.20 of the M.U.T.C.D.

**Signal Cable & Wiring**

The cable shall include IMSA 19-1 or 20-1 cable. Proper cable termination at signal heads, control cabinet and junction points shall be performed by the Contractor. Proper termination is defined as forming the required conductors and connecting them to the appropriate terminals within the signal heads, control cabinet or junction points where appropriate. Any splicing of cable shall be in conformance with Subsection 813.60 C. - Splicing.

All cables & wires shall comply with Subsection 813.

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**ITEMS 815.1 & 816.02** (Continued)**Traffic Signal Equipment**

The traffic signal controller units (CU), malfunction management units (MMU), detector amplifiers, cabinet power supply, bus interface units (BIUs) and all other ancillary traffic signal control components included in the traffic control cabinet shall comply with the National Electrical Manufacturers Association (NEMA) Standard No. TS 2-2021, Traffic Controller Assemblies with National Transportation Communications for ITS Protocol (NTCIP) Requirements – Version 03.08.

**Traffic Signal Controller**

The traffic controller supplied shall conform to Section 3 “Controller Units” of the NEMA TS 2 Standard. The traffic controller shall be supplied in a TS 2 Type 2 Configuration as required in the list of major traffic signal items included on the plans for each intersection location. Specifically, the controller unit (CU) shall be supplied as an actuated controller; defined as Type A1 in Subsection 3.2 of the NEMA TS 2 Standard.

The controller shall utilize an interface conforming to Subsection 3.3 of the NEMA TS 2 Standard. The controller unit shall utilize an input/output interface conforming to the requirements of part of Paragraph 3.3.1 for all input/output functions with the Malfunction Management Unit (MMU) and Paragraph 3.3.5 for input/output functions with the Terminal Facilities (TF), loop detector amplifiers and auxiliary devices.

The controller unit shall be a shelf-mounted, keyboard-entry, menu-driven unit and conform to the Standard Specifications, with internal time base coordination, emergency preemption, and programmatic capability. The controller shall be complete with a module, including modem card and physical connector, to support closed-loop communication.

The local system intersection controller shall include all the following internal functions:

- 1) Full software support with the control and data protocol of an on-street master and central-office traffic signal management software.
- 2) Local time-based scheduler including automatic accommodation for daylight savings time.
- 3) Local time-based coordination control.
- 4) Local preemption control with at least twelve programmable internal preemption sequences.
- 5) Data upload and download support.
- 6) Process system and local intersection detector activity and accumulate samples of vehicle counts, occupancy, speed, stops, and delay.
- 7) Perform extensive failure evaluation of the controller, detectors, and communications.
- 8) Provide local control of remotely selected NEMA and special functions.

**ITEMS 815.1 & 816.02** (Continued)

- 9) Controllers shall provide Adaptive Maximum green time operation. They shall operate as follows; after a phase maxes out twice in a row and on each successive max out thereafter, one step value will be added to the Adaptive Max until the value of the Dynamic Max is reached. Returning to Normal Max shall be achieved in the same fashion. After a phase gaps out twice in a row on each successive gap out thereafter one step value, and only one step value, will be subtracted from the Adaptive Max until the value of the Normal Max is reached.

All controllers shall include a Linux engine board, and a 10 Base-T Ethernet port which is IP addressable to function in an Ethernet-based system. All controllers shall also include a USB port.

To minimize training and simplify local programming, all local parameter access shall utilize prompting and English language displays, and all codes needed by the user, if any, shall be on the front panel or on the display screen to avoid the need for memorization or the presence of a manual.

Traffic Controller Cabinet

The controller cabinets shall conform to the NEMA TS 2 Type 1 Standards, Section 7. Cabinet size shall be as shown below. It should be noted that approximate cabinet dimensions are in inches.

<u>Item Number</u>	<u>NEMA TS 2 Cabinet Type</u>	<u>Cabinet Size (Nominal) (HxWxD*)</u>	<u>Back Panel</u>	<u>Mounting</u>	<u>Malfunction Management Unit</u>
815.1	6	55 x 44 x 26	16-Position	Ground	16 Channel

\* Approximate cabinet dimensions are provided in inches.

The control cabinet shall be made of aluminum with and interior and exterior brushed aluminum finish. The cabinet shall contain a second fan for additional cabinet cooling.

The cabinet shall also be wired with a normally closed switch connected to a user-defined input to the controller for remote monitoring of the control cabinets' door open status.

Controller cabinet foundations shall not obstruct a sidewalk or crosswalk so that passage by physically challenged persons is impaired.

Provisions shall be made for manual override of the traffic controller. Manual override equipment shall include an automatic-manual switch and interval advance hand pushbutton switch, both located within the auxiliary police door. The hand pushbutton switch shall have a flexible cord of sufficient length to allow movement by the operator to observe the operation of the intersection from the controller cabinet.



**ITEMS 815.1 & 816.02** (Continued)

The following requirements are applicable to each signalized location and are designed for the effective use of a laptop computer in conjunction with traffic signal controllers. These requirements are also designed to permit all engineers, electricians, and technicians (including those who are disabled, but ambulatory) to work in the cabinet in a safe, effective and comfortable manner. To this extent, the following meets applicable ADA requirements.

1. Furnish and install one slide-out/slide-in shelf appropriate for the size and load of a laptop computer.
2. Furnish and install a paved pad in front of the control cabinet. This pad shall be constructed of cement concrete (4000 PSI,  $\frac{3}{4}$  Inch, 610 Cement Concrete), built in accordance with the sidewalk specification applicable to this project, approximately level, approximately 1" above the surrounding unpaved surface, or at even grade with the adjacent surface if paved. This pad shall abut the front of the cabinet, project at least 1-foot to each side of the cabinet and at least 3-feet in front. No pad is required if the front of the cabinet immediately abuts an existing or proposed paved sidewalk or other paved surface.
3. Both the firmware and software version in each control unit shall be the same throughout the project and shall be the latest version available on the market.
4. The contractor shall furnish one 6-foot CAT5e cable with each new controller unit to connect a laptop computer to the controller unit. This cable shall have RJ45 terminations on each end.
5. Payment for the work described above shall be deemed to be incidental to and included in the prices bid for various items of traffic signal work, and no additional payment shall be made for the work described above.

**Field Monitoring Unit (FMU)**

The FMU shall be manufactured by Applied Information (AI), Model AI-500-085-02 FMU with 4G Video and 4-Port Ethernet Switch, or approved equivalent. If another product is proposed, Contractor shall submit a test unit to the agency for evaluation along with conducting a live demonstration of the FMU functionality and shall submit test plans demonstrating the proposed device meets or exceeds all items in this specification prior to acceptance.

**This work shall consist of furnishing, installing, configuring, and testing an FMU that meets the following requirements:**

1. The work under this section specifies the requirements for the FMU. The FMU shall operate independent of the brand/type of intersection controller, video or thermal detection system and battery backup system (if applicable) deployed in the traffic cabinet.
2. The FMU shall function correctly between -34 degrees C and +74 degrees C.

**ITEMS 815.1 & 816.02** (Continued)

3. The FMU shall have at least five (5) other FMU installations within the New England area.
4. The FMU shall be provided with appropriately rated connectors that allows the FMU to be exchanged by unplugging connectors, without tools.
5. The Contractor shall develop a test plan that fully demonstrates that all requirements as defined in these specifications have been met. The test plan shall define in detail each test, and the expected result of each test. The test plan shall be submitted as part of the shop drawings and shall be subject to revisions based on review and comment by the agency and the design consultant. Where applicable, the Contractor shall provide manufacturer certificates of compliances to verify that the unit supplied meets a specific requirement.
6. The FMU shall monitor and log all Controller and cabinet faults and/or alarms.
7. The FMU shall be wired directly to the cabinet.
8. The FMU shall have an internal cellular modem running at 4G LTE.
  - 8.1. The Cellular modem shall be designed to be replaced / upgraded to 5G service when available.
9. The FMU shall incorporate an integrated GPS and cell modem.
10. The configuration of the FMU shall be accomplished by accessing the internal web server with a browser. It shall be possible to configure the FMU without any special software.
11. The FMU shall be powered via a standard 120 VAC input power.
12. The FMU shall allow for the routing of the controller configuration packets to and from the controller by Ethernet for any type of controller utilized by the agency. In this way, it shall be possible to configure the controller and utilize the controller specific software to interrogate the controller, and the FMU shall provide the redundant communications pipeline (where applicable) which allows this to be accomplished.
13. The FMU shall be connected via a RJ-45 Ethernet cable to the Ethernet Switch (if applicable).
14. The FMU shall be configured to allow for the remote display and control of the connected traffic signal controller via the FMU manufacturer cloud hosted web-based software. This feature shall not require the end user to create a separate VPN connection to the FMU.
15. The FMU shall be configured to provide access to view the detection system, including the video image of each approach, via the FMU web-based software. This feature shall not require the end user to create a separate VPN connection to the FMU.
16. The FMU shall perform a load test of the connected Battery Backup System (BBS) batteries on a scheduled or on demand basis (if applicable).

**ITEMS 815.1 & 816.02** (Continued)

17. The FMU shall, within the size limitations above, include a battery and battery charging/monitoring circuit to allow the FMU to function correctly even when all power to the intersection has failed. The battery shall continue to power the FMU for a minimum of 5 hours after all power has failed to the intersection.
18. The FMU shall incorporate an integrated GPS which will allow the FMU to geo-locate itself on the FMU management software map, without configuration.
19. The FMU shall be connected to the traffic signal controller to provide for GPS time sync pulse for the traffic signal internal clock.
20. The FMU shall operate without requiring a static IP address. The only configuration required at the FMU is to enter the URL of where the FMU management software is hosted.
21. In the event that the cell service is interrupted or is not available, the FMU shall store any events that occur in its internal memory and forward these events automatically to the FMU management software when the cell service is restored. In this way, a complete record of events at the device can be maintained even if cell service is interrupted for a period of time. The system shall store 5,000 events.
22. The FMU shall utilize HTTP and HTTPS protocols, and XML data structures, for communication with the FMU management software. In this way the data shall be scalable for future expansion and competition. The use of custom proprietary protocols is not permitted.
23. The FMU shall include Ethernet communications via an Ethernet Port with RJ45 connector.
24. The FMU shall include an integrated four port Ethernet switch.
25. The FMU shall be supplied and installed to include weatherproof antennas to support operations.
26. The FMU shall be supplied, installed, and configured by the Contractor with map display management software that has the following features:
  - 26.1. The FMU shall include a scrollable, zoomable map display, with the intersections and other monitored devices shown as representative icons on the map. The map shall include the ability to see the intersections using Google Streetview or similar.
  - 26.2. The alarm status of the intersection shall be clearly indicated on the icon on the map so that the user can see at a glance which intersections are in an alarm condition.
  - 26.3. The map display shall also include a list of intersections, with the number and priority of alarms indicated on the list. Intersections in high priority alarm shall be moved to the top of the list, followed by medium priority, low priority and then finally by intersections not in an alarm state.
  - 26.4. The icons shall dynamically change to be able to clearly indicate if an intersection is offline.
  - 26.5. Clicking on the icon on the map shall expose a display window with the current parameters of the intersection shown.

**ITEMS 815.1 & 816.02** (Continued)

- 26.6. The default map display position and zoom shall be configurable by user so that the user's view will default to show the intersections that the user is responsible for managing.
- 26.7. The map view shall have the ability to show Google traffic overlays on the map.
27. The FMU shall be supplied, installed, and configured by the Contractor with intersection detail display management software that has the following features:
- 27.1. It shall be possible to drill down, either from the map icon or from the list, to a device level detail for the intersection. The cabinet shall be fully wired to support the following parameters that shall be monitored and displayed:
- 27.1.1. The alarm status, with priority indicated, and a text description of the alarm (if an alarm is present for this device).
- 27.1.2. The time since the last communication with the device.
- 27.1.3. The following parameters (real time values, minimum for the day values, maximum for the day values, and average for the day values).
- 27.1.3.1. The AC mains voltage (value)
- 27.1.3.2. The battery back-up voltage (value)
- 27.1.3.3. The cabinet temperature (value)
- 27.1.3.4. The cabinet humidity (value)
- 27.1.3.5. The presence of AC power (OK or Fail)
- 27.1.3.6. The flashing status of the intersection (OK or Flashing)
- 27.1.3.7. Stop Time status (OK or Stop Time Active)
- 27.1.3.8. The cabinet door status (Open or Closed)
- 27.1.3.9. The intersection fan status (Fan on or Fan off)
- 27.1.4. It shall be possible to view graphs of each of the value parameters in graphical form over the most recent two-week period. This includes real time graphs of:
- 27.1.4.1. The AC mains voltage
- 27.1.4.2. The battery back-up voltage
- 27.1.4.3. The cabinet temperature
- 27.1.4.4. The cabinet humidity
28. The FMU shall be supplied, installed, and configured by the Contractor with a diagnostics and log display management software that meets or exceeds the following:
- 28.1. From the device level detail within the FMU management software, it shall be possible to drill down to get the raw data; the error logs; and the communications logs to allow a technician to fault-find problems.

**ITEMS 815.1 & 816.02** (Continued)

- 28.2. It shall be able to filter the logs by Device; by Device Type and/or by Group as well as between dates.
- 28.3. It shall be able to print these selected logs to a local printer or a PDF file.
- 28.4. It shall be able to export these logs to Excel on the local computer for further analysis.
- 29. The FMU shall be supplied, installed, and configured by the Contractor with an alarm management software that meets or exceeds the following:
  - 29.1. The FMU management software shall have a comprehensive alarm generation capability.
  - 29.2. It shall be able to configure alarms to be generated on any parameter that indicates a value that is out of tolerance, including analog values, digital values, and enumerated values.
  - 29.3. Alarms shall be configurable to be of Low, High or Critical Priority.
  - 29.4. The alarm priority shall be displayed throughout the FMU management software, on all displays using color codes such as red-critical; yellow-high; and amber-low to indicate the priority of the alarm.
  - 29.5. The current active alarms shall be accessible for viewing via an expandable window, to observe which alarms are active and when the alarm occurred. The highest priority alarms shall rise to the top of the list.
- 30. The FMU shall be supplied, installed, and configured by the Contractor with alerts management software that meets or exceeds the following:
  - 30.1. The FMU management software shall have a comprehensive alerting function to enable the response personnel to be notified when an abnormal situation has occurred.
  - 30.2. It shall be able to configure alerts to one or more personnel for each alarm. This will cause, as selected, an SMS and/or an email to be sent to the person when an alarm occurs.
  - 30.3. The alert notification system shall be configurable by the system user to optionally send via email and/or via SMS message when an alarm clears.
  - 30.4. The SMS and email alerts shall be issued within 30 seconds of the occurrence of an event which results in an alert being issued.
- 31. The FMU shall be supplied, installed, and configured by the Contractor with connectivity and server management software that meets or exceeds the following:

**ITEMS 815.1 & 816.02** (Continued)

- 31.1. The contractor shall supply the FMU with the FMU manufacturers 10-year options for Connectivity and Service, as part of the purchase price. The Connectivity and Service agreement shall include at a minimum:
  - 31.1.1. Cellular Connectivity
  - 31.1.2. No cellular overage charges
  - 31.1.3. Video Streaming
  - 31.1.4. Extended warranty on the hardware for the period of the Connectivity and Service Agreement
  - 31.1.5. Over-the-air software updates
  - 31.1.6. Over-the-air security updates
  - 31.1.7. Remote Front Panel of the connected traffic signal controller
  - 31.1.8. SPaT message broadcast to mobile device application
  - 31.1.9. Future Connected Vehicles Service
- 32. The FMU shall be configured for SPaT data.
- 33. The FMU shall be supplied with the unlimited video/data streaming service.
- 34. The FMU shall be configured with Traffic Signal Controller remote front panel access.
- 35. The FMU shall be configured to supply streaming video from the detection system.
- 36. At the time of the shop drawing submittal, Contractor shall supply a detailed list of available FMU functions for the agency consideration.

**Malfunction Management Unit (MMU)**

The malfunction management units (MMU) shall comply with Section 4 of the NEMA TS 2 standard. The MMU shall be capable of operating as either a Type 16 with 16 channels (8 vehicle, 4 pedestrian, 4 overlap) or a Type 12 with 12 channels (8 vehicle, 4 overlap). The MMU's supplied shall be configured to operate as Type 16 units.

The MMU's in either the Type 16 or Type 12 configuration shall be capable of operating in a NEMA TS 2 Type 2 cabinet, a NEMA TS 2 Type 1 cabinet, or a NEMA TS 1 cabinet without loss of functionality. The MMU shall be connected directly to the controller unit to support enhanced MMU monitoring of controller operations. The MMU shall support Flashing Yellow Arrow operation.

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**ITEMS 815.1 & 816.02** (Continued)**Bus Interface Unit**

The Bus Interface Unit (BIU) shall comply with Section 8 of the NEMA TS 2 Standard. The BIU shall be fully interchangeable with any other manufacturer's unit and interchangeable in a NEMA TS 2 Type 1 cabinet assembly.

The BIU shall perform the interface function between Port 1 at the controller unit, the malfunction management unit, the loop detector rack assembly, and the back panel terminal and facilities.

As a minimum, two LED indicators shall be provided on the BIU front panel. One indicator shall serve a dual use; as a power-on indication and as a diagnostic indicator for proper operation of the device. The second indicator shall serve as a transmit indicator illuminating each time data is transmitted.

Two Spare BIUs shall be included in every new cabinet.

**Cabinet Power Supply**

A separate power supply shall be supplied and installed in the TS 2 cabinet. The unit shall be AC line powered and provide regulated DC power, unregulated AC power, and a line frequency reference for the rack-mounted loop amplifiers, bus interface units, load switches, and other auxiliary cabinet equipment as required. At a minimum, the power supply shall meet all requirements of Section 5.3.5 of the NEMA TS 2 Standard.

The power supply shall be shelf mounted.

The unit shall contain four LED indicators on the front panel to indicate the four outputs;

1. + 12 VDC +/- 1 VDC @ 5.0 amps,
2. + 24 VDC +/- 2 VDC @ 2.0 amps,
3. 12 VAC @ 250 milliamps,
4. 60 Hz line frequency reference.

A test point terminal shall also be located on the unit's front panel for +24VDC and logic ground testing.

**Load Switches**

Load switches shall comply with Subsection 6.2 of the NEMA TS 2 Standard. All load switches shall utilize optically isolated encapsulated modular solid-state relays. Discrete components on circuit boards are not acceptable.

Load switch indicator lights shall be LED-type and wired on the input side of the device.

NOTE: The controller cabinet assembly shall be initially supplied with a full complement of load switches to accommodate each available position of the back panel.

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**ITEMS 815.1 & 816.02** (Continued)**Flashers**

Flashers shall comply with Subsection 6.3 of the NEMA TS 2 Standard and be equipped with two output indicator lights which will show flashing power out to the cabinet assembly.

**Flash Transfer Relays**

Flash transfer relays shall comply with Subsection 6.4 of the NEMA TS 2 Standard. The field electrical loading for flash operation shall be wired through the transfer relays such that the load on the 2-circuit flasher is as balanced as possible within the limitations of the signal phasing.

NOTE: The controller cabinet assembly shall be initially supplied with a full complement of flash transfer relays to accommodate each available position of the back panel.

**Surge Suppression**

The Contractor shall supply and install surge suppression in the traffic controller cabinet in accordance with NEMA TS 2 Standards and the manufacturer's recommendations. At a minimum surge suppression shall be provided for video equipment, loop detectors, power service, and emergency preemption.

**Pullout Drawer**

A pullout drawer hinged at the top and having sliding tracks shall be provided in the cabinet. The drawer shall be capable of holding 18kg in weight when the drawer is extended. This drawer should be located between the controller and the power distribution assembly. Drawers with sharp intrusions will not be accepted.

**Cabinet Door Sticker**

The Contractor shall supply and install a laminated door sticker on all existing and proposed cabinets. This sticker shall be permanently affixed to the upper left-hand side of the interior main cabinet door. The sticker shall contain, at a minimum, the following:

- Vehicle detection information including detector channel assignment, phase assigned, approach and termination points.
- Network communications information for all in-cabinet devices as well as the back-up power system (if applicable). This includes IP addresses, subnet mask and MAC address.

**Video Detection**

The Contractor shall provide and install a Video Detection (VD) System, as shown on the plans and these special provisions. The VD system shall include video cameras, video processor unit, detection algorithms, all cables, connections, mounting hardware, application software, and accessories required by the manufacturer for proper operation of the system, including but not limited to surge protection devices.

This specification sets forth the minimum requirements for a detection system that detects vehicle, bicycle, and pedestrian traffic on a roadway using only video images of live traffic.



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**ITEMS 815.1 & 816.02** (Continued)**Detection System Capability***Functionality*

- a. Must support real-time detection of vehicles and cyclists in configurable detection zones.
- b. Must support the configuration of at least 150 zones.
- c. Must support both rectangular and irregular polygon shaped zones.
- d. Must ensure the detection system meets or exceeds the FDOT TERL 98% vehicle occupancy detection accuracy requirement in good setup and lighting conditions.
- e. Must support directional detection zones to reduce false detections from objects traveling opposite or perpendicular to the intended direction of travel.
- f. Must automatically adapt to poor conditions which inhibit accurate detection.
- g. Must support stop bar detection for both vehicles & bicycles.
- h. Must be able to distinguish between vehicles and bicycles and configure stop bar detection zones which can only be activated by one class of object and not the other.
- i. Must be able to configure detection zones as either pulse or presence zones.
- j. Must be able to detect & classify pedestrians and apply filtering to vehicle and bicycle zones such that they are not activated by pedestrians.
- k. Must support multiple pulse or presence zones for each approach.
- l. Must support individual lane pulse and presence zones.
- m. Must support combined lane pulse and presence zones.
- n. Must support the configuration of departure zones for road users exiting the intersection.
- o. Must utilize configurable directional filtering for detection zones.
- p. Must support delay and extend functionality per detection zone.
- q. Must support virtual actuation channels that do not actuate controller channels but can be used to populate signal performance measures.
- r. Must support the output of a constant call on all detection channels within 1 second in the event that a loss of video signal occurs.
- s. Must support automatically switching individual detection zones into alternate detection mode when high glare conditions are detected.
- t. Must support manually overriding detection information to force actuated channels into constant call, both from the roadside device and the software portal.

*Configuration*

- a. Must support secure configuration of system remotely without requiring any addition connectivity costs.
- b. Must provide full configuration history for changes made in remote platform.
- c. Must support roadside configuration of detection zones.
- d. Must support Over-The-Air software and algorithm updates without requiring manual installation.

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**ITEMS 815.1 & 816.02** (Continued)**Hardware***Intersection Camera*

- a. Must provide 360 degrees of visibility from the point of installation.
- b. Must be powered via Power over Ethernet (PoE) and be IEEE802.3af compliant.
- c. Must support configuration in both spherical “fisheye” configuration, and rectangular “quad view”.
- d. Must support at least 9-megapixel (MP) capture.
- e. Must support ability to capture 4K video.
- f. Must provide H.264 and MJPEG image compression.
- g. Must support H.265.
- h. Must support RTSP streaming.
- i. Must support third-party integration of RTSP video streams into Video Management System (VMS) platforms.
- j. Must support maximum aperture ratio of 1:1.9.
- k. Must support focal length of 1.38mm.
- l. Must include a clear polycarbonate resin-based dome.
- m. Must be rated to IP66 (NEMA 4X compliant).
- n. Must include an electronic de-humidification device for use in various weather conditions.
- o. Must support the ability for users to zoom in and out, rotate and pan the video feed.
- p. Must allow direct connection of Cat 5e cable from camera to traffic cabinet to limit number of connections.
- q. Must include lens defrost functionality with total camera power operation not exceeding standard PoE.
- r. Must utilize a NEMA temperature rated shielded PoE cable with drain wire.
- s. Must support in-line ethernet repeaters for long distance cable runs.

*Mount*

- a. Must include all mounting hardware with device for vertical and horizontal mounting.
- b. Mounting fixture must be constructed of weatherproof aluminum.
- c. Mounting hardware must support attachment via a 1.5-inch threaded fitting.

*In-Cabinet Platform*

- a. Must support up to two Intersection Cameras for coverage of larger or irregular intersections.
- b. Must have an integrated TFT color display which provides diagnostic information such as the status of all phases and detectors, as well as diagnostics on the camera IP and operational status.
- c. Must display the status of detection channels on a front panel display.
- d. Must display Transmit/Receive status of SDLC bus.
- e. Must include a USB 2.0 device port.
- f. Must support 1 x 10/100/1000 Ethernet WAN port.
- g. Must support 2 x 10/100/1000 Ethernet LAN ports.

**ITEMS 815.1 & 816.02** (Continued)

- h. Must support 3 x 10/100/1000 Ethernet LAN ports with PoE (support for 802.3af PoE and 802.3at PoE+ to a maximum of 50W across all three ports).
- i. Must include onboard processing capabilities to perform video-based vehicle detection and generation of traffic analytics.
- j. Must support 16 actuation outputs over NEMA-rated GPIO ports direct wiring with constant-call fail active capability.
- k. Must support 8 actuation outputs over NEMA-rated GPIO ports for other purposes such as preemption without constant-call fail active capability.
- l. Must support one SDLC port that meets the following criteria:
  - o. Must provide all necessary cabling to connect to a cabinet's existing Port 1/SDLC bus.
  - o. Must provide the capability to act as one or more SDLC detector racks.
  - o. Must support generating actuations on up to 64 channels over SDLC.
  - o. Must support reading terminal and facility input & outputs at a frequency of at least 10 times per second.
  - o. Must support reading channel state at a frequency of at least 10 times per second.
  - o. Must support the acquisition of MMU fault status including conflict, red failure, and clearance failure.
  - o. Must support reading information from all detectors wired into the cabinet supporting up to 100 ms resolution between detection events.
  - o. Must detect the failure of a detector in either always high or always low mode.
  - o. Must support capturing and reporting Controller Faults based on MMU status bits of 'in conflict', 'red failure', 'diagnostic failure', 'in failure state', and 'local flash'.
- m. Must have an integrated layer 2 ethernet switch to support cabinet device interconnectivity.
- n. All ethernet ports must feature in-line, auto-resetting surge protection compliant to IEC 61000-4-5 Class 4.
- o. Must have an internal LTE modem that supports remote communication for software updates.
- p. Must support Traffic Controller Interfacing via NTCIP.
- q. Must support being powered through NEMA 15-5 receptacle OR direct wire to cabinet.
- r. Must offer super capacitor-based power reserve sufficient to continue robust operation during brownouts/intermittent power loss for 5 seconds. The system must be able to safely shut down in the event of power loss.
- s. Must provide galvanic isolation between earth ground and logic ground.
- t. Must not exceed 10.5" (height), 3" (width), 10" (depth).
- u. Must support vertical and horizontal orientation for installation.
- v. Typical system power consumption should be less than 130W.

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**ITEMS 815.1 & 816.02** (Continued)*Certification Testing*

- a. Must be NEMA TS-2-2016 tested and compliant, including shock, vibration, voltage, and thermal articles 2.2.7-2.2.11.
- b. Must support NEMA operating temperature specification -34 °C to 74 °C (-29 °F to 165 °F).
- c. Must support NEMA storage temperature specification -34 °C to 74 °C (-29 °F to 165 °F).
- d. Must support humidity operating requirements of 5% - 95% RH non-condensing.
- e. External power supplies must be UL and c-UL compliant.
- f. Must be FCC tested and compliant.
- g. Must be ROHS compliant.

*Upgradability*

- h. Must support the ability to add cellular communications capability where remote communications to the entire traffic cabinet is required with an additional software license, but no additional hardware devices.
- i. Must support the ability to add cabinet monitoring for UPS and door alarms with an additional software license, but no additional hardware devices (requires communications).
- j. Must support the ability to add an additional software license for ATSPMs, but no additional hardware devices (requires communications).
- k. Must support the ability to add an additional software license for cloud-based multimodal counts and mobility dashboard and database without any additional hardware devices.

**Installation**

The cable to be used between the camera and the processor in the traffic cabinet shall be CAT5E, shielded, direct burial cable. This cable shall be suitable for installation in conduit or overhead with appropriate span wire. Shielded RJ-45 connectors shall be used where applicable. The CAT5E cable, RJ-45 connector, stripping and crimping tool shall be approved by the supplier of the video detection system, and the manufacturer's instructions must be followed to ensure proper connection.

Installation of the video detection system shall be overseen by the equipment supplier as recommended by the supplier and documented in installation materials provided by the supplier.

**Limited Warranty**

The devices shall be supplied with a standard manufacturer's warranty, transferable to the Customer. The device shall carry a warranty including parts and labor for 3 years from the date of shipment. Firmware and Software are updated for the life of the product. Firmware updates, web application updates, and security patches, shall be provided by the vendor over the term of the contract.

**Maintenance and Support**

The supplier shall maintain an ongoing program of technical support for the video detection system.

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**ITEMS 815.1 & 816.02** (Continued)**Data Plans**

Each video detection system shall be supplied with the manufacturer's 24-month plans for: Managed LTE Connectivity (up to 2 GB of data usage per month), Intersection Monitoring, and Continuous Multimodal Turning Movement Counts. The plan durations shall begin on the date of system configuration.

**Managed Ethernet Switch (MES)***General*

This specification sets forth the minimum requirements for an environmentally hardened Managed Ethernet Switch (MES) that provides connectivity to Ethernet equipment resident within the traffic signal cabinet and as shown on the plans.

*System Hardware*

The module shall support transmission utilizing Category 5 cable or better and multimode or single-mode fiber through the use of SFP modules. The module shall support the Ethernet data IEEE 802.3 protocol using Auto-negotiating and Auto-MDI/MDI-X features. The module shall feature eight 10/100TX RJ-45 ports and three 100/1000FX SFP ports. The module shall require no in-field electrical or optical adjustments or in-line attenuators to ease installation. The module shall provide power, link speed, and fiber port status indicating LEDs for monitoring proper system operation. The module shall have redundant power supply connections to minimize single-point failure. The module shall provide a serial connection for local management of the device as well as a web-based configuration and management interface hosted on the device. The module shall have a lifetime warranty to reduce system life cycle cost in an event of a module failure. The MES shall be installed in the cabinet as shown on the plans and or as directed by the Engineer.

The MES shall support the following IEEE Networking Standards:

1. IEEE 802.3 10Base-T Ethernet
2. IEEE 802.3u 100Base-TX Fast Ethernet
3. IEEE 802.3ab 1000Base-TX
4. IEEE 802.3z Gigabit Ethernet Fiber
5. IEEE 802.3x Flow Control and Back-pressure
6. IEEE 802.1p class of service
7. IEEE 802.1Q VLAN and GVRP
8. IEEE 802.1D-2004 Rapid Spanning Tree Protocol (RSTP)
9. IEEE802.3ad LACP
10. IEEE802.1X Port based Network Access Control

**ITEMS 815.1 & 816.02** (Continued)

The MES shall provide the following switch performance:

1. Switch Technology: Store and Forward Technology with 32Gbps Switch Fabric.
2. System Throughput: 14,880pps for 10M Ethernet; 148,800pps for 100M Fast Ethernet; 1,488,100 for Gigabit Ethernet
3. Transfer Packet Size: 64 bytes to 1522 bytes (with VLAN Tag)
4. MAC Address: 8K MAC
5. Packet Buffer: 1Mbits
6. Relay Alarm: Dry Relay output with 1A@24V ability

*Small Form-Factor Pluggable (SFP) Optic Modules*

The interchangeable SFP modules supplied shall support single-mode optical fiber. The optical fiber SFP modules shall support Gigabit Ethernet transmission and accommodate two fiber strands via a duplex LC optical connector. The supplied SFP modules shall operate at the 1310 nm wavelengths with optical power to support transmission up to 15 kilometers. The module shall require no in-field electrical or optical adjustments or in-line attenuators to ease installation. The module shall have a MTBF of > 100,000 hours and operate in an environment of -40° C to +75° C and relative humidity between 0% to 95% (non-condensing). The module shall be UL and ULC listed and CE marked. The circuit board shall be UL 94 flame rated and meet all IPC standards. All PC boards shall be designated with part number, PC board number and show appropriate revision number. Housing shall be of all metal construction. The module shall have a lifetime warranty to reduce system life cycle cost in an event of a module failure.

*Point – To – Point Ethernet Radio Unit*

The Contractor shall furnish, install and integrate a wireless communications system as part of the traffic signal control assembly. This wireless communications system shall consist of Ethernet radios. The antennas shall be located as shown on the plans. The wireless Ethernet radio unit shall contain provisions to link controller units to allow remote computer monitoring and control capabilities.

The radio shall be a 5.8 GHz point-to-point wireless broadband Ethernet system for ITS communications. 5.8 GHz is to be used for broadband connectivity applications. The system shall consist of connectorized radios and/or radios with integrated panel antennas. All radios and antennas shall all be the same as to make and model. The following specifications are the minimum requirements for the 5.8 GHz broadband wireless network.

**GENERAL REQUIREMENTS** - The 5.8 GHz wireless broadband system shall have the following minimum general operating characteristics:

1. Shall operate in an environment with an ambient temperature range of -40° C to +75° C without the assistance of fan-forced cooling.
2. Shall operate in an environment with a relative humidity of 5% to 95% (non-condensing).

**ITEMS 815.1 & 816.02** (Continued)

3. The wireless Ethernet module shall be a ComNet NW1. The module shall support IEEE 802.3 protocol using the 802.11a/n standard. The module shall feature 2(two) 10/100/1000TX RJ-45 ports that support one port as an 802.3af/at PoE Powered Device and the other port as an 802.3at PoE Power Sourcing Equipment. The module shall support two antennas utilizing MIMO technology and a maximum throughput of 240Mbps. The modules shall be encased in an IP67 dust and water immersion housing. The module shall provide power, link, and signal strength status indicating LEDs for monitoring proper system operation. The module shall have a lifetime warranty to reduce system life cycle cost in an event of a module failure.
4. The module shall be configurable for either Client, single-point Access Point, or multi-point Access Point operation.
5. Shall support transmission distances up to 2 miles (with adequate line-of-sight).
6. Shall support Spanning Tree Protocol.
7. All modules shall support passive PoE and IEEE802.3af/at PoE PD.
8. The module shall provide either auto-selectable or user static selectable frequency modes of operation.
9. The module shall support Dynamic Frequency Selection (DFS) and Transmit Power Control (TPC) operation.
10. The module shall provide up to +26dBm RF power output.
11. The module shall have selectable channel bandwidth capacity – 10, 20 or 20/40MHz.
12. The module shall provide antenna alignment, signal strength, and site survey tools.
13. The module shall be available with 19dBi or 8dBi gain integral antenna.
14. The module shall use WPA2 – either AES or TKIP encryption.
15. The module radiated emission shall be compliant with ETSI standards.
16. The module shall be supplied in an IP67 compliant housing.
17. All modules and system parameters shall be configurable via a Graphical User Interface (GUI).
18. The following IEEE Networking Standards shall be supported:
  - IEEE 802.3 10Base-T Ethernet
  - IEEE 802.3u 100Base-TX Fast Ethernet
  - IEEE 802.3ab 1000Base-T Gigabit Ethernet
  - IEEE 802.3af Power over Ethernet
  - IEEE 802.3at Power over Ethernet
  - IEEE 802.3D Spanning Tree Protocol (STP)
  - IEEE 802.11h DFS & TPC
  - IEEE802.1X Port-based Network Access Control
  - NTP Client

**ITEMS 815.1 & 816.02** (Continued)

## 19. Wireless Radio Performance:

Bandwidths 10, 20, 40MHz

## 20. Wireless Antenna Performance:

Standard Internal Antenna Dual Polarized Directional

Gain 20dBi

Azimuth 17° Hor/Ver

Elevation 17° Hor/Ver

## 21. Management

Configuration: Web, HTTPS, TFTP/Web Update for firmware and configuration backup/restore, DHCP Client, User configurable Watchdog and Auto-Reboot Mechanism, Reset to default, Multi-Level Configuration and Monitoring Login Accounts, User Configurable Long Range Parameters, Admin password, Port Speed/Duplex control, status, SNMP v2c.

NTP: Network Time Protocol to synchronize time from Internet

802.1x: Port-based Network Access Control

DHCP Server

System Log

## 22. Electrical Specifications

Operating Voltage: 24VDC @ 175mA.

48VDC @ 87.5mA

PoE Support: IEEE 802.3af/at PD compliant, IEEE 802.3at PSE compliant

Power Consumption: 5W max

**Emergency Vehicle Preemption**

Optically actuated emergency preemption equipment shall be installed for local control of the signals during the passing of appropriately equipped emergency vehicles through intersections. Traffic Signal Plans (Sequence and Timing Plans) illustrate the proposed location for the emergency preemption receivers and pre-empt control of the intersection.

The emergency vehicle preemption control system shall consist of a data-encoded phase selector to be installed within the traffic control cabinet. This unit will serve to validate, identify, classify and record the signal from the optical detectors located on support structures at the intersection. Upon receiving a valid signal from the detector, the phase selector shall generate a preempt call to the controller initiating a preemption operation as shown on the plans.

The optical detectors shall be single input, single output units used to control one approach. A minimum of two optical detectors shall be supplied unless otherwise noted in the major item list.

The Contractor shall install a confirmation strobe at the traffic signal location as shown on the plans.



**ITEMS 815.1 & 816.02** (Continued)

The following description of work specifies the responsibilities involved in the installation of an optical Emergency Vehicle Preemption system.

The Contractor is required to supply material and labor, required or shown, for the complete installation of optical preemption equipment including optical detectors, cable, interfacing equipment to the local controller, making electrical connections and all required incidentals.

The Contractor shall perform the following field supervision and turn-on services:

The Contractor shall initiate documentation for As-Built drawings.

The Contractor shall demonstrate the system and instruct the drivers of emergency vehicles in the operation of the system.

Any operation problems occurring within the next 30-days shall be corrected by the Contractor or by a Field Service Representative if the Contractor cannot do so.

The cost of these field supervision and turn-on services shall be included in the Lump Sum Bid Price, and no additional payment shall be made.

Preemption System design and Documentation shall include the following:

- Provide the installing agency with locations for detector installation. Suggested detector locations are shown on the plans and may be changed to improve the operation. Notice shall be given to the Engineer prior to any change.
- Provide the controller manufacturer, Engineer, and Owner with electrical diagrams.
- The installer shall install the equipment consistent with the preemption equipment, the manufacturer's recommended installation procedures and electrical diagrams in a neat and workmanlike manner.
- The preemption equipment manufacturer shall be responsible for operational checkouts of the specified preemption functions prior to final acceptance and approval.
- Operating checkouts includes the following:
  - Verifying that the priority system timing and range are properly set.
  - Preemption equipment warranties are put into effect.
  - Signal Timing and Sequence under Preemption Control. See preemption data as shown on the Traffic Signal Plan(s).

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**ITEMS 815.1 & 816.02** (Continued)**Posts and Bases**

Steel posts shall be two-piece with octagonal base, per MassDOT Standards as specified in the major items list and shall be painted YELLOW.

Signal base foundations shall not obstruct a sidewalk or crosswalk so that passage by physically-challenged persons is impaired.

**Mast Arm Assembly**

Mast arm poles, bases and anchor bolts shall be fabricated and constructed in conformance with MassDOT Standard Drawings, the Contract drawings, the latest edition of AASHTO “Standard Drawings for Structural Supports for Highway Signs, Luminaries and Traffic Signals”, MassDOT’s December 2015 Overhead Signal Structure & Foundation Standard Drawings, and as stated below.

Vertical mounting brackets of the type regularly supplied by the manufacturer and conforming to applicable provision of section 815 of the Standard Specifications shall be used for the attachment of signal heads to the mast arm. Sign brackets for mast arms shall be used in all locations where a sign is to be mounted to the mast arm. Mast arm sign brackets shall consist of a mast arm clamp assembly, vertical support tube, stainless steel bands, clamp screw, hardware, and all miscellaneous materials necessary to fix mount the sign to the mast arm. No hanger mounts shall be used.

All mast arm poles shall be Type 2 galvanized steel monolevers with shoe bases. Acceptance of Type 2 mast arm poles will be contingent upon review and approval of shop drawings submitted by the Contractor. Longhand design calculations shall be submitted by the Contractor with the shop drawings for all Type 2 mast arm poles. The Contractor shall provide a set of calculations, stamped by a Structural Engineer registered in the Commonwealth of Massachusetts, along with plans and specifications for the poles for review by the Engineer.

**Mast Arm Pole Foundations**

Mast arm foundations shall be cored pier foundations and constructed in conformance with *2015 MassDOT Overhead Signal Structure and Foundation Standard Drawings*. Foundation sizes and depths shall be selected from the foundation design charts shown in MassDOT’s Standard Drawings for a Design Wind Speed of 110 MPH.

For estimating and bidding purposes, the Contractor shall use the calculated moments and core footing design as shown on the Standard Drawings. This foundation design is based on calculated moments, soil type, and Foundation Design Chart of the MassDOT Mast Arm & Foundation Details and Standard Drawings. This information is provided in the Table below.

**ITEMS 815.1 & 816.02** (Continued)

Mast Arm Length (Boring)	Station	Offset	Soil Type	Foundation Diameter	Depth	Rock Socket Length	Vertical Bars	Tie Bars
Item 815.1								
35' (TB-5)	18+62.21	52' LT	Wet Sand (Loose)	3' - 6"	14' - 6"	3' - 0"	18 - #8	#5 @ 9"
40' (TB-4)	19+40.36	42' LT	Wet Sand (Dense)	3' - 6"	10' - 6"	4' - 5"	18 - #8	#5 @ 9"
25' (TB-2)	19+89.11	31' RT	Wet Sand (Loose)	3' - 6"	11' - 6"	-	18 - #8	#5 @ 12"
25' (TB-2)	19+40.87	33' RT	Wet Sand (Loose)	3' - 6"	11' - 6"	-	18 - #8	#5 @ 12"
20' (TB-3A)	19+00.88	83' RT	Wet Sand (Loose)	3' - 6"	9' - 6"	-	18 - #8	#5 @ 12"

**Note: Information for foundation design based on Soil Boring Logs at mast arm foundation locations.**

If unforeseen soil conditions are encountered that prevent the use of MassDOT standard foundation type, the Contractor is responsible to select and design alternative foundation types. Alternative foundation types could include spread footings, coring and socketing into rock or other foundations previously used to support similar loads, within reason. The Contractor shall submit the alternative foundation type to the Engineer for review. The alternative foundation type shall be stamped by a Structural Engineer registered in the Commonwealth of Massachusetts and submitted to the Design Engineer for review and approval. Contractor shall submit both shop drawings and calculations of the mast arms to the Design Engineer for review and approval.

Foundations shall not obstruct a sidewalk or crosswalk so that passage by physically challenged persons is not impaired. ADA/AAB clearance shall be maintained. The top of all foundations in sidewalk areas shall be located flush with finish grade. The top of each mast arm foundation shall not be exposed in the sidewalk.

No separate payment will be made for work considered incidental to the excavation, including but not limited to, mast arm foundations, dewatering, etc. but all costs in connection therewith shall be included in the contract lump sum price.

**Signal Heads**

Signal heads mounted on mast arms shall be rigidly attached to the mast arms. All signal heads mounted overhead on mast arms shall be installed, with the bottom of the signals at the same height. All traffic signal lenses shall be 12 inches in diameter. All signal heads shall be equipped with ball and/or arrow light emitting diode (LED) modules. Five (5) inch non-louvered backplates and tunnel visors shall be provided on all signal heads, unless otherwise noted on the plans.

All backplates shall include 3-inch wide, yellow reflective micro-prismatic retroreflective sheeting conforming to ASTM D4956 Type VIII or better on the outside edge of the backplates.

**ITEMS 815.1 & 816.02** (Continued)

Traffic Signal LED Module

All signal and pedestrian displays shall be equipped with LED signal modules. All red, amber, green, and pedestrian signal housings except for optically programmed and fiber optic housings shall conform to the following where applicable:

- ITE's Vehicle Traffic Control Signal Heads – Light Emitting Diode (LED) Arrow Traffic Signal Supplement, Dated April 3, 2006
- ITE's Vehicle Traffic Control Signal Heads – Light Emitting Diode (LED) Circular Signal Supplement, Dated June 27, 2005
- ITE's Pedestrian and Countdown Signal Modules Compliant to PTCSI – Part 2 Light Emitting Diode (LED), Dated, August 2007.
- Energy Star / EPACT Program Requirements for Traffic Signals
- On the MassDOT Traffic Signal Approved Equipment List

An independent lab shall certify that the LED signal module complies with the applicable ITE specification. The independent report should be submitted to MassDOT for review unless the module is already on the approved list.

To prevent the LED module warranty from being voided, the connecting leads on the module shall not be cut. The original LED module leads shall be connected to the signal head terminal block as continuous wire without splices.

The LED signal module will be replaced or repaired by the manufacturer if it exhibits one of the following:

- A failure due to workmanship or material defects within the first 60 months of field operation
- A greater than 40 percent light output degradation or a fall below the minimum intensity levels (as defined by the latest ITE performance specifications) within the first 36 months of field operation.

**ITEMS 815.1 & 816.02** (Continued)**Pedestrian Signal Heads with Countdown Timers**

All pedestrian heads shall be 16-inch, single units, with countdown timers. All pedestrian heads shall be in conformance with the MassDOT Accessible Pedestrian Signal (APS) Installation Policy, dated June 1, 2012 and as revised. Pedestrian head indications shall be illuminated L.E.D. type displaying graphical symbols of a walking person and/or upraised hand. The countdown module shall display the number of seconds remaining throughout the pedestrian “WALK” interval, continue counting down through the flashing “DON’T WALK” interval, and blank out during the steady “DON’T WALK” interval. The countdown module shall be automatically set by the intersection controller based upon the “WALK” and “DON’T WALK” signal intervals only. The countdown module shall continuously monitor the intersection controller for any changes to the pedestrian phase timing, and reprogram itself automatically. All LED indications on the pedestrian signal shall have an automatic dimming circuit for night illumination to reduce long-term degradation to the LEDs.

All pedestrian signal heads shall be equipped with cap visors and powder coated **YELLOW**.

**Note: Countdown displays shall not be used during the “WALK” interval nor during the yellow change interval of a concurrent change interval.**

**Accessible Pedestrian Signal Push Buttons**

Accessible Pedestrian Signal (APS) pushbuttons shall provide information in non-visual formats (such as audible tones, speech messages, and/or vibrating surfaces). The APS pushbuttons shall be compliant with the 2009 MUTCD and the MassDOT Accessible Pedestrian Signal (APS) Installation Policy, dated June 1, 2012 and as revised. The accessible pedestrian signal shall be programmed for full MUTCD compliance, and included on the MassDOT Approved Equipment List. At a minimum the APS pushbuttons shall be provided with the following features:

- Pushbutton locator tone
- A visible and audible indicator that the button press has occurred
- A raised vibro-tactile directional arrow
- A percussive tone for the “WALKING PERSON” indication
- A speech walk message for the “WALKING PERSON” indication (If necessary)

APS push button controls shall be raised from or flush with their housings and shall be a minimum of 2 inch in the smallest dimension. The force required to activate the controls shall be no greater than 5lbs.

APS push buttons shall be located as close as practicable to the sidewalk curb ramp serving the controlled crossing, and in compliance with current MassDOT and ADA regulations, and shall permit operation from a clear ground space. If two crosswalks, oriented in different directions, end at or near the same location, the positioning of pedestrian push buttons and/or legends on the pedestrian push button signs should clearly indicate which crosswalk signal is actuated by each pedestrian push button. Push buttons shall be separated by a minimum 10-foot distance per MUTCD Fig 4E-3. The pedestrian sign and saddle shall include a standard sign R10-3e educational sign to supplement the countdown pedestrian signals.

## **ITEMS 815.1 & 816.02** (Continued)

A maximum mounting height of 42 inch above the finish sidewalk grade shall be used for pedestrian push buttons. The maximum reach to all push buttons shall be 10 inches on a level landing (per 521 CMR 21.10.4).

### Equipment Finish and Color

Vehicle, Pedestrian Housings	<i>Yellow</i>
Signal Housing Supports (posts)	<i>Aluminum</i>
Mast Arms	<i>Galvanized</i>
Posts and Bases	<i>Galvanized &amp; Painted Yellow</i>
Controller Cabinet (exterior) & Meter Socket	<i>Aluminum</i>
Controller Cabinet (interior)	<i>Aluminum</i>
Front of Signal Housings, and Backplates	<i>Flat Black</i>
Tunnel Visors of signal housings (exterior)	<i>Yellow</i>
Tunnel Visors of signal housings (interior)	<i>Flat Black</i>

### Miscellaneous Requirements

#### *Software*

All local controller, malfunction management unit, and amplifier software shall be supplied with the latest available revision. Any software upgrades released by the manufacturer shall be supplied at no charge to the MassDOT for a period of five years after acceptance of the traffic signal installations.

#### *As-Built Drawings*

The Contractor shall provide as-built drawings in the latest AutoCAD Civil 3D format. Two (2) hard copy plans of each location shall also be provided.

#### *Data Base Programming & Documentation*

Each programmable local hardware component (i.e. controller, malfunction management unit, preemption unit, and detector amplifier) shall be initially programmed by the Contractor based on information contained on the plans.

Three bound sets of hard copy programming per device shall be supplied to the MassDOT by the Contractor.

The Contractor shall supply an 8½” x11” laminated copy of the traffic signal design plan and sequence and timing chart to be left in the cabinet documentation envelope mounted on the inside of the cabinet door.

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**ITEMS 815.1 & 816.02** (Continued)*Testing Period*

Upon completion of all work, the Contractor shall request a final inspection and test of signal equipment in writing at least thirty (30) days prior to the inspection date. The testing date shall be established with mutual agreement among the Contractor, MassDOT, Town of Webster, and the Engineer. Electrical tests shall be conducted by the Contractor, in the presence of the Engineer. The Contractor shall supply all necessary testing materials and labor for all tests and re-tests. The Contractor shall record the results of all tests and submit them to the Engineer for approval. The Contractor shall order and pay for a Police Officer detail to facilitate the equipment testing.

*Fine Tuning and Adjustment Period*

The Contractor shall employ the services of the manufacturer or his authorized representative to instruct MassDOT and Town of Webster personnel on the use of the system and to provide fine tuning and adjustments to all timing functions programmed within the controller units. Fine tuning and adjustment shall be accomplished at the direction of the Engineer and shall take place over a three (3) day period (8 hours per day). These days may or may not be consecutive and shall be established by the Engineer to allow for the study of the results of the adjustments.

*Final Inspection and Acceptance*

Upon successful completion of the 30-day testing period wherein the traffic signal system has operated for 30 days without failure, the Contractor shall notify MassDOT and the Town. The Engineer will make a final inspection of the installation in the presence of MassDOT, the Town, and the Contractor. An inspection check will be made to ensure that all equipment, materials, installations and operations are in accordance with the construction contract, plans and specifications. Items to be checked will include, but not be limited to, traffic signal systems operation, cabinet equipment, documents (wiring diagrams, as-built plans, instruction manuals, parts list, warranties, grounding resistivity test report, etc.), signs, and pavement markings, and street hardware (posts, bases, housings, brackets, etc.).

The Engineer will notify the Contractor in writing of any items in which the inspection reveals that the work is incomplete, defective, or does not otherwise meet the project specifications. The Contractor shall perform the corrective actions necessary to achieve final acceptance by MassDOT. These corrective actions shall be done by and at the expense of the contractor and within 15 days of the date of the inspection report, unless otherwise approved in writing by MassDOT.

*Guarantee After Final Acceptance*

The Contractor shall diagnose (troubleshoot) the system and replace any part of the traffic signal system found to be defective in workmanship, material or manner of functioning within six months from date of final acceptance of all the installations under this Contract. This requirement does not affect the one-year warranty period on equipment specified in Subsection 815.20 of the Standard Specifications. Note: some of the equipment installed under this Contract shall have a warranty period beyond one year as noted.

**ITEMS 815.1 & 816.02** (Continued)

Upon the date of acceptance of the traffic signal systems by MassDOT and the Town, the Contractor shall turn over all guarantees and warranties to the Town, where applicable.

**Basis of Payment**

The work under Items 815.1 and 816.02 will be paid for at their respective Contract lump sum price, which price shall include all labor, material, equipment and incidental costs required to complete work.

No separate payment will be made for maintenance of existing installations, and all costs in connection therewith shall be included in the lump sum price.

No separate payment will be made for work considered incidental to the excavation, including but not limited to, ledge removal, mast arm foundations, dewatering, etc., but all costs in connection therewith shall be included in the price bid for the various contract items.

Conduit shall be paid for under Item 804.3 - 3 Inch Electrical Conduit Type NM Plastic (UL).

Pull boxes shall be paid for under Pull Box 12 x 12 – SD2.031, Item 811.31.

Electric handholes shall be paid under Electric Handhole SD2-022, Item 811.22.



**ITEM 817.415**      **REMOVE AND RELOCATE METER PEDESTAL**      **LUMP SUM**

The work under these items shall conform to the relevant provisions of Subsection 815 of the Standard Specifications, NEW ELECTRICAL SERVICE Section and the Subsection 8.14 of these Special Provisions and the following:

The work shall include removing and relocating the existing meter pedestal and disconnect switch at the site identified in the Plans and as specified in the contract documents in accordance with these specifications. The work shall also include furnishing and installing additional components, as well as relocating, salvaging, or disposing of existing components as specified below.

For overhead connections, the Electric Company servicing the area will make the connection from the top of the riser on the utility pole to the power source. The Contractor shall supply all labor, materials, and equipment to install the service connection, complete in place and in accordance with the Electric Company requirements and procedures, from the designated ITS cabinet or meter pedestal to and including the riser with enough wire coiled above the riser to permit the Electric Company servicing the area to make the final connection.

For underground connections, the Electric Company servicing the area will perform the actual wiring of the service connections at its power source, but all steel sweeps, ducts, entrance holes into manholes, wiring, patching and all other necessary labor, materials and equipment required to install the electric service, complete in place, shall be furnished by the Contractor.

The Contractor shall pay the Electric Company servicing the area for their services rendered for the connection of overhead and underground service connections.

Before starting work at existing manholes, the Contractor shall test for gas and blow out the manholes.

This work shall include providing and installing all required equipment, wiring, equipment ground and surge protection device (SPD), documentation, and testing. This item consists of the following primary components:

1. Remove and Relocate
  - a. Meter Pedestal and Disconnect Switch
  
2. Remove and Discard
  - a. Existing Handhole near the Existing Meter Pedestal
  
3. Furnish and Install
  - a. Meter Pedestal Foundation
  - b. Conduit, wiring, and mounting equipment as necessary

**ITEM 817.415** (Continued)

The Contractor shall warrant this work for a period of 60 days after successful testing of the relocated equipment.

Any items identified to be relocated or salvaged which are damaged, or otherwise made unsatisfactory for continued use by the MassDOT, shall be repaired or replaced at the Contractor's expense, as directed by the Engineer. The Contractor shall document through photographs and with the Engineer any damage to existing equipment identified to be relocated prior to any work. Contractor shall verify with the Engineer and through the Resident Engineer all equipment is operating as intended within three (3) days of any planned work efforts. The Contractor shall notify MassDOT Resident Engineer and MassDOT ITS Coordinator a minimum of two (2) weeks prior to planned equipment relocation.

The Contractor shall relocate all equipment and make it operational again within a 24-hour period (there shall be a maximum downtime for the camera of 24 hours). Any preparation work (make ready) required at the proposed meter pedestal location (conduit installation, foundation, etc.) shall be completed prior to the scheduled relocation.

**As-Built Plans**

As-built AutoCAD drawings shall be supplied to MassDOT before acceptance of the relocated meter pedestal at the CCTV site as outlined under Item 100.9.

**Basis of Payment**

Item 817.415 will be paid for at the Contract unit price per LUMP SUM, which price shall include all labor, materials, equipment, and incidental costs required to complete the work.

No separate payment will be made for testing, cabling, conduit, mounting hardware, connectors, surge protectors or other minor hardware. No separate payment will be made for work required to remove, relocate, salvage, dispose, furnish or install equipment identified above, but all costs in connection therewith shall be included in the Contract LUMP SUM price bid.

**ITEM 819.752   FIELD SITE AND INTEGRATED SYSTEMS TESTING   LUMP SUM**

The Contractor shall develop and submit test plans and acceptance testing procedures for the MassDOT ITS CCTV equipment. Example test plans are provided for use in Document A00883. If the example test plans are utilized, the Contractor will need to customize them to this specific project and submit them for approval.

All test plans need to be approved by MassDOT ITS Coordinator  
ITS Programs  
MassDOT - Highway Division  
[ITS-Programs.IntelligentTransportationSys@dot.state.ma.us](mailto:ITS-Programs.IntelligentTransportationSys@dot.state.ma.us)

Prior to commencement of the Field Site and Integrated System testing, the Contractor shall meet the following minimum requirements:

1. Approved shop drawings for all required items
2. Proof of successful completion of the Prototype Integration Test and approved test results
3. All Construction items inspected and approved
4. 4G LTE Communication and fiber optic communication established between all field sites and the HOC
5. Successful approval of the Field Site and Integrated System Test Plans
6. Submit functional block diagrams, site equipment wiring diagrams and details

A Contractor representative shall be on site to record the official test results and submit them to MassDOT after test completion.

The following are the minimum ITS Field Site and Integrated Systems testing and test reporting requirements:

Develop Test Plans, Detailed Test Procedures and Test Reports

The Contractor shall develop a Test Plan for the ITS Field Site Equipment Test to be conducted locally at the ITS equipment locations; and an Integrated ITS Deployment Systems Test to be conducted on the ITS Field Site Equipment while being monitored at, and under the control of, the Statewide HOC in Boston or third-party vendor.

- A. The Contractor shall develop detailed Test Procedures, derived from the approved Test Plans for the CCTV Camera System, and all elements of the Communications System.
- B. The test procedures shall include:
  1. The requirements that are to be tested
  2. The minimum pass/fail criteria
  3. The test equipment required
  4. Step by step procedures for the test
  5. Test result discrepancy and test reporting forms
- C. The Contractor shall provide a Test Report that documents the results of each test.

**ITEM 819.752** (Continued)

- D. The Contractor shall issue a Test Discrepancy form for each test procedure that fails. Each Test Discrepancy shall be resolved before the test can pass.
- E. All Test Plans, Test Procedures, Test Result Reporting Forms and Test Reports must be approved by MassDOT. Once all items are approved by MassDOT, the Contractor may commence with ITS Field Site Equipment Tests.

**ITS Field Site Equipment Test**

- A. The Contractor shall review and pre-test all sites to assure the equipment complies with the test plan and all test plan requirements are met prior to requesting official site equipment tests to be witnessed by MassDOT and/or their representative.
- B. The Contractor shall verify that each item of equipment installed at the ITS Deployment site is the appropriate model and is installed and connected properly as documented on the applicable submitted shop drawings.
- C. The Contractor shall verify that all equipment has been properly cabled and each cable labeled as documented on the applicable submitted shop drawings.
- D. The Contractor shall verify that all equipment and structures have been properly grounded. In no case shall the resistance to ground exceed 25 ohms.
- E. The Contractor shall inspect all equipment to verify that all mechanical connections are complete and secured properly, all hardware is installed in the proper position and all cables terminated as per the applicable submitted shop drawings.
- F. The Contractor shall perform a software and firmware audit on each ITS device and communications component to verify that the most current approved versions of software and firmware have been installed and that this audit data is documented.
- G. The Contractor shall make all adjustments and alignments necessary to the CCTV Camera and other installed equipment per the manufacturers recommended practices and procedures and the functional requirements, Specifications and Contract Drawings.
- H. The Contractor shall verify that all equipment specification requirements are satisfied when the equipment is under local control at the ITS deployment site. At the successful completion of all ITS Field Site Equipment Tests, the Contractor may commence with the Integrated ITS Deployment Systems Tests.

**Integrated ITS Deployment Systems Test**

- A. All ITS field equipment shall be tested for complete functionality between the MassDOT Statewide Highway Operations Center in Boston, MA to the ITS deployment sites.

**ITEM 819.752** (Continued)

- B. The Contractor shall demonstrate that the CCTV Camera System can be accessed, its video image displayed on a display monitor and that all camera control functions (PTZ, focus, preset activation, etc.) can be exercised via the head end CCTV control system and camera controller.

The Integrated ITS Deployment Systems Test shall not be considered approved until all project devices and sites meet the testing and integration requirements above.

**30 Day Operational Test Period**

At the successful completion of all the Integrated Field Site Equipment Tests and the Integrated ITS Deployment Systems Test, a 30-Day Operational Test Period shall commence prior to final acceptance. On a case-by-case basis, MassDOT may allow the 30-Day Operational Test Period to begin where very minor outstanding items or unique circumstances exist preventing all sites from passing the Integrated Field Site Equipment Tests and the Integrated ITS Deployment Systems Test. MassDOT reserved the exclusive right to determine what is considered a “minor” item. During the 30-day test period, the Contractor shall be responsible for all costs associated with electrical service for that device. If a given device fails to meet any of the Engineer’s functional requirements during that period, the failure must be rectified, and the 30-day test period shall start over for that device once its functional requirement issues have been resolved and retested as required. If the 30-day test period has been delayed for a given device, as described above, the 30-day test period shall start for that device once its functional requirement issues have been resolved.

All test results shall be submitted and approved by the MassDOT. Once all items are approved by MassDOT, Final Testing Acceptance will be issued to allow commencement of the Operations and Maintenance period.

**Basis of Payment**

Item 819.752 will be paid for at the Contract unit price Lump Sum payable at the successful completion of the 30-Day Operational Test Period and approval of all submitted test results for all equipment sites. No partial payments shall be made. The Contract unit price shall include all labor, equipment, materials, and all incidental costs required to complete the work.

**ITEM 821.01****6 FOOT BRACKET ARM****EACH**

The work under this Item shall conform to the relevant provisions of Subsection 820 of the Standard Specifications and the following:

The work shall include the furnishing and the installation of Highway Lighting Bracket Arms to be mounted on utility poles at the locations shown on the Plans and/or as directed by the Engineer. All materials and construction procedures shall conform to information contained in these Specifications, the Contract Plans, and to the requirements and standard practices of the Massachusetts Department of Transportation.

All davit arms shall be from a single manufacturer. Luminaire attachment on to mounting arm supports shall comply with luminaire mounting requirements.

All poles shall comply with AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals, including the most recent interim revisions. It will be the Contractor's responsibility to provide the pole owner with all proposed bracket, connection, and luminaire data (including expected pole loads and mounting location/height) so that the owner can verify all expected loading on the poles. The Contractor shall consult the Engineer if the pole owner shows that the proposed bracket arms and luminaires cannot be supported on their Utility Poles.

**Submittals**

The Contractor shall submit the following information to the Engineer for approval:

Manufacturer's data for the following:

- Mounting arms

Shop drawings for all Lighting Bracket Arms, including dimensions, wind loading calculations, and other applicable information. Wind loads shall be calculated using a design wind speed of 110 MPH. Wind loading calculations shall be stamped by a Registered Professional Structural Engineer in the Commonwealth of Massachusetts.

The Contractor shall not order any materials prior to approval of all shop drawings and product cut sheets.

**Materials**

The single davit arm shall be a separate section which fits to the utility pole shaft. The davit arm shall be provided with a 2-3/8 inches outside diameter street tenon for mounting the luminaire. The davit arm tenon shall accommodate the luminaire slip fitter. Provisions shall be made for dissimilar metals where required. The maximum angle above horizontal of the arm shaft at the point of luminaire attachment shall be three degrees. Contractor shall coordinate mounting requirements with the luminaire manufacturer.

**ITEM 821.01** (Continued)Miscellaneous Hardware

All screws, nuts, bolts, washers and associated small hardware, except high strength bolts, shall be of Type 316 stainless steel.

Warranty

Provide written documentation stating that the manufacturer's warranty conforms to the warranty specified in this Section.

1. Protection of Metal from Corrosion: Warranty against perforation or erosion of finish due to weathering.
2. Color Retention: Warranty against fading, staining, and chalking due to effects of weather and solar radiation.
3. Warranty Period: Manufacturer's standard, but not less than 10 years from date of Substantial Completion to repair or replace any supplied items which fail to meet the specifications as the result of defects of materials or workmanship.

The manufacturer's warranty, as stated above, shall be valid for all installations of procured products, regardless of the Installation Contractor. The Manufacturer will be allowed to inspect, at no cost to the Authority and with the Engineer present, the installation of the product for the final issuance of the warranty specified in this Section. Should any modifications be required regarding the installation of the product(s), it will be at the Installation Contractor's expense. Once all modifications are accepted by the Manufacturer, the product warranty will become effective and will be supported by the Manufacturer in accordance with this Section.

Installation

Contractor is required to provide all miscellaneous hardware required to install the above items which are not noted on drawings or specification. All hardware unless otherwise noted shall be stainless steel.

Submittals

Pole submittals shall include the following:

- Product Data: For each type of bracket arm indicated, arranged in order of lighting unit designation. Include data on accessories, finishes, and the following:
  - Means of attaching luminaires and arms/brackets with indication that the pole is suitable for the equipment being attached.
- Design calculations, certified by a Massachusetts Registered Professional Engineer, indicating strength of mounting connections. Calculations shall be signed and stamped by the owner of the Utility Poles.
- Product Certificates: Signed and Stamped by the owner of the Utility Poles, certified calculations shall be provided on the following:
  - Products are designed for load requirements in AASHTO and MassDOT Standards that load imposed by luminaire and accessories has been included in design. Calculations to be provided are outlined in AASHTO.

**ITEM 821.01** (Continued)

- Detailed shop drawings, signed and stamped by a MA Professional Engineer. Depicting all aspects of bracket arm assembly, construction, certification, welds, hardware, arms, connections to poles, nuts, washers, and finishes.
- Manufacturer Experience Record documentation.
- Work Plan as described above.

**Method of Measurement**

Item 821.01 will be measured for payment by Each Bracket Arm installed, complete in place.

**Basis of Payment**

Item 821.01 will be paid for at the Contract Unit Price per Each, which price shall include all labor, materials, equipment, submittals, and incidental costs required to complete the work.



**ITEM 821.121****HIGHWAY LIGHTING POLE 30 FOOT  
(ANCHOR BASE) 6 FOOT BRACKET****EACH**

The work under this Item shall conform to the relevant provisions of Subsection 820 of the Standard Specifications and the following:

The work shall include the furnishing and the installation of 30-foot-high Highway Lighting Poles at the locations shown on the Plans and/or as directed by the Engineer. All materials and construction procedures shall conform to information contained in these Specifications, the Contract Plans, and to the requirements and standard practices of the Massachusetts Department of Transportation.

Highway Lighting Poles must be from a manufacturer listed on the MassDOT Approved Fabricators List. They shall be anchor-base type designed for use with underground supply conductors. Pole length shall be such as required to obtain the mounting height shown on the Contract Plans.

All poles and davit arms shall be from a single manufacturer. Luminaire attachment on to mounting arm supports shall comply with luminaire mounting requirements.

All Highway lighting poles shall have an AASHTO frangible anchoring except light poles on bridge structures and median islands.

All poles shall comply with AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals, including the most recent interim revisions. Strength analysis for each pole shall multiply the actual equivalent projected area of luminaires, sign, and brackets by a factor of 1.1 to obtain the equivalent projected area to be used in pole selection. It will be the Contractor's responsibility to provide the pole manufacturer with all existing anchor data and proposed luminaire data so that the manufacturer can obtain all expected loading on the poles. The pole manufacturer may suggest an increase in gauge of the shaft, taper, and base thickness to have a structurally sound pole.

**Submittals**

The Contractor shall submit the following information to the Engineer for approval:

Manufacturer's data for the following:

- Lighting poles
- Mounting arms
- Pole labels
- Anchor bolts

Shop drawings for all Lighting Poles, including foundation details, dimensions, wind loading calculations, pole deflection and other applicable information. Wind loads shall be calculated using a design wind speed of 110 MPH. Wind loading calculations shall be stamped by a Registered Professional Structural Engineer in the Commonwealth of Massachusetts.

**ITEM 821.121** (Continued)

Shop drawings for Lighting Poles shall include a table showing all light poles included in the Contract. The table shall include pole number, bolt circle diameter, pole dimensions, davit arm dimensions, anchor bolt size, and station number.

Samples shall be submitted for pole and luminaire finish.

The Contractor shall not order any materials prior to approval of all shop drawings and product cut sheets.

**Materials**

Highway Lighting Poles and davit arms shall be unpainted galvanized steel. Each section shall be fabricated from the minimum United States Standard Gauge as shown on the Standard Detail Drawings with minimum yield strength of 55,000 pounds per square inch after fabrication. Pole tensile strength shall meet AASHTO Standards. Lighting Poles shall be hot-dipped galvanized per ASTM A123, and finished in accordance with MassDOT Standard Provisions.

Highway Lighting Poles shall be one or two-section, single point arm type conforming to AASHTO LTS, latest edition. Each section shall be of one-piece construction with a full-length, longitudinal, high frequency resistance weld and circular in cross-section with a uniform taper of approximately 1/8 inch of diameter change per foot of length.

The single davit arm shall be a separate section which slip fits to the pole shaft. The davit arm shall be provided with a 2-3/8 inches outside diameter street tenon for mounting the luminaire. The davit arm tenon shall accommodate the luminaire slip fitter. Provisions shall be made for dissimilar metals where required. The maximum angle above horizontal of the arm shaft at the point of luminaire attachment shall be three degrees. Contractor shall coordinate mounting requirements with the luminaire manufacturer.

Poles shall be provided with shoe bases of the same material as the pole shaft. Shoe base shall be circumferentially welded to the shaft on the inside and outside.

Each pole shaft shall be provided with a vibration damper to offset the effects of wind induced harmonic vibrations. Dampeners shall be galvanized steel chain fully covered with a synthetic plastic sheath and mounted to the inside of the pole with a 1/2 inch diameter stainless steel bolt. The actual location, type, and size of pole vibration dampener shall be by the recommendations of the pole manufacturer.

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**ITEM 821.121** (Continued)**Standard Nut Covers**

Bolt covers for anchor bolts shall be zinc die cast. Each bolt cover shall be fastened to the shaft by a ¼ inch Type 304 or 316 stainless steel, self-tapping, hex head screw.

A reinforced handhole 5 inches by 7 inches inside opening shall be circumferentially welded in each pole shaft. Handholes shall be provided with a steel cover and stainless-steel attachment screws and antisieze compound on cover screws. A nut holder shall be welded to the handhole, and the nut holder shall include a 0.5-inch - 13 UNC hex head bolt and nut for grounding. The handhole shall be located where shown on the drawings.

Ground lugs shall be considered standard material and positioned internally and opposite the pole's handhole opening. The lug shall provide the ability to secure a wide range of copper conductors.

Frangible bases or couplings shall be provided in accordance with AASHTO LTS-5 standards. Frangible couplings are not allowed for light poles on median islands and bridges.

Frangible anchoring system shall protect anchor bolts. Frangible anchoring shall be a system that includes the following: 1 reaction plate, 4 gray iron breakaway couplings, 4 zinc plated threaded studs, 12 zinc plated hex nuts, 4 plastic spacers, 12 galvanized washers, and 1 protective shroud. The reaction plate shall be galvanized ductile iron, 7/8 inches thick, manufactured in accordance with ASTM specification A536, standard specification for ductile iron castings. The reaction plate sits directly atop the concrete pole foundation beneath the breakaway couplings. The purpose of the reaction plate is to prevent damage to the anchor bolts when breakaway couplings are fractured and to permit leveling. The 4 gray iron breakaway couplings shall be manufactured in accordance with ASTM specification A48, standard specification for gray iron castings. Dissimilar metals, such as cast aluminum, are not acceptable. The protective shroud shall be aluminum, 0.045 gauge with a height of 7.5.

**Miscellaneous Hardware**

All screws, nuts, bolts, washers and associated small hardware, except high strength bolts, shall be of Type 316 stainless steel.

**Street Light Fuse Connector (Fuse Holder and Fuse)**

The fuse holder and contacts shall be rated in accordance with the maximum load anticipated and shall have a high conductivity. The fuse holders and contacts shall be suitable for safely gripping a cartridge type midget fuse in such a manner that when the connector is opened the fuse will remain on the load side of the connector. The fuse shall be a non-glass type, size as required.

**Anchor Bolts**

Anchor bolts shall be fabricated from a hot rolled carbon steel bar with a minimum guaranteed yield strength of 55,000 pounds per square inch. Bolts shall have an "L" bend on one end. Four bolts, sized as required for the specified wind loading, each furnished with two hex nuts and two flat washers, shall be provided for each light pole. Included with each anchor bolt shall be two leveling shims and associated nuts and washers. The entire anchor bolt shall be galvanized.

**ITEM 821.121** (Continued)

Galvanizing shall be performed in accordance with the following specifications:

- ASTM A123 - Standard Specification of Zinc (Hot Dipped Galvanized) Coating on Iron and Steel Products
- ASTM A143 - Standard Practice for Safeguarding Against Embrittlement of Hot-Dip Galvanized Structural Steel Products and Procedure for Detecting Embrittlement
- ASTM A153 - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
- ASTM E376 - Standard Practice for Measuring Coating Thickness by Magneticfield or Eddy- current (Electromagnetic) Testing Methods
- ASTM A384 - Standard Practice for Safeguarding Against Warpage and Distortion During Hot-Dip Galvanizing of Steel Assemblies
- ASTM A780 - Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings  
All drilled and tapped holes and nuts welded to tubular assemblies will be tapped with the proper sized tap after galvanizing.

**Warranty**

Provide written documentation stating that the manufacturer's warranty conforms to the warranty specified in this Section.

1. Special Warranty: Manufacturer's warranty containing the manufacturer's agreement to repair or replace lighting poles and standards that fail in finish, materials, and workmanship within ten (10) years, including but not limited to the following:
2. Protection of Metal from Corrosion: Warranty against perforation or erosion of finish due to weathering.
3. Color Retention: Warranty against fading, staining, and chalking due to effects of weather and solar radiation.
4. Warranty Period: Manufacturer's standard, but not less than 10 years from date of Substantial Completion to repair or replace any supplied items which fail to meet the specifications as the result of defects of materials or workmanship.

The manufacturer's warranty, as stated above, shall be valid for all installations of procured products, regardless of the Installation Contractor. The Manufacturer will be allowed to inspect, at no cost to the Authority and with the Engineer present, the installation of the product for the final issuance of the warranty specified in this Section. Should any modifications be required regarding the installation of the product(s), it will be at the Installation Contractor's expense. Once all modifications are accepted by the Manufacturer, the product warranty will become effective and will be supported by the Manufacturer in accordance with this Section.

**ITEM 821.121** (Continued)**Installation**

The Drawings show in general the locations of the roadway lighting systems. They are diagrammatic only but shall be followed as closely as actual conditions at the site will permit. The Installation Contractor will be required to field verify base conditions and coordinate with base details shown in contract drawings to assure that no field modification of pole will be required. If any field modifications are required, they must be submitted in writing to the Engineer for approval.

A galvanized flat washer shall be placed over the stud. The pole shall be erected with the shoe base placed over the flat washers. Galvanized washers shall be placed over the shoe base. Top nuts shall be placed over the lock washers and hand tightened. Lateral support shall be provided as required. Provide galvanized shims to level pole and tighten nuts until pole is plumb. Top nuts shall be tightened to manufacturer's recommended torque.

The pole shall be installed so that the arm is perpendicular to the baseline of the roadway. Pole and arm cable shall be installed through the pole and arm with adequate slack to connect to the luminaire terminals. Adequate slack pole and arm cable shall be left at the base of the pole to permit connections to the roadway lighting circuits. Install fuse and fuse holder at base to make ready the pole for erection and connection to the roadway lighting circuits.

Each light pole shall be identified by a number which shall indicate MassDOT unit number (LP-1), lighting pole material ('S' - steel), Distribution type (T3), luminaire type ('L' - LED), luminaire output ('27K' - 27,000 Lumen), luminaire wattage ('175W' - 175 watts), and circuit number ('LC#1/HLP-1'). Identifying numbers shall be as indicated on the drawings. Example:

LP-1  
S  
T3-L27K-175W  
LC#1/HLP-1

Apply pole identification by using adhesive labels with white characters on a black background. Furnish all-weather mylar over laminated label with a permanent aggressive adhesive. The identification shall be two and a quarter inch (2.25") high, with two-inch (2") dye cut letters. The number shall be assembled as a vertical label and applied to the streetlight poles on the quadrant of the surface on the pole that faces oncoming traffic (2 labels per pole for mainline locations). The top of the label shall be installed three (3) feet above the ground line. Service temperature of the label shall range from -50 degrees Fahrenheit to 275 degrees Fahrenheit. The installation of the label and application of the sealant shall be conducted when the ambient temperature is above 40 degrees Fahrenheit.

**ITEM 821.121** (Continued)

Contractor is required to provide all miscellaneous hardware required to install the above items which are not noted on drawings or specification. All hardware unless otherwise noted shall be stainless steel.

Install poles as follows:

1. Use web fabric slings (not chain or cable) to raise and set poles.
2. Mount pole to foundation with leveling nuts and flat-washers and tighten top nuts (including flat-washers and locknuts) to torque level as specified by the pole manufacturer.
3. Secure poles level, plumb, and square.
4. Install poles and mounting arms in accordance with the manufacturer's installation requirements.
  - a. Install brackets on poles as indicated on Contract Drawings.
  - b. Install luminaires on pole brackets and connect to pole wiring.
  - c. Install lamps as indicated on Contract Drawings.
  - d. Connect pole wiring to lighting circuit in handhole at pole base.
  - e. Make grounding in accordance with applicable codes and these Contract Drawings.
  - f. Install label on pole as indicated above.

**Grounding**

1. Bond metal poles/support structures and mounted electrical devices.
2. Install grounding conductor pigtail in the base for connecting luminaire to grounding system.
3. Provide a sufficient length of grounding conductor to extend a minimum of 12 inches outside the hand hole.
4. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL486A and UL486B.
5. The luminaires shall be grounded in a manner to protect the structure and support from stray currents produced by the traction power system.

**Submittals**

Pole submittals shall include the following:

- Product Data: For each type of pole indicated, arranged in order of lighting unit designation. Include data on pole, accessories, finishes, and the following:
  - Materials and dimensions of pole shaft(s) inclusive of all welded components.
  - Materials and dimensions of the base.
  - Means of attaching luminaires and arms/brackets with indication that the pole is suitable for the equipment being attached.
  - Base Templates and anchor bolt requirements.

**ITEM 821.121** (Continued)

- Shop Drawings: Include anchor-bolt templates keyed to specific poles and certified by manufacturer.
- Design calculations, certified by a Massachusetts Registered Engineer, indicating strength of bolted foundation. Calculations shall be signed and stamped by the manufacturer of the poles.
- Product Certificates: Signed and Stamped by the manufacturer of the poles, certified calculations shall be provided on the following:
  - Products are designed for load requirements in AASHTO and MassDOT Standards that load imposed by luminaire, accessories, and signage has been included in design. Calculations to be provided are outlined in AASHTO.
- Design calculations, certified by a Massachusetts Registered Engineer, indicating strength of bolted foundation.
- Detailed pole shop drawings, signed and stamped by a Massachusetts Registered Engineer. Depicting all aspects of pole assembly, construction, certification, welds, hardware, vibration dampener, arms, bases, anchorage, nuts, washers, and finishes.
- Manufacturer Experience Record documentation.
- Work Plan as described above.

**Method of Measurement**

Highway Lighting Pole 30 Foot (Anchor Base) 6 Foot Bracket will be measured for payment per Each Light Pole installed, complete in place.

**Basis of Payment**

Highway Lighting Pole 30 Foot (Anchor Base) 6 Foot Bracket will be paid for at the Contract Unit Price per Each, which price shall include all labor, materials, equipment, and incidental costs required to complete the work.

No separate payment will be made for light poles, anchor bolts, frangible anchoring system, davit arm, materials, including pole wiring, fuses streetlight fuse connector, vibration dampers, mounting hardware, bolt covers, skirt, frangible couplings, connections, but all costs in connection therewith shall be included in the price bid.

**ITEM 823.240      HIGHWAY LIGHTING LUMINAIRE 27,000 LED      EACH**

All work performed under these items shall be in accordance with the relevant provisions of Subsection 820 of the Standard Specifications and the following:

All luminaires specified in this section shall be delivered and clearly marked with the manufacturer's name, catalog number, voltage, source type, maximum wattage, and driver type.

Fixtures shall be grounded in accordance with Massachusetts Electric Code.

Stated Item Numbers refer to a nominal lumen package; actual lumen output of luminaire will vary from the actual luminaire manufacturer supplied. The lumen package is representative of the nominal lumens needed for the intended use of the luminaire.

The work shall include furnishing and installing highway lighting luminaire 27,000 LUMEN Minimum LED.

All luminaires shall be in accordance with MassDOT manufacturing and submittal standards.

**Materials**

Luminaires shall consist of a cast aluminum housing and door frame assembly, removable driver assembly, gasketed optical system and adjustable mounting arm assembly. In addition, the luminaire shall meet the following performance requirements and standards:

- ANSI/NFPA 70, National Electrical Code
- IEEE C62.41, Guide on the Surge Environment in Low-Voltage (1000 V and Less) AC Power Circuits
- FCC 47 CFR Part 15, Federal Code of Regulation (CFR) testing standard for electronic equipment
- NEMA SSL 3-2010, High-Power White LED Binning for General Illumination
- IESNA LM-79, Optical and Electrical Measurements of Solid-State Lighting Products
- IESNA LM-80, Approved Method for Measuring Lumen Maintenance of LED Light Sources
- IESNA TM-15, Luminaire Classification System for Outdoor Luminaires
- IESNA TM-21-11, Projecting Long Term Luminous, Photon and Radiant Flux Maintenance of LED Light Sources
- UL1598, Luminaires
- Wet location rated: UL-1598
- Ingested Protection rated: IP66
- Drivers all RoHS Compliant
- Vibration Testing: CAL Trans 611
- 3G Vibration Rating: ANSI C136.31
- Weather ability testing: ASTM Designation - B117
- Manufacturer's Warranty: 10 years



**ITEM 823.240** (Continued)

Luminaires shall include a mounting system capable of accommodating 1¼ inch to 2-inch ID (2-3/8" OD) pipe for slipfitter. The system shall be manufactured to provide a minimum adjustment of 3 degrees above and below horizontal. The mounting opening of the luminaire shall be provided with a cover to prevent insect infiltration into the luminaires. Highway Luminaires shall have a four (4) bolt (two clamps) universal slip fitter as indicated on the Contract Drawings. The mounting clamp design shall also provide "teeth" or a "saw cut" in the fitter clamp to lock the luminaire into position. The Contractor shall torque the clamping bolts according to the manufacturer's recommendations. Care must be followed as to not under or over tighten.

Adequate provisions shall be provided to the luminaire for the dissipation of heat radiated from the driver.

Housing and door shall be aluminum with a nominal 2.5 mil thick paint finish able to withstand a 3000-hour salt spray test as specified in ASTM Designation - B117.

Each refractor or lens shall be made from UV inhibited optical grade material and be resistant to scratching.

Provide a NEMA lamp wattage decal inside fixture per ANSI C136.22 and a NEMA lamp wattage decal on the outside of the fixture per ANSI C136.15.

All exposed hardware shall be manufactured of stainless steel.

Each luminaire shall comply with the following:

- All luminaires shall utilize LEDs from well-known and reputable LED manufacturers: Nichia, CREE, Philips. As part of the submittal package, the manufacture shall supply all testing and data sheets for the supplied LEDs.
- Each Luminaire shall consist of an assembly that utilizes LEDs as the light source. In addition, a complete luminaire shall consist of a housing, LED array, and electronic driver (power supply).
- Photometry must be compliant with IESNA LM-79.
- Each luminaire shall meet all parameters of this specification throughout the minimum operational life when operated at the average nighttime temperature.
- Luminaire shall be constructed such that LED drivers and surge modules may be replaced or repaired without replacement of whole luminaire.

**ITEM 823.240** (Continued)**Electrical Requirements**

- The highway luminaire driver compartment must be accessible from the bottom of the fixture via a tool-less entry and a tool-less removal of the driver and/or driver tray itself. Quick disconnect electrical connections must be on all wires to and from the driver.
- Operation Voltage: The luminaire shall operate from a 60 HZ  $\pm$ 3 HZ AC line over a voltage ranging from 108 VAC to 305 VAC. The fluctuations of line voltage shall have no visible effect on the luminous output.
- Power Factor: The luminaire shall have a power factor of 0.9 or greater.
- THD: Total harmonic distortion (current and voltage) induced into an AC power line by a luminaire shall not exceed 20 percent.
- Surge Suppression: The luminaire onboard circuitry shall include surge protection devices (SPD) to withstand high repetition noise transients as a result of utility line switching, nearby lightning strikes, and other interference. The SPD protects the luminaire from damage and failure for common and differential mode transient peak currents up to 10 kA (minimum). SPD shall conform to UL 1449 and be certified as such. SPD performance has been tested per procedures in ANSI/IEEE C62.41-2:2002 category C high exposure and ANSI C136.2 10kV BIL. The SPD shall fail in such a way as the Luminaire will no longer operate. The SPD shall be field replaceable.
- LED Driver Protection: Fixture shall include a protection device prior to the driver to ensure that an over voltage condition due to a lost neutral will not exceed the maximum allowed voltage to the driver. Manufacturer to provide test results to confirm conformance to this requirement.
- Operational Performance: The LED circuitry shall prevent visible flicker to the unaided eye over the voltage range specified above.
- RF Interference: LED Drivers must meet Class A emission limits referred in Federal Communications Commission (FCC) Title 47, Subpart 15 regulations concerning the emission of electronic noise.

**Photometric Requirements**

- Optical Assemblies: LEDs shall be provided with discreet over optical elements to provide an IESNA Type III distribution. Luminaire and optical assemblies shall be mounted parallel to the ground. Each LED shall provide the same optical pattern such that catastrophic failures of individual LEDs will not constitute a loss in the distribution pattern.
- No more than 3.0% of the total luminaire lumens shall be in the 80° to 90° range and no lumens will be emitted above 90°. BUG rating shall not exceed B3-U0-G4.
- Light Color/Quality: The luminaire shall have a correlated color temperature (CCT) of 3,985K  $\pm$ 275K. The color rendition index (CRI) shall be greater than 70.
- The minimum percentage luminaire lumens to the street side of the luminaire shall be greater than 75%.
- The optical assembly of the luminaire shall be protected against dust and moisture intrusion per the requirements of IP-66 (minimum) to protect all optical components.

**ITEM 823.240** (Continued)**Thermal Management Requirements**

- The thermal management (of the heat generated by the LEDs) shall be of sufficient capacity to assure proper operation of the luminaire over the expected useful life.
- The LED manufacturer's maximum thermal pad temperature for the expected life shall not be exceeded.
- Thermal management shall be passive by design. The use of fans or other mechanical devices shall not be allowed.
- The luminaire shall have a minimum heat sink surface such that LED manufacturer's maximum junction temperature is not exceeded at maximum rated ambient temperature.
- The heat sink material shall be aluminum.
- The driver Tcase temperature shall not exceed 70°C at a 40°C ambient operating temperature. Submit testing with approval submittal.

The Luminaire shall have an IESNA Distribution Type III. Luminaire shall have Initial minimum 27,000 Lumens. Averaged rated Life: >100,000hr to 70% of Initial output at 15 Degree Celsius (57 degree of F); Averaged rated of Driver of >100,000hr, Minimum 70 CRI, 4000 Kelvin

The lighting system shall provide 0.9 average maintained footcandles on roadway. The lighting system shall be based on the light poles layout shown on the Plans and luminaires rated as shown on the Plans.

The electrical subcontractor shall submit calculations based on the following parameters:

LLF = LLD x LDD x LATF, where

LLD: Lamp Lumen Depreciation. Use minimum 0.86, or use chart from manufacturer.

LDD: Luminaire Dirt Depreciation. Use 0.9 (from 2012 FHWA Roadway Design Handbook)

LATF: Luminaire Ambient Temperature Factor. Use 1.02 or 1.025 for 15 Degree Celsius Zone.

**Submittals**

Submit complete Shop Drawings for approval of highway lighting luminaires including:

- Full details and materials descriptions for luminaires, LEDs, PCBs, drivers, materials, protection devices, certificates, calculations, testing reports, and wiring connections, as well as all accessories and incidentals.
- Design calculations and Shop Drawings submitted to the Department for review and approval shall be stamped by a Professional Engineer registered in Massachusetts.

**ITEM 823.240** (Continued)

Luminaire submittals shall include the following:

- Product Data: For each luminaire, arranged in the order of lighting unit designation. Include data on features, accessories, finishes, and the following:
  - Physical description of fixture, including dimensions and verification of indicated parameters. Including descriptive literature and catalogue cuts for but not limited to luminaire, LED driver, and surge protection device.
  - Luminaires' weight, effective projected area, details of attaching luminaires, accessories, and installation and construction details.
  - Manufacturer's recommended replacement parts list.
  - LED Driver/Power Supply: description, operating characteristics, electrical data, component/capacitor temperature rating and reliability testing report from an independent laboratory including mean-time-between-failure (MTBF).
  - LEDs and Printed Circuit Board Construction.
  - LED type, ratings and description including heat dissipation design indicating margin between the maximum rated LED junction temperature and the junction temperature at operating current.
  - Light Loss Factors (lumen depreciation as a function of operating current, temperature and operating hours): Provide measurement bases for these factors.
  - Photometric report illustrating iso-illuminance for the project mounting height, classification type and cutoff characteristic. All photometric files presented shall be prepared and certified by an independent testing laboratory.
  - Independent laboratory IESNA LM-79 and LM-80 Reports. The test laboratory must hold National Voluntary Laboratory Accreditation Program (NVLAP) accreditation for the IES LM-79 test procedure or must be qualified, verified, and recognized through the U.S. Department of Energy's CALiPER program.
  - Luminaire IESNA distribution classification and TM-15 BUG rating.
  - All components shall be submitted with a list of all standards to which the product conforms. Submittals shall include proper Ingress Protection (IP) and UL Listing documentation for all the submitted products.
  - Vibration Characteristics Test Reports as specified within this section.
  - Written Warranty that complies with this section.
- Shop Drawings: Catalog cuts and manufacturers drawings.
- Wiring Diagrams: Power, and control wiring.
- Coordination Drawings
- Mounting and connection details, drawn to scale, for exterior luminaires with all requirements specified here within.
- Weight of the fixture inclusive of the LED Driver.
- Mounting and installation details drawn to scale.
- Operation and Maintenance Data: For luminaires to include in maintenance manuals.

**ITEM 823.240** (Continued)

- Calculation(s) to be completed using the design drawings as the basis for the pole placement and mounting height. Calculations are to include average, maximum, minimum, maximum/minimum and average/minimum for maintained luminance and illuminance on an R3 roadway surface as required. Calculations shall comply with IESNA. Software used shall be industry recognized for performing roadway calculations. The Contractor shall demonstrate through the calculations specified above that all equal luminaires submitted conform to the criteria here within with total light loss factor as defined in luminaire submittal requirements.
- Samples: Provide (1) operable fixture for each fixture type, supplied with a 120V driver and a cord and plug for tabletop review and operation. This sample will remain the property of the Authority to be used by the engineer for quality assurance purposes during and after the project installation.
- Luminaire for each type and size.
- LED drivers of each type and size.
- Fuses of each type and size

**Warranty**

The luminaire manufacturer shall comply with the following warranty for all LED Luminaires:

- The Manufacturer warrants that the design, material and workmanship incorporated in each luminaire shall be of the highest grade and consistent with established, and generally accepted, standards for lighting application.
- The Manufacturer agrees that this warranty (non-prorated warranty) shall commence with the acceptance of the luminaires, whether a defect is patent or latent, and shall continue for a period of ten (10) years after acceptance by the MASSDOT.
- The warranty by the Manufacturer shall be valid for all installations of procured products, regardless of the Installing Contractor. The Manufacturer will be allowed to inspect, at no cost to the Department and with the Engineer present, the installation of the product in order for the final issuance of the warranty specified above. Should any modifications be required regarding the installation of the product(s), it will be at the expense of the contractor. Once all modifications are accepted by the Manufacturer, the product warranty will become effective and supported by the Manufacturer.
- Any claims against the warranty will be valid regardless of who performs the installation. The Manufacturer will be allowed to inspect after the time the repair has been made, at no cost to the Department and with the Engineer present, the installation of the product in order for the final issuance of the warranty specified above.

**Installation**

Adjust all luminaires to the satisfaction of the Engineer. Adjustments required at night shall be done at no additional cost to the contract. Provide all equipment needed (for adjustment and for Engineer's inspection) including scaffolding and bucket truck, if required.

The Contractor shall provide a witness test in the presence of the Engineer to ensure that installed circuiting is verified against the Contract Documents. This testing may be witnessed by the Engineer of record and/or a MassDOT representative.

**ITEM 823.240** (Continued)

Method of Measurement

Item 823.240 will be measured for payment per Each luminaire installed, complete in place.

Basis of Payment

Item 823.240 will be paid for at the Contract Unit Price per Each, which price shall include all labor, materials, equipment and incidental costs required to complete the work.

**ITEM 823.711**

**HIGHWAY LIGHTING LUMINAIRE AND  
ARM REMOVED AND STACKED**

**EACH**

The work under this Item shall conform to the relevant provisions of Subsection 820 of the Standard Specifications and the following:

The work shall include carefully removing existing highway lighting bracket arms and luminaires designated to be removed on the Plans. The Contractor shall transport and stack all of the lighting bracket arms and luminaires at the Town of Webster Highway Department.

The Contractor is responsible for maintaining street lighting at all times in addition to providing temporary illumination for the work zone and temporary illumination of the lane closure/shift and crossover roadway areas. No portion of the roadway shall remain unlit during construction.

Where possible, existing lighting luminaires and arms shall remain operational until the new lighting system is in place and functioning. In the event existing utility poles must be removed prior to the new system being operational, temporary lighting shall be provided.

**Method of Measurement**

Highway Lighting Luminaire and Bracket Arm Removed and Stacked will be measured for payment per Each luminaire and bracket arm removed.

**Basis of Payment**

Highway lighting luminaire and bracket arm removed and stacked will be paid for at the Contract unit price per each which price shall include all labor, materials, equipment and incidental costs required to complete the work.

Temporary lighting required due to the removal of existing light poles will be paid for under Item 853.8.

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**ITEM 852.1**                      **TEMPORARY PEDESTRIAN CURB RAMP**                      **EACH****ITEM 852.2**                      **TEMPORARY PEDESTRIAN BARRICADE**                      **FOOT**

The work under these Items consists of furnishing, deploying, maintaining in proper operating condition, and removing temporary pedestrian barricades and temporary pedestrian ramps as part of a Temporary Pedestrian Access Route (TPAR) in order to guide pedestrians around a fully- or partially closed sidewalk. These devices are intended to prevent pedestrians from entering the work area and to prevent pedestrians from inadvertently entering the vehicle travel lane by providing visual and physical separation between each space.

**Materials:**

The Temporary Pedestrian Barricade shall have a continuous bottom rail or edge no more than two (2) inches above the ground and eight (8) inches in height (minimum) to accommodate cane users. The barricade shall also have a smooth and continuous hand railing along the top edge no less than thirty-two (32) inches above the ground and shall not obstruct or project into the pedestrian path of travel. Barricade walls shall be nearly vertical and generally within the same plane.

If exposed to traffic, Temporary Pedestrian Barricades shall be crashworthy.

The Temporary Pedestrian Curb Ramp shall provide a forty-eight (48) inch minimum width, with a firm, stable and non-slip surface. Protective edging with a two (2) inch minimum height shall be installed when the curb ramp or landing platform has a vertical drop of six (6) inches or greater.

The Temporary Pedestrian Curb Ramp walkway and landing area surface shall be of a solid, continuous and contrasting color abutting up to the existing sidewalk.

If a Temporary Pedestrian Curb Ramp leads to a crosswalk, a detectable warning pad must be used at the base of the ramp. If it leads to a protected path that does not conflict with vehicular traffic, then a detectable pad shall not be used.

**Construction Methods:**

The Temporary Pedestrian Barricade shall be placed in an area that will provide pedestrians with a TPAR on a smooth, continuous and hard surface for its entirety. The geometry and alignment of the facility shall meet the applicable requirements of the “Americans with Disabilities Act, Accessibility Guidelines for Buildings and Facilities” and the Massachusetts Architectural Access Board.

The recommended width of the TPAR is sixty (60) inches, but if constraints exist a minimum clear width of forty-eight (48) inches shall be provided along its entirety. If a sixty (60) inch width cannot be accommodated in full, a sixty (60) inch by sixty (60) inch passing space shall be provided every two hundred (200) feet or less along the TPAR.

Turning areas shall be a minimum of sixty (60) inches by sixty (60) inches.



**ITEMS 852.1 & 852.2** (Continued)

Lateral joints between any surfaces shall not exceed one-half (0.5) inch. Lateral edges may be vertical up to one-quarter (0.25) inch high and shall be beveled at 1V:2H between one-quarter (0.25) and one-half (0.5) inches.

The TPAR shall be kept clear of debris, snow and ice and the Temporary Pedestrian Barricades and Temporary Pedestrian Curb Ramps shall not obstruct drainage.

Removal and/or resetting of Temporary Pedestrian Barricades and Temporary Pedestrian Curb Ramps shall be considered incidental to these items.

**Method of Measurement and Basis of Payment.**

Item 852.1 will be measured for payment by the total length per linear foot of Temporary Pedestrian Barricade, as applicable, and shall be the actual number of linear feet furnished and installed as required and approved by the Engineer. Payment for Item 852.1 will be made at the contract price per linear foot installed in place, including all incidental items. This price shall include the cost of furnishing, installing, resetting, removal and maintaining the barricades in good working condition.

Item 852.2 will be measured for payment by the quantity per each unit of Temporary Pedestrian Curb Ramps, as applicable, and shall be the actual quantity of units furnished and installed as required and approved by the Engineer. Payment for Item 852.2 will be made at the contract price each unit installed in place, including all incidental items. This price shall include the cost of furnishing, installing, resetting, removal and maintaining the curb ramps in good working condition.

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**ITEM 853.21      TEMPORARY BARRIER REMOVED AND RESET      FOOT**

Work under this item shall conform to the relevant provisions of Section 850 and shall consist of removing, transporting and resetting temporary barrier systems and limited deflection temporary barrier systems from alignments established along the roadway to new alignments in accordance with the details shown on the plans, as required by the construction and staged construction operations and as required by the Engineer for the channelization of traffic and/or work zone protection.

The work shall also include furnishing and installing all hardware and associated materials per the details and/or manufacturer's specifications. The work shall also include necessary patches and repairs caused by the temporary barrier system to damaged pavement surfaces or any adjacent longitudinal barrier once the system has been removed.

Temporary barrier systems and limited deflection temporary barrier systems shall be removed from existing locations and reset in accordance to the construction methods stated in the respective barrier items.

Damage to the pavement surface or adjacent permanent barriers caused by removing or resetting temporary barrier shall be repaired as directed by the Engineer at the Contractor's expense.

**Method of Measurement and Basis of Payment**

Item 853.21 will be measured and paid by the foot, in place which shall provide full compensation for removing, relocating, resetting, realigning, and transporting maintaining the temporary barrier system and/or limited deflection temporary barrier system. The Contractor will be paid for this item each time the barrier is relocated either to a new work zone, to off-season storage, or back to the project from storage. The Contractor will not be separately compensated for any work necessary to maintain or re-align units or replace damaged units. No payment will be made for removing and resetting barriers for the purpose of gaining access to the construction work zone. No payment will be made for removing, relocating and resetting any barriers moved for the convenience of the Contractor.

For temporary barrier systems that require anchorage systems, the cost of furnishing, installing and removing the anchorage and hardware and the restoration of pavement surfaces or adjacent permanent barrier systems to facilitate anchorage shall be considered incidental to the cost of this Item.

**ITEM 853.23****TEMPORARY BARRIER (TL-3)****FOOT**

Work under this Item shall conform to the relevant provisions of Subsection 850 of the Standard Specifications and shall consist of furnishing, installing, maintaining and final removal of TL-3 temporary barrier systems for work zone protection at any locations where Temporary Limited Deflection Barrier is not required.

**Materials**

The Contractor shall use a temporary barrier system that is listed on the Qualified Traffic Control Equipment List.

The Contractor may submit alternate materials to the Engineer for approval if the temporary barrier system meets the following criteria:

1. The system has been tested by an independent laboratory that is accredited by FHWA to crash test roadside hardware;
2. The system meets the minimum requirements of the AASHTO *Manual on Assessing Safety Hardware* (MASH) at Test Level (TL) 3 or higher; and
3. The system has a federal-aid eligibility letter from FHWA.

Copies of the testing results and the federal-aid eligibility letter shall be submitted and approved by the Engineer prior to procurement of an alternate temporary barrier system.

The Contractor shall supply shop drawings to confirm the available clear area behind the barrier equals or exceeds the maximum dynamic deflection of MASH Test 3-11 during testing procedures taken at an independent laboratory that is accredited by FHWA to crash test roadside hardware.

Delineators shall be installed on all temporary barrier systems in conformance with the relevant provisions of Subsection 850.69 and shall be incidental to the temporary barrier systems.

Temporary impact attenuators that are listed on the Qualified Traffic Control Equipment List shall be used whenever a blunt end of the temporary barrier system is facing traffic within the clear zone unless it is protected by a second barrier system or secured to a separate barrier system or bridge railing by a method approved by the manufacturer.

**Construction Methods**

Temporary barrier systems shall be placed in line with the drawings. Installation shall be per the manufacturer's specifications, details, and the approved shop drawings.

The Contractor shall not place any breaks in the temporary barrier system that will result in sections that are shorter than the stated minimum length-of-need (LON) under MASH Test 3-11. Exceptions shall be allowed for gate systems or changeable length segments placed over expansion joints if those barrier segment types have been tested and meet the minimum requirements of MASH Test 3-11 with the adjoining barrier system.

**ITEM 853.23** (Continued)

Within the LON section, temporary barrier systems shall only be placed on paved surfaces unless otherwise tested and certified under MASH TL-3 for those conditions.

Damage to the pavement surface caused by the temporary barrier during installation, while in service, and/or during removal shall be repaired as directed by the Engineer at the Contractor's expense.

Temporary barrier systems that require anchorage systems shall conform with the relevant provisions of Subsection 850.70.

Method of Measurement

Item 853.23 shall be measured per Foot, in place.

Basis of Payment

Item 853.23 shall be paid at the Contract Unit Price per Foot for temporary barrier installed in place, including all incidental items. This price shall include the cost of furnishing, installing, maintaining and final removal of all temporary barrier systems that are not designated as Limited Deflection Barrier.

For temporary barrier systems that require anchorage systems, the cost of furnishing and installing the anchorage and hardware and the restoration of pavement surfaces or adjacent permanent barrier systems to facilitate anchorage shall be considered incidental to the cost of this Item.

Payment for temporary barrier removed and reset will be made under Item 853.21.

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**ITEM 853.33      TEMPORARY BARRIER- LIMITED DEFLECTION (TL-3)      FOOT****Description**

Work under this item shall conform to the relevant provisions of Subsection 850 and shall consist of furnishing, installing, maintaining and final removal of limited deflection TL-3 temporary barrier systems for channelization of traffic and/or work zone protection. The limited deflection temporary barrier system shall require an anchorage system on the bridge which provides a maximum six (6) inch dynamic lateral deflection requirement at the base as recorded in the crash test documentation. A minimum of 2'-6" for working width of the temporary barrier system shall be provided allowing for the maximum six-inch dynamic lateral deflection. In all cases, the clear area available behind the barrier shall be greater than the dynamic deflection of the barrier system. A single manufacturer system shall be used throughout the length of the project, with pinned to pavement barrier being compatible with the anchored to concrete bridge deck barrier.

**Materials**

The Contractor shall use a temporary barrier system that is listed on the current MassDOT Qualified Traffic Control Equipment List.

The Contractor may submit alternate materials to the Engineer for approval if the limited deflection temporary barrier system meets the following criteria:

1. The system has been tested by an independent laboratory that is accredited by FHWA to crash test roadside hardware;
2. The system meets the minimum requirements of the AASHTO *Manual on Assessing Safety Hardware* (MASH) at Test Level (TL-3) or higher;
3. The system meets the mentioned above maximum dynamic deflection criteria; and
4. The system has a federal-aid eligibility letter from FHWA.

Copies of the testing results and the federal-aid eligibility letter shall be submitted and approved by the Engineer prior to procurement of an alternate temporary barrier system.

The Contractor shall supply shop drawings to confirm the available clear area behind the barrier equals or exceeds the maximum dynamic deflection of MASH Test 3-11 during testing procedures taken at an independent laboratory that is accredited by FHWA to crash test roadside hardware.

Delineators shall be installed on all limited deflection temporary barrier systems in conformance with the relevant provisions of Subsection 850.69 and shall be incidental to the temporary barrier systems.

Temporary impact attenuators that are listed on the Qualified Traffic Control Equipment List shall be used whenever a blunt end of the limited deflection temporary barrier system is facing traffic within the clear zone unless it is protected by a second barrier system or secured to a separate barrier system or bridge railing by a method approved by the manufacturer. Payment for Temporary Impact Attenuators shall be made under Item 628.305 or 628.04, as appropriate.

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**ITEM 853.33** (Continued)**Construction Methods**

Limited deflection temporary barrier systems shall be placed in line with the drawings. Installation shall be per the manufacturer's specifications, details, and the approved shop drawings.

The Contractor shall not place any breaks in the limited deflection temporary barrier system that will result in sections that are shorter than the stated minimum length-of-need (LON) under MASH Test 3-11. Exceptions shall be allowed for gate systems or changeable length segments placed over expansion joints if those barrier segment types have been tested and meet the minimum requirements of MASH Test 3-11 with the adjoining limited deflection barrier system.

Within the LON section, limited deflection temporary barrier systems shall only be placed on paved surfaces unless otherwise tested and certified under MASH TL-3 for those conditions.

Damage to the pavement surfaces, membrane waterproofing for the bridge deck, and the proposed concrete bridge deck caused by the limited deflection temporary barrier during installation, while in service, and/or during removal shall be repaired as directed by the Engineer at the Contractor's expense. A proposed repair procedure shall be submitted to the District Bridge Engineer for approval prior to the start of the repair work.

Limited deflection temporary barrier systems that require anchorage systems shall conform with the relevant provisions of Subsection 850.70.

**Method of Measurement**

Item 853.33 shall be measured by the Foot, in place.

**Basis of Payment**

Payment for work under this item shall be made at the contract price per Foot for limited deflection temporary barrier installed in place, including all incidental items. This price shall include the cost of furnishing, installing, maintaining and final removal of all limited deflection temporary barrier systems.

For limited deflection temporary barrier systems that require anchorage systems, the cost of furnishing and installing the anchorage and hardware and the restoration of pavement surfaces, or adjacent permanent barrier systems to facilitate anchorage shall be considered incidental to the cost of the item.

Payment for limited deflection (TL-3) temporary barrier removed and reset will be under Item 853.21.

**ITEM 853.8      TEMPORARY ILLUMINATION FOR WORK ZONE      DAY**

The work under this Item shall conform to the relevant provisions of Subsection 850 of the Standard Specification and the following:

Work under this Item includes deploying and maintaining in proper operating condition an LED balloon diffuser lighting system. Portable light towers shall be used throughout the project area for temporary work zone lighting. Use of unshielded high wattage flood lights is not permitted.

These towers shall be used, relocated and adjusted to meet the criteria in Subsection 850 of the Standard Specifications and the following:

The Contractor shall illuminate the following work zone areas:

- Change in direction (i.e., work zone entrances and exits, crossovers, etc.)
- Tapered areas
- Actual area where the construction is being performed
- Temporary Lighting for locations where existing lighting must be removed or deenergized and cannot be replaced before the road is open to traffic.

Light measurement shall be based on the illuminance method and the lighting levels shall be based on the classification of construction activity that is taking place. At no time shall the light level be below 5 fc and the uniformity shall not exceed 6:1. Task Classifications and recommended illumination levels is shown in Table 1.

<b>Task Classifications</b>	<b>Illumination Level</b>	<b>Average Minimum Maintained Illuminance</b>
All work operations areas, setup of lane or road closures, lane closure tapers, and flagging stations, such as: Excavation (all types), Embankment Fill and Compaction, Reworking Shoulders, Asphalt Pavement Rolling, Subgrade, Stabilization and Construction, Base Course Rolling, Sweeping, Cleaning and Landscaping.	Level I	5 foot-candles
Areas on or around construction equipment; asphalt paving, milling, and concrete placement and/or removal, such as, Milling, Removal of Pavement, Asphalt Paving and Resurfacing, Concrete Pavement, Waterproofing and Sealing, Sidewalk Construction, Base Course Grading and Shaping, Surface Treatment, Bridge Decks, Drainage Structures and Drainage Piping, Other Concrete Structures, Barrier Wall and Traffic Separators, Guardrails and Fencing, Striping and Pavement Markings, Repair of Concrete Pavement, Highway Signs, Hole Filling and Repair of Guardrails and Fencing.	Level II	10 foot-candles
Pavement or structural crack/ pothole filling; joint repair, pavement patching and/or repairs, installation of signal/electrical/mechanical equipment, such as, Traffic Signals, Highway Lighting Systems and Crack Filling	Level III	20 foot-candles

TABLE 1

TASK CLASSIFICATIONS AND ILLUMINATION LEVELS

**ITEM 853.8** (Continued)

A detailed work zone lighting plan shall be submitted to MassDOT for approval before any work has commenced. Said plan shall include photometrics that detail the light levels that are to be provided. Photometrics shall include the following: calculated illuminance, uniformity, and glare avoidance verification throughout the work zone as well as the active travel lanes. The lighting plan shall be submitted with all supporting calculations, catalog cut sheets and supporting documentation.

Any potential glare from the work zone lighting system should be considered from each direction and on all approaching roadways and opposing lanes of traffic. Glare from the illumination system should be minimized as much as possible for both workers and motorists in adjacent active travel lanes. If necessary, the Contractor shall provide supplemental hardware, such as, visors, louvers, shields, glare screen and barrier to reduce glare in adjacent active travel lanes.

The work zone plan shall show the layout for each work area including the number, location, spacing of all fixed and/or mobile structures, description of illumination equipment that is proposed to be used on this project, and mounting details for mobile lights attached to construction equipment. Plan shall be designed by a professional engineer that is registered and licensed by the Commonwealth of Massachusetts and shall be submitted to the Engineer for approval prior to any nighttime work operations within the State Highway Right of Way.

Temporary Illumination is required if the existing lighting must be removed and cannot be replaced before the road is open to traffic. All portable lighting shall be located off the travel way. Whenever possible the lighting shall be located on the side of the road opposite the closed lanes. All lighting equipment shall be approved by the Engineer prior to use. The Contractor shall submit to the Engineer a temporary lighting plan for approval. The temporary lighting plan shall be prepared by a Professional Engineer and consist of the means and methods of the proposed lighting and contain supporting calculations. No nighttime work shall be performed until the plan is approved by the Engineer. The contractor shall provide power to adequately energize the lighting equipment specified. Generator placement and wiring shall be in compliance with the Massachusetts Electrical code and OSHA safety standards. The Contractor shall furnish to the Engineer a Multi-function digital illuminance meter, complete with instructions and capable of measuring from 0.01 to 200 fc. The illumination on the project shall be monitored at random intervals for conformance to the specifications set forth herein. Substandard illumination shall be sufficient reason for the Engineer to stop all affected work until the substandard situation is corrected.

The Contractor shall allow MassDOT up to 30 calendar days for review and comment.



**ITEM 853.8** (Continued)

Method of Measurement and Basis of Payment

Item 853.8 will be measured and paid for at the contract unit price per DAY. The cost shall include all labor, materials, equipment, tools and all incidentals required for the design and installation of the work zone lighting system. This shall include, but not be limited to lighting plan preparation, delivery, removal, wiring connections, equipment relocations, staging or tripods, generators, light meter, maintenance and include all material and labor incidental for a complete, functional and operational work zone illumination system.

The price of this item shall include the material and labor necessary to install any supplemental hardware required to reduce glare on all adjacent active travel lanes.

The per day price shall be full compensation for all “Temporary Illumination for Work Zone” regardless of the number of concurrent work areas, amount of equipment concurrently in use or the durations of or changes of the work shifts per day.

Installation and modifying the existing set-up shall be incidental to Item 853.8.

**ITEM 854.017**      **TEMPORARY PAVEMENT MARKINGS – 12 INCH FOOT**  
**(PAINTED)**

Work under this Item shall conform to the relevant provisions of Subsection 850 of the Standard Specifications and the following:

The work shall include furnishing, installing, maintaining and removing temporary pavement markings.

Temporary 12-inch-wide pavement markings shall be installed at the locations indicated on the Plans.

**ITEM 864.1**

**FRICITION SURFACE FOR BIKE LANES**

**SQUARE FOOT**

The work under this Item shall be in accordance with Section 860 of the Standard Specification for Highways and Bridges and the following:

The work shall consist of furnishing and placing green and/or white Friction Surface (FS) for bicycle safety. FS shall be provided for bicycle lanes at roadway and driveway crossings as identified on the Plans. This surface treatment is also commonly known as High Friction Surface Treatment (HFST).

The acceptable manufacturers and products and/or equal manufactured products are as follows:

**DBI Services**

Contact: Richard Baker (rbaker@dbiservices.com)  
(804) 213-0335  
100 North Conahan Drive  
Hazleton, Pennsylvania 18201  
(<http://www.dbiservices.com/demarcation-colored-pavement>)

**Traffic Calming USA**

Contact: Glyn Owen (glyn@trafficalmingusa.com)  
(770) 550-4044  
317 A, North Point Parkway  
Acworth, Georgia 30102  
(<http://www.trafficalminusa.com/coloredstone.html>)

**Ennis-Flint**

Contact: Scott Seeley (sseeley@ennistraffic.com)  
(800) 331-8118 ext. 3619  
115 Todd Court  
Thomasville, NC 27360  
(<http://www.ennisflint.com/Products/Colored-Bike-Lanes/Cyclegrip>)

**Transpo Industries, Inc.**

20 Jones Street  
New Rochelle, NY 10801  
(<http://transpo.com/color-safe/index.html>)

Quality Control

**A. General**

The installer shall submit a minimum of three projects with the owner's contact information on which the Friction Surface for Bike safety has been placed within the past three (3) years. An installer who does not meet this minimum shall be allowed if they are certified by the manufacturer to install and a manufacturer's representative is onsite during installations.

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**ITEM 864.1** (Continued)**B. Contractor's Quality Control Inspector and Materials Submittal**

The Contractor shall hire a Quality Control (QC) inspector having a minimum of three (3) years' experience in field inspection of HFST applications. The QC inspector shall be expected to verify the recommended manufacturer's equipment, materials, proposed methods of installation, materials blending procedures, monitoring of ambient temperature, proposed methods of curing and corrective action plan. The Contractor shall also submit a Material Submittal for these items including product literature, shop drawings, and safety data. The QC Inspector credentials and Material Submittal shall be submitted to the Engineer for approval at least 30 days prior to placement of the Control Sections of the above items. The Contractor's Submittal shall include a construction procedure and a proposed schedule for placement of this item as well as verification that the Contractor shall provide technical services from the manufacturer upon request of the Engineer.

**C. Control Section**

The Contractor shall construct a control section with a minimum area of one square yard to represent the Green Friction Surface for Bike Lane, and 3 linear feet to represent the White Friction Surface for Buffer. The color, the surface texture, surface friction, materials and installation, shall be presented for acceptance and approval by the Engineer and the Municipality's Public Works or Transportation Department prior to installation. The control section may be constructed as a Friction Surface on the project and if accepted may remain as part of completed work. Acceptance criteria for the Control Section shall consist of the Engineer's approval and written certification by the manufacturer's QC Inspector that the Control Section meets the manufacturer's HFST product specifications, complete in place.

**D. Pre-construction Meeting**

The Contractor shall arrange for and conduct a Pre-Construction Meeting with the Engineer and a manufacturer representative, following the Engineers approval of the Contractor's Material Submittal. The Contractor's proposed schedule for furnishing and placing these items, as well as other related item details shall be presented to the Engineer during this meeting.

**Equipment and Application Requirements****A. Construction Requirements**

A manufacturer's representative shall be present at the jobsite during construction of the control section. All construction operations shall meet the manufacturer's recommendations. Final approval will be given by the Engineer.

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**ITEM 864.1** (Continued)**B. Weather Limitations**

The Friction Surface shall not be placed on any wet surface or when the ambient temperature and humidity or the pavement temperature is below the manufacturer's recommendations or when the anticipated weather conditions would prevent the proper application and curing of the surface treatment as directed by the manufacturer's representative.

**C. Surface Preparations**

The Contractor shall clean the intended application area thoroughly. All loose particles, dirt, sand dust, etc. must be removed. Broom and use a power blower or compressed air. The surface must be clean, dry and free of all dust, oil, debris and any other material that might interfere with the bond to the existing surface as recommended by the manufacturer's representative.

*HFST Placed Over Existing Hot Mix Asphalt (HMA) Surfaces*

The manufacturer's specification shall control the installation on any new HMA pavement paved in the previous 30 days with motor vehicle traffic or 60 days without motor vehicle traffic.

*HFST Placed Over Existing Concrete Surfaces*

All curing compounds shall be completely removed from concrete surfaces prior to installation by shot blasting or grinding. Existing concrete surfaces shall be wire brushed, but may require shot blasting or grinding dependent on condition.

*Obstacles*

Pavement markings that are to be left in place, utilities, structures, curbs and any other existing materials within or adjacent to the treatment location shall be masked to protect from application, as required by the Engineer. Existing pavement markings conflicting with the surface treatment should be removed by grinding or water blasting. Extra care should be taken to thoroughly remove the dust and debris caused from grinding. Any existing pavement markings, utilities, structures, curbs or other existing materials that are damaged during the FS application process shall be replaced at the contractor's expense per direction of the Engineer.

*Pre-Conditions*

The contractor shall repair all reflective cracking or joints prior to application per the manufacturer's recommendation, and as required by the Engineer.

**D. Surface Friction**

The Contractor shall meet as a minimum the friction value for the surrounding pavement surface, and shall certify that the HFST material aggregate shall include only calcined bauxite, corundum, or alternate equal anti-skid aggregate approved by the Engineer. Aggregate used shall have a minimum hardness value of 8.0 per Mohs Hardness Scale and be uniformly applied – providing a surface friction value >60 BPN over the entire surface.

**ITEM 864.1** (Continued)**E. Application Methods**

FS shall be applied in accordance with the manufacturer's recommendations. The FS can be applied by either mechanical or manual techniques.

**F. Color Surface Treatment (CSF)**

The Contractor shall furnish and apply CST at the location and in accordance with patterns shown on the Plans, in conformance with these specifications, and as required by the Engineer.

All materials listed in this provision that are not listed on MassDOT Qualified Construction Materials List shall be submitted to the Engineer for approval. The Contractor shall not purchase the subject materials until the Engineer has granted approval.

*CST Materials*

- Be VOC compliant and lead chromate free.
- Not contain 0.1% or more of any chemical listed by the International Agency for Research on Cancer (IARC), the National Toxicology Program (NTP), or regulated by the US Occupational Safety and Health Administration (OSHA) as a carcinogen.
- Conform to current Federal, State and Local air pollution regulations, including those for the control (emission) of volatile organic compounds (VOC).
- Be packaged and stored in accordance with the manufacturer's instructions and requirements for shelf life and storage conditions in original unopened containers. Shipping documents and containers shall have identification numbers or batch dates for confirmation of when products were manufactured, clearly labeled as to the type material and the ratio of the components to be mixed by volume as well as showing resin or hardener components, brand name, name of manufacturer, lot or batch number, temperature range for storage, expiration date and the quantity contained. Include any special instructions regarding mixing and the Material Safety Data Sheets. This information shall be made available for inspection at any time.
- Colors shall be green for bicycle lanes, white for the 12-inch-wide edge buffer stipes, or as otherwise approved by the Engineer. Exact Colors shall be approved by the Engineer prior to the material purchase by the Contractor.

**ITEM 864.1** (Continued)**G. Testing and Acceptance**

FS shall be allowed to cure for the minimum duration as recommended by the binder component supplier's specifications and during that time the application area shall be closed to all vehicles and contractor's equipment traffic. After placement and cure of the FS, the Contractor shall test the finished surface to detect de-bonded areas per manufacturer recommendations. If no manufacturer recommendations are available, the Contractor shall visually inspect the entire high friction surface treatment (HFST) for de-bonded areas, and repair as recommended by the manufacturer and as required by the Engineer at the Contractor's own expense. It shall be acceptable for localized de-bonded sections, as determined by the Engineer, to be repaired by cutting back to a well-bonded area and using hand application of polymer resin and stone to blend the patch in with the existing material. The final approval of properly bonded HFST shall be determined by the Engineer based on visual inspection, and de-bonded areas shall be repaired prior to payment of adjacent areas of HFST under Item 864.1.

Excess and loose aggregate shall be removed from the traveled way and shoulders in such a way that the FS is not damaged or disturbed. Excess aggregate that can be reused shall be clean, uncontaminated and dry, if it is to be re-used in the FS application.

Acceptance criteria for the finished HFST items above shall consist of the Engineer's approval and written certification by the manufacturer's QC Inspector that the finished HFST items above meet the manufacturer's HFST product specifications, complete in place.

**H. Preformed Thermoplastic Sheets**

The Contractor shall provide Preformed Thermoplastic Sheets for bike symbols that fall within the FS areas as shown on the plans, or as required by the Engineer. The Preformed Thermoplastic Sheets shall be placed directly over the HMA surfaces in accordance with the manufacturer's recommendations, and shall not be placed over FS surfaces. The FS surfaces shall not be placed in Preformed Thermoplastic Sheet areas, and not measured for payment in these areas.

**Method of Measurement**

Item 864.1 will be measured for payment by the Square Foot area of Friction Surface for Bike Lanes, as applicable, and shall be the actual number of square feet furnished and installed as required and approved by the Engineer.

**Basis of Payment**

Item 864.1 will be paid for at the Contract unit price per Square Foot, which shall be full compensation for all labor, materials, tools, equipment, testing, services of a Quality Control Inspector, and incidental items necessary to complete the work as described above and as required by the Engineer.

**ITEM 864.33      SLOTTED PAVEMENT MARKER TWO-WAY WHITE/RED      EACH****ITEM 864.34      SLOTTED PAVEMENT MARKER TWO-WAY YELLOW/RED      EACH**

Work to be done under this Item shall be done in accordance with the following:

**Description**

The work to be done under this item shall consist of furnishing and installing slotted pavement marker two-way white/red and yellow/red in accordance with Engineering Directive E-05-003, the relevant provisions of Traffic Standard TR.6.3 “Typical Pavement Markings for Freeways”, and the following:

- Markers shall be installed along the solid white and yellow lane lines at **40 foot intervals** on the I-395 Southbound Ramps as shown on the Plans.

**Construction Methods**

The work shall include cutting the tapered pavement slot to the dimensions shown on the typical details (See Engineering Directive E-05-003) for the two-way markers, application of the manufacturer’s recommended epoxy adhesive, and placing the reflectorized pavement marker in the proper position within the slot so that the reflective face is visible and perpendicular to oncoming traffic and so that the top of the marker is set 1/8± inch below the top of the adjacent pavement.

Surface preparation and installation shall be strictly in accordance with the manufacturer’s instructions.

**Materials**

Reflectorized pavement markers shall be 3M Series 290, Avery Dennison Lifelite Model 948 BW, Ray-O-Lite Model 2004 or an approved equal.

**Method of Measurement**

Item 864.33 and Item 864.34 will be measured for payment by the Each respective slotted pavement marker installed, complete in place.

**Basis for Payment**

Item 864.33, and Item 864.34 will be paid for at the respective Contract unit price per Each, which price shall include all labor, materials, equipment, cutting the tapered pavement slot, and all incidental costs required to complete the work.



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<b><u>ITEM 866.206</u></b>	<b><u>6 INCH REFLECTORIZED WHITE LINE (POLYUREA)(RECESSED)</u></b>	<b><u>FOOT</u></b>
<b><u>ITEM 866.212</u></b>	<b><u>12 INCH REFLECTORIZED WHITE LINE (POLYUREA)(RECESSED)</u></b>	<b><u>FOOT</u></b>
<b><u>ITEM 866.224</u></b>	<b><u>24 INCH REFLECTORIZED WHITE LINE (POLYUREA)(RECESSED)</u></b>	<b><u>FOOT</u></b>
<b><u>ITEM 867.206</u></b>	<b><u>6 INCH REFLECTORIZED YELLOW LINE (POLYUREA)(RECESSED)</u></b>	<b><u>FOOT</u></b>
<b><u>ITEM 867.212</u></b>	<b><u>12 INCH REFLECTORIZED YELLOW LINE (POLYUREA)(RECESSED)</u></b>	<b><u>FOOT</u></b>

The work under these Items shall conform to the relevant provisions of Subsection 860 of the Standard Specifications and the following:

The work shall include grooving a slot in the pavement surface and the furnishing and installation of white and yellow pavement markings in the grooved slot. As work incidental to these items, the Contractor or pavement marking Material Supplier will measure the performance of the pavement markings upon installation and at according to the measurement and sampling procedures outlined in ASTM D7585 (*Standard Practice for Evaluating Retroreflective Pavement Markings Using Portable Hand-Operated Instruments*), ASTM E2177 (*Standard Test Method for Measuring the Coefficient of Retroreflected Luminance of Pavement Markings in a Standard Condition of Wetness*), and ASTM E2832 (*Standard Test Method for Measuring the Coefficient of Retroreflected Luminance of Pavement Markings in a Standard Condition of Continuous Wetting*).

#### Materials

Polyurea will be one of the following products, or approved equivalent:

1. 3M Series 5000 Liquid Pavement Markings; or
2. Ennis-Flint HPS-5; or
3. Epoplex LS90.

All Liquid Pavement Marking Materials will have no-track times that do not exceed 10 minutes.

All Pavement Marking will conform to ASTM D6628 (Standard Specification for Color of Pavement Marking Materials).

Wet Reflective Element products for Liquid Pavement Markings will be specified by the Material Supplier in order to meet the Pavement Marking Performance subsection of this document.

All Pavement Marking Materials, including reflective elements, will be free of heavy metals.

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**ITEMS 866.206, 866.212, 866.224 & 867.212** (Continued)**Construction***Construction Methods for Installation of Groove*

Prior to cutting out the grooves for all recessed line, the Contractor will use a chalk line or other suitable method to layout the proposed pavement markings on the surface course so that the Engineer can inspect the locations. Once the Engineer has inspected and approved the proposed striping layout, the grooves for the proposed pavement markings may be cut. No pavement grooving will be done without the prior approval of the Engineer.

Groove position will be a minimum of 2 inches from the edge of the pavement marking to any longitudinal pavement joints. The groove will not be installed on bridge joints, at drainage structures, or in other areas identified by the Engineer. The groove will not be installed continuously for intermittent pavement markings, but only where markings are to be applied.

The Contractor will grind the groove to the correct depth, width, and length as specified and in proper alignment. For use with Liquid Pavement markings, grooves for 6-inch lines will be 7 inches  $\pm$  ¼ inch wide and grooves for 12-inch lines will be 13 inches  $\pm$  ¼ inch wide.

For use with Preformed Contrast Pavement Markings, grooves for 6-inch lines will be 9 inches  $\pm$  ¼ inch wide and grooves for 12-inch lines will be 15 inches  $\pm$  ¼ inch wide. All grooves may extend up to 1 inch beyond the length of the markings.

Groove depth and tolerance for use with Polyurea Pavement Markings will be determined by the pavement marking Material Supplier prior to the start of any grinding, but will not be less than 60 mils  $\pm$  5 mils deep.

All grinding must be inspected and given final approval prior to the placement of any marking material. Measurements for the depth of the slot will be taken at the center of the groove. Depth plates will be provided by the Contractor to the Engineer to assure that desired groove depth is achieved.

The use of gang stacked diamond cutting blades to grind a smooth square slot to the depth tolerance specified will be required for producing all grooves. The spacers between blade cuts will be such that there will be less than a 10 mil rise in the finished groove between the blades. The acceptability of the surface texture will be determined by the Engineer and/or Material Supplier's Technical Representative.

The diamond grinder will have an articulating head so that the slots are installed correctly on grades and super elevated sections.

**ITEMS 866.206, 866.212, 866.224 & 867.212** (Continued)

Grooves that are ground deeper or wider than the specified allowable limits will be repaired according to the Department's approved repair procedure at no additional cost to the Department. Grooves that are ground too shallow or narrow will be reground to the specification limits at no additional cost to the Department. Slots that are ground out of alignment will be cut out and patched using an approved method and approved materials.

Grooves will be clean, dry and free of laitance, oil, dirt, grease, paint or other foreign contaminants prior to pavement marking installation. Shrouds and a vacuum apparatus will be included as part of the grinder to pick up the pieces of pavement that are ground out. The Contractor will prevent traffic from traversing the grooves, and re-clean grooves, as necessary, prior to application of pavement markings at no additional cost to the Department.

**Construction Methods for Installation of Durable Pavement Markings**

All work will be done in accordance with the Material Supplier's specifications and the following:

For Polyurea Pavement Markings, the binder will be applied at a rate to achieve a minimum uniform wet thickness and tolerance specified by the pavement marking Material Supplier, but will not exceed 25 mils  $\pm$  2 mils.

The Line Thickness for all materials will be met across at least the middle 2/3 of the pavement marking width. Depth plates will be provided by the Contractor to the Engineer to assure that desired thickness is achieved.

Methodology and rate of application for reflective elements in Liquid Pavement Markings will be per the pavement marking Material Supplier's specifications in order to meet the Pavement Marking Performance subsection of this specification.

Newly installed markings will be protected from tracking during the setting period per Subsection 860.63.

**Pavement Marking Performance Measurements**

Incidental to the cost of these items, the Contractor or Material Supplier will perform average retroreflectance readings and provide the results to the Department.

Average retroreflectance readings will be taken at the following three times:

1. Initial (between 7 and 14 days from date of application);
2. 6 Month (182 days,  $\pm$  14 days from initial application); and
3. 1 Year (365 days,  $\pm$  14 days from initial application).

The cost of temporary traffic control setups for the Initial readings will be considered incidental to the cost of item. The Department will provide temporary traffic control setups for the 6 Month and 1 Year readings at no cost to the Contractor or Material Supplier.

**ITEMS 866.206, 866.212, 866.224 & 867.212** (Continued)

The retroreflectance readings that are performed during each testing period and location will comply with the following practices:

1. ASTM D7585 (Standard Practice for Evaluating Retroreflective Pavement Markings Using Portable Hand-Operated Instruments);
2. ASTM E2177 (Standard Test Method for Measuring the Coefficient of Retroreflected Luminance of Pavement Markings in a Standard Condition of Wetness); and
3. ASTM E2832 (Standard Test Method for Measuring the Coefficient of Retroreflected Luminance of Pavement Markings in a Standard Condition of Continuous Wetting).

All labor, materials, and equipment required to perform the retroreflective readings will be supplied at no cost to the Department. All measuring equipment will be properly calibrated prior to the implementation of any temporary traffic controls that are required.

The average Initial retroreflectance readings will exceed the following minimum values for all pavement marking materials installed under these items:

	White Markings	Yellow Markings
Observation Angle	1.05°	1.05°
Entrance Angle	88.8°	88.8°
ASTM D7585 (Dry)	500 mcd/lux/m <sup>2</sup>	300 mcd/lux/m <sup>2</sup>
ASTM E2177 (Wet Recovery)	400 mcd/lux/m <sup>2</sup>	200 mcd/lux/m <sup>2</sup>
ASTM E2832 (Wet Continuous)	200 mcd/lux/m <sup>2</sup>	100 mcd/lux/m <sup>2</sup>

For each longitudinal line (edge line, lane line, center line), the Engineer will determine a series of nonconsecutive one-mile-long segments that represent approximately 25% of the total centerline project mileage. Three retroreflective readings, within the first 500 feet of the mile and each spaced at least 40 feet apart per line, will be taken on each line type for each of the selected one-mile segments.

During the Initial testing, if the average of the three readings for a line within the one-mile segment falls below the specified minimum values, additional readings following the same methodology will be taken in an adjacent one-mile segment. If the average retroreflectance values in the adjacent mile segment also fall below the specified minimum values, the pavement marking will be removed by an approved method and reapplied at no cost to the Department.

Readings taken at the 6 Month and 1 Year intervals are for MassDOT Highway informational purposes only. Average readings that fall below the specified minimum values will not require additional testing or pavement marking removal and reinstallation.

**ITEMS 866.206, 866.212, 866.224 & 867.212** (Continued)

Retroreflectance readings will be summarized and include the following information: date & time of reading, location (including direction) of each test, number of tests performed, material type tested, ASTM test method, pavement marking color, date of initial material application, initial wet thickness of material, initial reflective element type and application rate, depth of groove, and any other pertinent information. Results for all readings will be provided within 10 business days of testing to the Engineer, with a second copy sent to:

State Traffic Engineer  
Attention: Pavement Marking Retroreflectivity Testing  
10 Park Plaza, Room 7210  
Boston, MA 02116

Method of Measurement

Items 866.206, 866.212, 866.224 and 867.212 will be measured for payment by the Foot installed complete in place.

Basis of Payment

Items 866.206, 866.212, 866.224 and 867.212 will be paid for at the respective Contract unit prices per Foot, which prices shall include all labor, materials, equipment and incidental costs required to complete the work.

No separate payment will be made for the performance measurements and reporting nor for the temporary traffic control for the initial measurements, but all costs in connection therewith shall be included in the Contract unit price bid.

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<b><u>ITEM 874.1</u></b>	<b><u>STREET SIGN REMOVED AND RESET</u></b>	<b><u>EACH</u></b>
<b><u>ITEM 874.2</u></b>	<b><u>TRAFFIC SIGN REMOVED AND RESET</u></b>	<b><u>EACH</u></b>

The work under these Items shall conform to the relevant provisions of Subsections 828 and 840 of the Standard Specifications and the following:

Work includes the dismantling, removal, transporting and resetting of the existing traffic and street name signs at the locations indicated on the Plans. The work also includes the removal and disposal (if not reused) of the existing sign supports and foundations. Street name signs to be removed and reset for reuse during various stages of construction at locations shown on the Plans shall be removed and disposed once a new proposed street sign has been installed as indicated on the Plans.

The Contractor shall exercise particular care in the dismantling, removal, transporting and resetting of the existing signs designated to be reused. Any sign panel damaged through carelessness or lack of protection by the Contractor shall be replaced at the Contractor's expense.

The Contractor will be held responsible for sign panels to be removed and reset and he shall replace or repair any damage due to his operation at his own expense. Any new materials shall be equal and similar to the present signs, including painting and lettering.

New supports shall be provided for all signs designated to be removed and reset. Payment of the new supports shall be paid under this Item.

The work shall include removing the supports, excavating of the existing foundations to a depth of 6 inches below finish grade, the disposal of the concrete foundations, backfilling with compacted gravel of the holes resulting from the excavation and the removal of the supports and the replacement, in kind, of any surface material disturbed.

The existing signs shall not be removed and reset without permission of the Engineer.

#### Method of Measurement

Item 874.1 and Item 874.2 will be measured for payment respectively by Each sign removed and reset.

#### Basis of Payment

Item 874.1 and Item 874.2 will be paid for at the respective Contract unit prices per Each, which prices shall include all labor, materials, equipment, supports, backfill, area restoration and all incidental costs required to complete the work.

New supports for signs being removed and reset are considered incidental to Item 874.1 and Item 874.2.

**ITEM 874.41**

**TRAFFIC SIGN REMOVED AND DISCARDED**

**EACH**

The work under this Item shall conform to the relevant provisions of Subsection 828 of the Standard Specifications and the following:

Work under this item includes the dismantling, removal, transporting, and discarding of the existing roadside signs shown on the plans and removal and disposal of the sign supports and their foundations.

Also included in this item is the removal of the existing supports and foundations from which the existing signs are removed. The existing foundations shall either be removed completely or the excavation shall be to a depth of at least 6" below the existing or proposed ground level, whichever is lower. The remaining hole shall be backfilled with compacted gravel and the ground surface restored or replaced in kind to match adjacent surface materials.

The existing signs shall not be removed until the new signs and structures replacing them are ready for traffic or until the Engineer permits.

If signs are attached to existing light poles, utility poles or traffic poles, only the sign and attached hardware shall be removed and discarded.

All signs that are to be removed and discarded shall become the property of the Contractor and shall be disposed of off the site.

**Method of Measurement**

Traffic Sign Removed and Discarded will be measured for payment by Each sign removed and discarded.

**Basis of Payment**

Traffic Sign Removed and Discarded will be paid for at the Contract unit price per Each, which price shall include all labor, materials, equipment, excavation, disposal of the existing foundations, supplying and placing of gravel backfill, compaction, the restoration or replacement in kind of disturbed surfaces, and all incidental costs required to complete the work.

**ITEM 874.7**      **MISCELLANEOUS SIGNS REMOVED AND STACKED**                      **EACH**

The work under this item shall conform to the relevant provisions of Subsections 828 and 840 of the Standard Specifications and the following:

The work to be done under this item shall include the dismantling, removal, transporting and storing of the miscellaneous traffic signs as shown on the Contract Plans and/or as required by the Engineer. The work also includes the removal and disposal (if not reused) of the existing sign supports and foundations.

The Contractor shall exercise particular care in the dismantling, removal, transporting and storage of the existing signs designated to be stacked. Any sign panel damaged through carelessness or lack of protection by the Contractor shall be replaced at the Contractor's expense.

The Contractor shall backfill with compacted gravel all holes resulting from the removal of the existing signs and their foundations and restore the area to match existing conditions of adjacent areas. The costs associated with backfilling and restoring the area are considered incidental to the cost of this item.

The existing signs shall not be removed and stacked without permission of the Engineer.

**Method of Measurement**

Miscellaneous Sign Removed and Stacked will be measured for payment by Each sign removed and stacked.

**Basis of Payment**

Miscellaneous Signs Removed and Stacked will be paid for at the Contract unit price per Each, which price shall include all labor, materials, equipment, backfill, area restoration and incidental costs required to complete the work.



**ITEM 877.1**

**SIGN POST REMOVED AND DISCARDED**

**EACH**

Work under this Item shall conform to the relevant provisions of Subsection 840 of the Standard Specifications and the following:

Work under this Item includes removal and disposal of existing metal sign posts and concrete foundations for guide signs at locations indicated on the Plans or in the Detail Sheets. All metal sign posts shall be completely removed and shall become the property of the Contractor for proper disposal. Sign posts with concrete foundations shall be removed to a minimum depth of 3 feet below existing grade to the satisfaction of the Engineer.

**Method of Measurement and Basis of Payment**

Item 877.1 will be measured and paid for per Each individual sign post (including concrete foundation) removed and disposed of as approved by the Engineer. The unit price shall include final compensation for all labor, equipment, and any incidental costs associated with the work.

**ITEM 950.31****TEMPORARY EARTH SUPPORT SYSTEM****LUMP SUM**

All work under this Item shall conform to the relevant portions of Subsections 140 and 950 of the Standard Specifications and these Special Provisions.

The Contractor shall furnish, install, maintain, and remove a temporary earth support system as required based upon the actual site conditions. The Temporary Earth Support System is anticipated for, but not limited to, the following construction operations:

- Support of the Route 16 roadway carried by the existing corrugated metal pipe (CMP) culvert structure during its staged demolition.
- Support of the Route 16 roadway carried by the proposed precast concrete box culvert structure during its staged construction.
- Support of the existing Mill Brook channel bottom, channel walls, and the excavated soil faces during construction of the proposed wingwalls, installation of the highway guardrail transitions, and installation of the proposed riprap within Mill Brook.

The temporary earth support system shall be designed by the Contractor. The earth support system shall be designed to be of sufficient size and strength to meet the requirements of the latest AASHTO Guide Design Specifications for Bridge Temporary Work and the AASHTO Construction Handbook for Bridge Temporary Works.

The Contractor shall be made aware that shallow bedrock is present at the site, which may preclude some forms of temporary earth support.

All components of the Temporary Earth Support System shall be removed to the extent possible subsequent to completing the construction of the proposed structures and removal of the existing structures. The Temporary Earth Support System shall be removed at least 2'-0" below the bottom of roadway subbase within the limits of Route 16, and least 2'-0" clear of any existing or proposed utilities in all directions, and at least 2'-0" below the top of proposed grade on adjacent side slopes. However, any component of the Temporary Earth Support System that protrudes into the supporting soil below the proposed box culvert or wingwalls shall be cut off and left in place. The Contractor shall follow the guidelines listed in the 2020 MassDOT LRFD Bridge Manual, Part I, Section 3.2.5.8 and 3.2.5.9 regarding when to cut off components of the Temporary Earth Support System and leave in place. No additional payment will be made for cutting of earth support to remain in place.

If used, timber lagging shall be removed in its entirety.

The temporary earth support system shall be installed in a manner to provide sufficient space for installation of the temporary limited-deflection barrier and to maintain the required lane widths shown on the plans in each stage of construction. The Contractor's installation shall ensure that no impact forces from the deflected temporary barriers are transferred to the earth support system unless the design calculations specifically show the system can resist vehicular impact loads satisfying MASH 2016 TL-3 criteria.

**ITEM 950.31** (Continued)

All components of the Temporary Earth Support System shall meet the following requirements:

1. The Contractor is responsible for selecting, designing, furnishing, installing, and maintaining the temporary earth support systems. The Temporary Earth Support System shall be designed considering all stages of construction.
2. The Contractor shall submit for review and approval, Plans and Calculations of the proposed system. All Plans and Calculations submitted shall bear the stamp of a Professional Engineer Registered in the Commonwealth of Massachusetts. Prior to any excavation, the Engineer must approve complete detailed drawings and complete calculations for the temporary earth support system in writing.
3. The temporary earth support system shall be designed to safely withstand all loads it may be subjected to while in place, including HS25 Live load surcharge and MASH 2106 TL-3 crash loads (if applicable). If the system is to be subjected to surcharge loads from cranes, a minimum 600 psf surcharge load shall be used. The allowable design stresses shall be in accordance with the latest edition of the AASHTO Guide Specification for Bridge Temporary Works.
4. All materials used for the temporary earth support systems shall be in good condition as determined by the Engineer.

The Contractor shall accurately locate all utility lines and structures to ensure that the proposed temporary excavation support system will not interfere with any existing/proposed utilities and structures.

Any dewatering required within excavations shall be paid for under Item 991.1.

**Basis of Payment**

Item 950.31 will be paid for at the contract unit price per Lump Sum, which price shall include full compensation for all labor, materials, tools, equipment, and excavation necessary to accomplish the specified work in a manner satisfactory to the Engineer.

Payment under this item is a partial progressive payment of the Lump Sum Contract Bid Price of this Item and shall be made based on the following percentages: 10% upon approval of the design, 30% upon completion of Stage 1, 30% upon completion of Stage 2, and 30% upon completion of Stage 3 based on the staging detailed in the Suggested Sequence of Construction on the Bridge Plans.

**ITEM 983.521**

**STREAMBED RESTORATION -  
NATURAL STREAMBED MATERIAL**

**CUBIC YARD**

The work shall be performed in accordance with the relevant provisions of Subsection 983 of the Standard Specifications, the project's environmental permits, and the following:

The work to be performed under this item shall consist of placing natural streambed material within the precast concrete box culvert and overtop/within the proposed riprap placed within the Mill Brook channel, to the limits shown on the plans, and as required by the project's environmental permit.

Natural streambed material shall be furnished and placed within the box culvert structure and the Mill Brook channel in a manner which establishes the required channel profile as shown on the plans, maintains a natural streambed appearance, and allows for unimpeded aquatic organism passage. The ultimate product will to the extent possible replicate the function and appearance of the existing Mill Brook waterway.

The Contractor shall coordinate with their subcontractors to ensure all required equipment is available on-site to complete the work to the required specifications. The natural streambed material is a key element to comply with the environmental permits issued for the project.

**Material**

Any stone excavated from the existing streambed during riprap installation shall be stockpiled and reused for streambed restoration, provided the excavated stone is characteristic of the existing stream material upstream and downstream of the work area, or meets the below criteria. Beyond the limits of the proposed box culvert, the elevations and conditions of the existing streambed shall be maintained to the maximum extent practical.

If the excavated material is not suitable or there is not enough material, natural streambed material shall be imported to the site and shall consist of locally sourced native cobbles and stones similar in shape and size of streambed stone adjacent to the work area. Angular rock is preferred over round stones as it is better able to lock together to prevent movement during high flows. Crushed Stone will not be accepted for any of the components. Any stone excavated from the existing streambed can be stockpiled and reused for streambed restoration, provided the excavated stone is characteristic of the existing stream material upstream and downstream of the work area, or meets the below criteria.

The following gradation may be used as a guide.

1. Stone 4 inches and under shall meet the following gradation:

Sieve opening	% Passing (by Mass)
4"	95
2"	55 – 65
¾"	30 – 45
#4	0 – 5

**ITEM 983.521** (Continued)

2. Stone 6 inches to 1 foot in diameter:

Stone Size	Percent Passing (by Mass)
1'	95
9"	25
6"	0

The natural streambed material shall be approved by the Engineer prior to use.

**Construction Methods**

The natural streambed material shall be installed “in the dry” utilizing the control of water system installed under Item 991.1.

Natural streambed material shall be placed over riprap to the depth depicted on the plans. The initial placement of natural streambed material shall fill / choke the voids in the underlying riprap. The riprap shall be choked with finer streambed material and shall consist of a well-graded mix of gravel, sand, and silt that represents the local streambed. Voids shall be filled by hand tamping with metal tamping rods, by shaking stone with the teeth of an excavator bucket, and/or by spraying water to settle fines between larger stones. Plate compactors shall not be used. The purposed for filling the voids is the present subsurface flow where water disappears into the large voids in the stone fill below the channel bed surface. It is recommended that lifts of riprap and natural streambed material be installed to achieve the full depth channel bottom section shown on the plans.

Natural streambed material shall also be installed within the box culvert structure to the grades and profile depicted on the plans. The final channel profile at the inlet and outlet of the box culvert shall be graded such that a hydraulically smooth surface is established. The channel bottom shall be free of any irregularities which could impede the flow of Mill Brook and contribute to future erosion. It shall resemble the appearance of a natural river, shall match the appearance of Mill Brook upstream and downstream of the work site, and there shall be minimal to no subsurface flow upon final inspection by the Engineer and Geomorphologist.

Once all material has been placed in each stage of the overall construction sequence, the Contractor shall slowly introduce flow into the newly constructed box culvert in such a way to slowly wet the stream to minimize initial sediment pulse. Every attempt shall be made to minimize the downstream movement of sediment.

Prior to the start of operations, the Contractor shall submit to the Engineer a natural streambed material placement plan and method of placement.

**ITEM 983.521** (Continued)

Method of Measurement

Streambed Restoration – Natural Streambed Material will be measured for payment per CUBIC YARD of material complete and in place.

Method of Measurement and Basis of Payment

Streambed Restoration – Natural Streambed Material will be paid for at the Contract Unit Price per CUBIC YARD under Item 983.521, which price shall include all labor, tools, materials, equipment, and incidental costs required to complete the work.

**ITEM 991.1****CONTROL OF WATER -  
STRUCTURE NO. W-12-030 (C83)****LUMP SUM**

The Work under this Item shall conform to the relevant provisions of Section 140 of the Standard Specifications and these Special Provisions.

This Item includes all work necessary to ensure replacement of Bridge No. W-12-030 is completed in the dry. It shall include all dewatering and maintenance of the water control system, any work and coordination effort associated with temporarily stopping flow on Mill Brook as outlined in the "Work in Mill Brook" heading of these special provisions, work associated with dewatering excavation sites prior to compaction of crushed stone, and general dewatering and maintenance of the water control system. Temporary Control of Water shall be provided for, but not limited to, the following construction operations.

- Removal of the existing corrugated metal pipe (CMP) culvert structure through all stages of construction.
- Excavation and preparation of subgrade for proposed structures.
- Installation of the proposed precast concrete box culvert and precast concrete curtain walls through all stages of construction.
- Backfilling behind the precast concrete box culvert structure.
- Construction of the cast-in-place wingwall footings and stems.
- Installation of riprap and natural streambed material within the Mill Brook channel.

The Contractor shall design, fabricate, and install a water control system capable of providing the necessary dry working conditions at the site. A suggested water control system and sequence of construction is depicted on the plans. The water control system may be comprised of temporary piping and temporary cofferdams (consisting of sandbags, temporary barriers with membrane/fabric. Pumping may be required. Steel sheeting may be utilized, however may not be practical due to shallow bedrock. The Contractor shall submit detailed shop drawings and calculations depicting the chosen water control system and showing satisfaction of the Temporary Water Control Design Data requirements stated on the plans.

As part of the work under this Item, it is the responsibility of the Contractor to determine the need and extent of dewatering techniques and sedimentation controls needed to control water and sediment at the site. Prior to executing the excavation operations, the Contractor shall submit working drawings and the methods and materials he/she proposes to use for the Engineer's approval.

Approval of the working drawings does not relieve the contractor of the responsibility of providing for the safe and successful completion of the work.

**ITEM 991.1** (Continued)**Construction Methods**

The Contractor shall utilize the existing sliding sluice gate flow-control structure, located immediately south of the existing Mill Brook culvert inlet, to assist in the control of water during construction. In determining his/her means and methods for completing the work, the Contractor shall take into full consideration the fluctuations of the water level in the Mill Brook, coordination requirements with the dam operator and their engineering representative, and shall adhere to the project's environmental permits as further described under the "Work in the Mill Brook" heading in the general provisions at the front these special provisions.

Contact information for the dam operator and their engineering representative is provided under the "Work in the Mill Brook" heading in the general provisions at the front these special provisions.

Complete stoppage of flow through Mill Brook using the existing sliding sluice gate is permissible on a limited basis, and shall be limited to the following construction operations:

- Removal of the existing CMP culvert
- Installation of steel pipe casings for the relocated gas and water utilities
- Final excavation and placement of crushed stone base material for the box culvert units.
- Setting of the box culvert units.
- Resetting of temporary water control elements between construction stages.

These operations shall be scheduled such that the total duration for a single stoppage of flow does not exceed the lesser of; 7 days, the available time granted by the dam operator, and the duration of time allowed by the project's environmental permits.

Complete stoppage of flow shall only occur during the seasonal low-flow period during the months of July/August/September and at the discretion of the dam operator.

The Contractor shall exercise care when operating the existing sluice gate as to not damage any of its components. Any damage to the sluice gate caused by the Contractor's negligence shall be repaired at the Contractor's expense to the satisfaction of the Engineer.

For all other in-water construction operations, constant flow must be maintained through Mill Brook. This work includes general excavation for the box culvert, construction of the cast-in-place wingwalls and any associated excavation, placement of subgrade material for the wingwalls, installation of the highway guardrail transitions, and installation of riprap within the Mill Brook channel. A temporary pipe and/or pump may be utilized to maintain the flow of Mill Brook during these construction operations.

Detailed Shop Drawings and Calculations for water retaining and dewatering measures shall be developed by the Contractor for this Item, prepared and stamped by a Professional Civil Engineer registered in the Commonwealth of Massachusetts, and submitted for the review by the Engineer prior to the start of construction.



**ITEM 991.1** (Continued)

Construction shall be conducted in such a manner as to minimize siltation and prevent contamination of the waterway.

Maximum screen sizes on the inlet side of all pumps shall not exceed ½ in (12.7 mm).

The Contractor is advised that the effectiveness of the water control method used will vary based on the field conditions and the time at which the actual excavation work is being performed. The Engineer has the right to order the Contractor to stop all excavation operations when in his/her judgment the Contractor's water control operations are failing to produce adequate results or are posing a threat to the environment. The water control system shall be inspected daily to ensure that it is functioning adequately, and no turbidity is being created by construction activities within the waterway the system is designed to protect.

The Contractor shall provide the means of removing all sediment from water pumped from the excavation areas; this shall include the use of sedimentation basins, check dams, sedimentation fences, or tanks.

Upon completion of the work all elements of the temporary water control system, including the sedimentation basins and sedimentation controls, shall be removed from the site.

**Basis for Payment**

Item 991.1 will be paid for at the contract unit price per Lump Sum, which price shall include full compensation for all labor, materials, tools, equipment, and excavation necessary to accomplish the specified work in a manner satisfactory to the Engineer.

Payment under this item is a partial progressive payment of the Lump Sum Contract Bid Price of this Item and shall be made based on the following percentages: 10% upon approval of the design, 30% upon completion of Stage 1, 30% upon completion of Stage 2, and 30% upon completion of Stage 3 based on the staging detailed in the Suggested Sequence of Construction on the Bridge Plans.

**ITEM 995.01      BRIDGE STRUCTURE, BRIDGE NO. W-12-030 (C83)      LUMP SUM**

The work under this Item shall conform to the applicable provisions of Subsection 995 of the Standard Specifications and the specific requirements stipulated below for the component parts of this Item. For those component parts where no specific requirement is stipulated, the Standard Specifications shall apply except for payment.

Work under this Item shall include all materials, equipment and labor needed to construct the following:

- Precast Concrete Box Culvert Structure and Precast Curtain Walls
- Precast Concrete Highway Guardrail Transitions
- High-performance (HP) cast-in-place reinforced concrete gravity wingwalls (channel walls, including footings and reinforcement)
- High performance (HP) cast-in-place reinforced concrete headwalls, CP-PL2 parapets, and temporary support block
- Damp-proofing
- Pedestrian handrail mounted on the CP-PL2 barriers.

The work does not include any items listed separately in the proposal. Payment for materials shown on the Plans as being part of this bridge structure or which may be incidental to its construction and are not specifically included for payment under another Item shall be considered incidental to the work performed under this Item and shall be included in the unit price of the component of which they are a part.

All work for the proposed box culvert and curtain wall installation, wingwall construction, and highway guardrail transition installation shall be completed in the dry. Any dewatering shall be considered incidental to the work and included under the Lump Sum Item 991.1.

**CAST-IN-PLACE CONCRETE**

The work to be done under these headings shall conform to the applicable provisions of Subsection 901 of the Standard Specifications and the following:

5000 PSI, HP Cement Concrete shall be used to construct the cast-in-place wingwall stems and footings, headwalls, CP-PL2 parapets, temporary support block, those areas designated by the Engineer, and/or as designated on the Plans.

**ITEM 995.01** (Continued)**PRECAST CONCRETE BOX CULVERT AND CURTAIN WALLS**  
**PRECAST CONCRETE HIGHWAY GUARDRAIL TRANSITIONS****A. General.**

The work under this Heading consists of fabricating, transporting, and installing the Precast Concrete Box Culvert and Curtain Walls and Precast Concrete Highway Guardrail Transitions (hereby referred to as Precast Concrete Bridge Elements). It includes all necessary labor, materials, and equipment to complete the work as shown on the Plans. The work shall conform with the MassDOT Standard Specifications and the requirements of the current AASHTO LRFD Bridge Construction Specifications, supplemented by the current relevant provisions of the latest edition of PCI MNL-116 (The Manual for Quality Control for Plants and Production of Precast and Prestressed Concrete Products), except as noted herein.

5000 PSI, HP Cement Concrete shall be used for the Precast Concrete Box Culvert and Curtain Walls.

5000 PSI, HP Cement Concrete shall be used to construct the Precast Concrete Highway Guardrail Transitions.

**QUALITY ASSURANCE****A. General.**

Quality Assurance includes all the planned and systematic actions necessary to provide confidence that a product or facility will perform satisfactorily in service. It is an all-encompassing term that includes Quality Control (performed by the Fabricator) and Acceptance (performed by MassDOT). Quality Control is the system used by the Contractor and Fabricator to monitor and assess their production processes at the plant facility and installation activities at the project site to ensure that the final product will meet the specified level of quality. Acceptance includes all factors used by MassDOT to determine the corresponding value for the product. MassDOT Acceptance inspection at the plant facility is intended as a means of evaluation of compliance with contract requirements. Contractor and Fabricator Quality Control activities and MassDOT Acceptance activities shall remain independent from one another. MassDOT Acceptance activities shall not replace Fabricator Quality Control activities.

**B. Fabricator Quality Control.**

Quality Control shall be performed by the Fabricator to ensure that the product is fabricated in conformance with the specifications herein. The Fabricator shall maintain a Quality Control system to monitor, assess, and adjust placement and fabrication processes to ensure the Precast Concrete Elements meet the specified level of quality, through sufficient Quality Control sampling, testing, inspection, and corrective action (where required). The Fabricator's Quality Control system shall address all key activities during the placement and fabrication and shall be performed in conformance with the Fabricator's NPCA or PCI Certification. Quality Control documentation shall meet the requirements of the Fabricator Quality Control – Documentation section below. Upon request, Fabricator Quality Control documentation shall be provided to the MassDOT Plant Inspector.

**ITEM 995.01** (Continued)**1. Plant.**

Prior to the fabrication of the Precast Concrete Bridge Elements, the Fabricator's precast concrete plant shall obtain the following:

- (a) Certification by the National Precast Concrete Association (NPCA) Plant Certification Program or Precast/Prestressed Concrete Institute (PCI) Plant Certification Program, for the applicable types of Precast Concrete Bridge Element(s) being fabricated.
- (b) MassDOT Prequalification
- (c) MassDOT Mix Design Approval

All concrete for the Precast Concrete Box Culvert Structure and Precast Concrete Highway Guardrail Transitions shall be produced by a single company and plant, unless otherwise approved by the Engineer.

**2. Personnel.**

The Fabricator shall provide adequate training for all QC personnel in accordance with NPCA or PCI certification. There shall be sufficient personnel trained and certified to perform the tests listed under Subsection M4.02.13, Part D. At a minimum, the Fabricator's Quality Control Personnel shall maintain the following qualifications and certifications:

- (a) QC Manager with an active NETTCP Field Technician or ACI Concrete Field Testing Technician – Grade I certification or higher, and a minimum of 4 years continuous experience in the manufacture of Precast Concrete Bridge Elements for state transportation departments. The QC Manager shall be on site while the batch plant is producing and placing concrete for MassDOT projects.
- (b) A Technician/Inspector having the Precast/Prestressed Concrete Institute (PCI) Technician/Inspector Level I or NorthEast Transportation Training and Certification Program (NETTCP) Precast Concrete Inspector, or higher.

The Contractor shall submit to the Engineer a copy of the Fabricator's Quality Control Personnel required qualifications, as specified above.

**3. Laboratory.**

The Fabricator shall provide a room of sufficient size to house all equipment and to adequately perform all testing. The room shall have either a separate moisture storage room or curing box for concrete cylinders, and it shall be thermostatically controlled to maintain temperatures consistent with AASHTO T 23. It shall include a desk and file cabinet for proper record keeping, and have good lighting and ventilation. This room shall be kept for testing and quality control and not used for any other purpose. An additional desk and file cabinet shall be provided for exclusive use of the Engineer. No exception from these requirements will be allowed without the express written permission of the Engineer.

**ITEM 995.01** (Continued)**4. Testing Equipment.**

At a minimum, the Fabricator's plant facility shall have the following testing equipment:

- (a) Air Content Meter Type A or B: AASHTO T 152
- (b) Air Content Meter Volumetric Method: AASHTO T 196 (Required for Lightweight Concrete)
- (c) Slump Cone: AASHTO T 119
- (d) Cylinder Molds AASHTO M 205
- (e) Concrete Testing Machine: AASHTO T 22
- (f) Screening Sieve: AASHTO T 27, AASHTO T 11
- (g) Curing Box: AASHTO T 23
- (h) Spread Test Base Plate for Self-Consolidating Concrete (SCC): ASTM C1611
- (i) All other equipment prescribed by AASHTO and ASTM standards for the tests to be performed by the Fabricator as specified

**5. Inspection.**

Quality Control personnel shall monitor and inspect the fabrication of each Precast Concrete Bridge Element. Quality Control personnel shall report all inspection activities on Quality Control Inspection Reports and non-conformances on Non-Conformance Reports (NCRs) throughout the entire fabrication process, as specified herein.

**6. Temperature Monitoring.**

At a minimum, the Fabricator shall monitor, record, and report the temperatures of the form, ambient temperatures surrounding the concrete, and temperatures of the concrete continuously, without interruption as specified below:

- (a) Prior to placement of concrete to verify that  $T_i \geq 50^\circ\text{F}$ .
- (b) Immediately after placement to verify that  $T_i \geq 50^\circ\text{F}$  is maintained.
- (c) Throughout the entire duration of the curing cycle, at regular intervals not to exceed one hour until 100% Design Strength ( $f'_c$ ) is attained, and concrete has cooled to within  $40^\circ\text{F}$  of the ambient temperature surrounding the Precast Concrete Box Culvert Structure and Precast Concrete Highway Guardrail Transitions.

At a minimum, the temperature measuring devices shall record and report the temperature of the concrete to the nearest  $2^\circ\text{F}$ . At least two temperature sensors (thermocouples) shall be positioned to record the maximum and minimum anticipated concrete temperatures. The anticipated minimum temperature shall be measured with one or more thermocouples at a distance no greater than 2 inches from the surface of the thinnest section. The anticipated maximum temperature shall be measured with one or more thermocouples at the center of the thickest section. Proposed temperature measurement locations shall be submitted to the Engineer for approval. Temperature recording devices shall be located within the curing enclosure and calibrated as required by PCI MNL-116 Section 4.18.4. Maximum heat increases and cool down rates shall comply with PCI MNL-116, Section 4.19. The Contractor shall furnish temperature logs recorded at a minimum frequency of once per hour to the Inspector as required, with each post-pour QC inspection report.

**ITEM 995.01** (Continued)

**7. Sampling and Testing.**

At a minimum, the Fabricator shall perform random Quality Control sampling and testing as specified in Table 1: Quality Control Sampling and Testing. The Fabricator shall perform additional Quality Control sampling and testing on concrete that has been retempered with admixtures or hold-back water during fabrication. Test Specimens shall conform to the requirements of Section M4.02.13 of the MassDOT Standard and Supplemental Specifications and AASHTO R 60, with the exception of the Stripping (80% f'c) set of cylinders. Stripping (80 % f'c) cylinders shall be cured in the same location and environment as the Precast Concrete Box Culvert Structure and Precast Concrete Highway Guardrail Transitions they represent. If approved by the Engineer, compressive strength cylinder match curing equipment, that maintains the same concrete conditions that the corresponding Precast Bridge Element is exposed to, may be utilized in lieu of Stripping (80 % f'c) field cured cylinders, with the use of thermocouples, controllers, and heaters.

**Table 1: Quality Control Sampling and Testing**

Quality Characteristic	Test Method	Sample Size	Specification Limit	Lot Size <sup>(c)</sup>	Sublot Size <sup>(d)</sup>	Frequency	Point of Sampling
Slump (in.) <sup>(a)</sup>	AASHTO T 119	Per AASHTO	≤ 8 in. or as approved by the Engineer	Total Quantity of Concrete (cy) produced on a Contract, per Type of Element fabricated, per Mix Design	20 cy	One (1) per Sublot or fraction thereof	Point of Discharge
Air Content (%)	AASHTO T 152	Per AASHTO	5% ≤ % ≤ 8%				
Temperature (°F)	AASHTO T 309	Per AASHTO	50°F ≤ °F ≤ 90°F				
Compressive Strength (psi)	AASHTO T 22	Stripping Cylinders: One (1) set of Three (3) 4 x 8 in.	≥ 80% f' c at Stripping				
		7-day Cylinders: One (1) set of Three (3) 4 x 8 in.	For Information at 7 days				
		28-day Cylinders: One (1) set of Three (3) 4 x 8 in.	≥ 100% f' c at 28 days				
		56-day Cylinders: One (1) set of Three (3) 4 x 8 in.	≥ 100% f' c at 56 days <sup>(b)</sup>				

**ITEM 995.01** (Continued)**Notes:**

- (a) Self-consolidating concrete (SCC) shall meet the requirements of M4.02.17.
- (b) 56-day Compressive Strength test specimens shall require testing only when 28-day Compressive Strength test specimens have failed to meet Design Strength ( $f'_{c}$ ).
- (c) Lot shall be defined as a specific quantity of material from a single source, produced or placed by the same controlled process.
- (d) Sublot shall be defined as an equal division or part of a Lot from which a sample of material is obtained in order to assess the Quality Characteristics of the Lot.

**8. Certificate of Compliance.**

The Fabricator shall provide a Certificate of Compliance in accordance with Standard Specifications, Division I, Section 6.01, stating that QC test cylinders have achieved the design strength,  $f'_{c}$ . A Certificate of Compliance shall accompany each shipment and shall be presented to the MassDOT Resident Engineer or designee upon delivery to the site.

**9. Documentation.**

At a minimum, the Fabricator shall maintain a filing system for the following QC records and documentation. All QC records and documentation shall be made available to MassDOT upon the request of the Department.

- (a) Current MassDOT Approved Mix Design Sheet(s) and Approval Letter(s)
- (b) PCI or NPCA Certification
- (c) Current Qualifications and Certifications for QC Manager(s) and QC Technician(s)
- (d) Most current set of Approved Shop Drawings
- (e) Approved Placement, Finishing and Curing Plan
- (f) Approved Dunnage Plan
- (g) Fabricator Certificate of Compliance for each Precast Concrete Bridge Element
- (h) Admixture Manufacturer's Certification of Compliance for each approved Admixture
- (i) Completed QC Inspection Report for each fabricated Precast Concrete Bridge Element
- (j) Identification Number for each fabricated Precast Concrete Bridge Element
- (k) Time and date of casting of each fabricated Precast Concrete Bridge Element
- (l) Date of stripping of each fabricated Precast Concrete Bridge Element
- (m) Batch Ticket Printout reporting the quantity of concrete produced for each batch of concrete produced
- (n) Concrete temperature records for each Precast Concrete Bridge Element fabricated
- (o) QC Test Report Forms for each subplot of concrete produced
- (p) Non-Conformance Reports (NCRs)
- (q) Documentation of Repairs (if applicable)

**ITEM 995.01** (Continued)**C. Acceptance.**

MassDOT will perform Acceptance inspection, sampling, and testing during fabrication and installation, to evaluate the quality and degree of compliance of the fabricated Precast Concrete Bridge Elements to MassDOT specifications. Additionally, MassDOT Inspectors will monitor the Fabricator's Quality Control activities to ensure the Fabricator is properly administering Quality Control in conformance with the Fabricator's NPCA or PCI Certification. Acceptance inspection and test results not meeting MassDOT specifications will result in Non-conformance Reports (NCR) being issued by MassDOT to the Fabricator or Contractor for corrective action. Final Acceptance for the fabricated Precast Concrete Box Culvert Structure and Precast Concrete Highway Guardrail Transitions shall be determined by MassDOT.

**1. Inspection.**

A MassDOT Inspector will be assigned to perform Acceptance activities during fabrication, which includes the inspection of the materials, work procedures, and Precast Concrete Bridge Elements. At least seven (7) days prior to the scheduled start of fabrication, the Fabricator shall contact the MassDOT Research and Materials Section (RMS) to provide notice of the scheduled fabrication start date. The Fabricator shall complete the following activities prior to notifying MassDOT RMS of the scheduled start date:

- (a) Receive approval for all submitted Fabricator cement concrete mix designs from the MassDOT Research and Materials Section for the current year, as specified under the *Mix Design* section and *Table 3: Trial Batch Sampling Testing for New Mix Designs*. Self-consolidating concrete shall meet the requirements of M4.02.17.
- (b) Receive approval for the submitted Fabricator Placement, Finishing, and Curing Plan from the MassDOT Research and Materials Section, as specified under the *Placement, Finishing, and Curing Plan* section.
- (c) Receive Engineer of Record approved shop drawings from the MassDOT Research and Materials Section as specified under the *Shop Drawings* section.
- (d) Participate in the pre-production meeting, as described under the *Pre-Production Meeting* section (if required).

Prior to the start of fabrication, the Fabricator shall review the fabrication schedule with the MassDOT Inspector. Fabrication shall only proceed when:

- (a) The QC Inspector and MassDOT Inspector are present to inspect the Precast Concrete Bridge Elements being fabricated.
- (b) The QC Manager is present at the Fabricator's plant.

The Fabricator shall grant access to all required areas of the Fabricator's plant to the MassDOT Inspector, during the hours of fabrication. Fabrication without MassDOT Inspector access to required areas is prohibited, and will result in the rejection of the fabricated Precast Concrete Bridge Elements.



**ITEM 995.01** (Continued)

Additionally, the MassDOT Inspector will monitor the adequacy of the Fabricator’s Quality Control activities. MassDOT Inspector Acceptance activities performed at the Fabricator’s plant shall remain independent from the Fabricator, and does not replace the Fabricator’s required Quality Control activities.

**2. Sampling and Testing.**

At a minimum, the MassDOT Inspector will perform random Acceptance sampling and testing for each Sublot of concrete produced as specified in Table 2: Acceptance Sampling and Testing. The MassDOT Inspector will also perform Acceptance sampling and testing on concrete that has been retempered with admixtures or hold-back water during production. Test Specimens will conform to the requirements of Section M4.02.13 of the MassDOT Standard and Supplemental Specifications and AASHTO R 60.

**Table 2: Acceptance Sampling and Testing**

Quality Characteristic	Test Method	Sample Size	Specification Limit	Lot Size <sup>(c)</sup>	Sublot Size <sup>(d)</sup>	Frequency	Point of Sampling
Slump (in.) <sup>(a)</sup>	AASHTO T 119	Per AASHTO	≤ 8 in. or as approved by the Engineer	Total Quantity of Concrete (cy) produced on a Contract, per Type of Element fabricated, per Mix Design	20 cy	One (1) per Sublot or fraction thereof	Point of Discharge
Air Content (%)	AASHTO T 152	Per AASHTO	5% ≤ % ≤ 8%				
Temperature (°F)	AASHTO T 309	Per AASHTO	50°F ≤ °F ≤ 90°F				
Compressive Strength (psi)	AASHTO T 22  AASHTO T 23	7-day Cylinders: One (1) set of Three (3) 4 x 8 in.	For Information at 7 days				
		28-day Cylinders: One (1) set of Three (3) 4 x 8 in.	≥ 100% f <sub>c</sub> at 28 days				
		56-day Cylinders: One (1) set of Three (3) 4 x 8 in.	≥ 100% f <sub>c</sub> at 56 days <sup>(b)</sup>				

**Notes:**

- (a) Self-consolidating concrete (SCC) shall meet the requirements of M4.02.17.
- (b) 56-day Compressive Strength test specimens shall require testing only when 28-day Compressive Strength test specimens have failed to meet Design Strength (f<sub>c</sub>).
- (c) Lot shall be defined as a specific quantity of material from a single source, produced or placed by the same controlled process.
- (d) Sublot shall be defined as an equal division or part of a Lot from which a sample of material is obtained in order to assess the Quality Characteristics of the Lot.

**ITEM 995.01** (Continued)**MATERIALS****A. Materials.**

Materials shall meet the following specifications (if applicable):

General	M4.00.00
Portland Cement	M4.01.0
Blended Hydraulic Cements	M4.01.1
Fly Ash	M4.01.2
Cement Concrete	M4.02.00
Cement	M4.02.01
Cement Mortar	M4.02.15
Aggregates	M4.02.02
Lightweight Aggregates	M4.02.03
Water	M4.02.04
Cement Concrete Additives	M4.02.05
Proportioning	M4.02.06
Mixing and Delivery	M4.02.10
Test Specimens	M4.02.13
Mortar for Filling Keyways	M4.04.0
Slag	AASHTO M 302
High Performance Cement Concrete	M4.06.1
Self-Consolidating Concrete (SCC)	M4.02.17
Controlled Density Fill – Non-Excavatable	M4.08.0
Reinforcing Bars	M8.01.0
Epoxy Coated Reinforcing Bars	M8.01.7
Galvanized Reinforcing Bars	M8.01.8
Welded Wire Reinforcement	M8.01.2
Mechanical Reinforcing Bar Splicer	M8.01.9
Lifting Devices	PCI MNL-116
Corrugated Metal Pipe	AASHTO M 36

**1. Cement Concrete Mix Design.**

The cement concrete shall be comprised of specified proportions of water and MassDOT approved aggregates, cement, supplementary cementitious materials (SCMs), and admixtures to form a homogenous composition. Cement concrete for Precast Concrete Bridge Elements shall meet the requirements of M4.06.1 High Performance Cement Concrete, with the exception that the “Total Cementitious Content” specified shall be considered the “Maximum Allowable Cementitious Content”. When used, self-consolidating concrete (SCC) shall meet the requirements of M4.02.17.

**ITEM 995.01** (Continued)

Prior to production of cement concrete, the Fabricator shall report and submit all proposed mix design formulations and its constituent materials onto the MassDOT Cement Concrete Mix Design Sheet to the MassDOT Research and Materials Section for review and approval. All mix design yields shall be designed for 1.0 cubic yards of concrete, with an allowable tolerance of +/- 1.0 %. All liquids incorporated into the proposed mix design(s) shall include both water and admixtures in the liquid mass calculation.

During production of cement concrete, the Fabricator shall not alter the previously approved mix design formulation or its constituent materials. Proposed alterations in source, type, batch quantity, or gradation to any of the constituent materials of the previously approved mix design formulation shall require a new MassDOT Mix Design Sheet submission to the MassDOT Research and materials Section for review and approval. Fabrication shall not occur without prior MassDOT mix design approval.

The Fabricator shall notify MassDOT RMS to schedule trial batch testing for the new mix design(s). Trial batch testing shall meet the following requirements:

- (a) Performed by a qualified laboratory and/or AASHTO accredited laboratory.
- (b) Performed and/or sampled in the presence of a MassDOT Inspector.
- (c) Meet the requirements as specified in *Table 3: Trial Batch Sampling Testing for New Mix Designs*. Self-consolidating concrete (SCC) shall meet M4.02.17.

Failure to perform all of the required trial batch testing or provide MassDOT RMS trial batch test results within the Specification Limits (as specified in Table 3) will result in the disqualification of the Fabricator's proposed mix design(s).

**ITEM 995.01** (Continued)**Table 3: Trial Batch Sampling and Testing for New Mix Designs**

Quality Characteristic	Test Method	Sample Size	Specification Limit	Performed By
Slump <sup>(a)</sup>	AASHTO T 119	Per AASHTO	Max. 8 inches or as approved by the Engineer	Quality Control
Air Content (AC)	AASHTO T 152	Per AASHTO	$5\% \leq AC \leq 8\%$	Quality Control
Temperature (°F)	AASHTO T 309	Per AASHTO	$50^{\circ}\text{F} \leq ^{\circ}\text{F} \leq 90^{\circ}\text{F}$	Quality Control
Compressive Strength <sup>(b)</sup>	AASHTO T 22 AASHTO T 23	28-day Cylinders: One (1) set of Three (3) 4 x 8 in.	Lab Mixed $f'_{cr} = 1.3 f'_c$ at 28 days Batch Mixed $f'_{cr} = 1.2 f'_c$ at 28 days	MassDOT
Alkali-Silica Reaction (ASR) <sup>(d)</sup>	ASTM C 1567	Per ASTM	M4.02.00	Quality Control
Resistance to Chloride Ion Penetration Chloride Ion Penetration <sup>(e)</sup>	AASHTO T 358 <sup>(f)</sup>	28-day Cylinders: One (1) set of Three (3) 4 x 8 in.	Resistivity $\geq 21 \text{ k}\Omega\text{-cm}$ at 28 days	MassDOT
Freeze/Thaw Durability <sup>(c)</sup>	AASHTO T 161 (Procedure A)	Per AASHTO	Relative Dynamic Modulus of Elasticity after 300 cycles $\geq 80\%$	Quality Control

**Notes:**

- (a) Self-consolidating concrete (SCC) shall meet the requirements of M4.02.17.
- (b) Trial batch compressive strength testing shall be performed by MassDOT. Laboratory mixed trial batch compressive strength results shall achieve 130% Design Strength ( $f'_c$ ). Batch-mixed trial batch compressive results shall achieve 120%  $f'_c$ . Acceptance will be based on compressive strength testing performed by MassDOT.
- (c) If an AASHTO accredited laboratory is preparing the trial batch test specimens, MassDOT Acceptance presence is not required. If the Fabricator is preparing the trial batch test specimens, MassDOT Acceptance presence is required during trial batch test specimen preparation.
- (d) Alkali Silica Reaction (ASR) testing shall meet the requirements of M4.02.00. Independent laboratories performing ASR testing shall be listed on the MassDOT Quality Construction Materials List (QCML).
- (e) Calcium nitrite shall be removed from mix designs containing the admixture and replaced by an equivalent quantity of water when preparing Chloride Ion Penetration resistance trial batch test specimens.
- (f) The Wenner probe tip spacing "a" shall be 1.5.

**2. Vertical Adjustment Assembly.**

Vertical Adjustment Assembly details and material requirements shall be as shown on the plans. Alternate devices may be used provided that they are adjustable and can support the anticipated loads. The design of the leveling devices, with necessary calculations, shall be submitted to the Engineer of Record for approval.

**ITEM 995.01** (Continued)**3. Grout.**

Grout used for shear keys, vertical adjustment assembly voids, and hand holes shall be in accordance with M4.04.0.

**4. Reinforcement.**

All reinforcing steel shall be epoxy coated Grade 60 unless otherwise noted on the plans. Mechanical reinforcing bar splicers shall be epoxy coated.

**5. Threaded Inserts.**

Threaded inserts are permissible to facilitate forming the keyway pours. Threaded inserts shall be hot dip galvanized or made of stainless steel. The number of threaded inserts shall be minimized, and the inserts shall not come in contact with the reinforcing steel.

**CONSTRUCTION METHODS – PLANT FABRICATION****A. Shop Drawings.**

Prior to performing any work under this Section, the Contractor shall receive approval for all shop drawings for the Precast Concrete Bridge Element being worked on and any special Contract requirements, provided that a complete shop drawing package is provided. The Contractor shall not order materials or begin work before receiving approved shop drawings. MassDOT will reject Precast Concrete Bridge Elements that deviate from the approved drawings or are fabricated prior to receiving written approval of the shop drawings. The Contractor shall bear full responsibility and costs for all materials ordered or work performed prior to the approval of the shop drawings or written authorization from MassDOT.

The Contractor shall submit scaled shop drawings to the Engineer of Record for review and approval. Upon approval, the Engineer of Record will forward two (2) sets of scaled, full size (minimum 24x36") paper copies of the Approved (or Approved as Noted) shop drawings to the MassDOT Director of Research and Materials. Calculations are not to be included in any submittal to the Research and Materials Section. An approval stamp shall appear on every shop drawing sheet. Wet-stamping or wet-signing is not required, provided that the stamp and reviewer name are legible. The Fabricator's name and address shall appear on each sheet.

Resubmittal of "Approved as Noted" shop drawings is not necessary for minor revisions, provided that the correction can be clearly understood and is unambiguous without possibility of misinterpretation. Shop drawings with questions or comments that require a response and/or additional information from the Fabricator must be resubmitted.

**ITEM 995.01** (Continued)

Detailed shop drawings shall be prepared in accordance with the relevant provisions of Subsection 5.02 and shall, at a minimum, contain the following:

- (a) Number and type and/or piece mark of the precast concrete bridge element including overall length, width, and height.
- (b) Skew angle.
- (c) Location, size and geometry of all steel reinforcement, including mechanical reinforcing bar splicers to be used for connecting Precast Concrete Bridge Elements together in the field.
- (d) Location and details of all inserts, anchors, Vertical Adjustment Assemblies, and any other items required to be cast into the Precast Concrete Bridge Elements (whether detailed on the plans by the Engineer of Record or provided for the Contractor's convenience). Precast Concrete Bridge Elements shall not be fired or drilled into for attachment purposes. All hardware shall be galvanized except as noted.
- (e) Locations and details of the lifting devices, including supporting calculations, type and amount of any additional reinforcing required for lifting. The Fabricator shall design all lifting devices based on the no cracking criteria in Chapter 8 of the PCI Design Handbook (7<sup>th</sup> edition).
- (f) The minimum compressive strength required prior to handling the precast concrete bridge element.

The shop drawings shall not include procedures for placement, finishing, and curing of concrete. These details shall be included in the Placement, Finishing and Curing Plan that is to be submitted to MassDOT Research and Materials Section as described under Placement, Finishing, and Curing Plan.

**B. Fabrication.**

All Precast Concrete Bridge Elements shall be fabricated in accordance with the latest edition of PCI MNL-116 as modified herein.

**C. Fabrication.**

At least 30 days prior to start of fabrication, the Contractor shall submit the Fabricator's proposed Placement, Finishing and Curing Plan to the Engineer for approval by MassDOT Research and Materials Section. This shall be an independent submittal, separate from the fabrication shop drawings. The Placement, Finishing and Curing Plan shall include the following:

- (a) Method of Mixing
- (b) Method of Placement
- (c) Method of Consolidation
- (d) Method of Finishing
- (e) Method of Initial Curing
- (f) Method of Intermediate Curing
- (g) Method of Final Curing
- (h) Moisture Retention Materials and Equipment (water spray equipment, saturated covers, sheet materials, liquid membrane-forming compounds, accelerated curing equipment, etc.)
- (i) Cylinder Curing Methods, Location, and Environmental Control (temperature, humidity, etc.)
- (j) Temperature Monitoring, Recording, and Reporting

**ITEM 995.01** (Continued)**D. Dunnage Plan Shop Drawings.**

At least 30 days prior to the start of fabrication, the Contractor shall submit proposed Dunnage Plan Shop Drawings to the Engineer of Record for review and approval. This shall be an independent submittal, separate from the fabrication shop drawings. Upon approval, the Engineer of Record will forward two (2) sets of scaled, full size (minimum 24"x36") paper copies of the Approved (or Approved as Noted) Dunnage Plan to the MassDOT Director of Research and Materials. Calculations are not to be included in any submittal to the Research and Materials Section. The Dunnage Plan shall include the following:

- (a) Proposed layout of the Precast Concrete Bridge Elements for storage in yard and during shipping
- (b) Support and blocking point locations
- (c) Support and blocking materials

**E. Box Culverts**

The Contractor shall submit design computations for the box culvert bridge elements to the Engineer for review and approval. The computations shall be prepared in accordance with the latest AASHTO LRFD Bridge Design Specifications, the 2020 MassDOT LRFD Bridge Design Manual, and the Plans using English units and HL-93 live loading. The design computations shall consider all Strength, Extreme Event and Service Limit States as are appropriate for each stage of fabrication, shipment, construction, and for the final in-service condition. Design computations and shop drawings shall be prepared and stamped by a Professional Engineer licensed to practice in the Commonwealth of Massachusetts. The shop drawings shall be prepared and submitted in accordance with the section, Drawings, above.

The box culvert dimensions provided on the plans are shown to establish the size of the proposed opening. The width and thickness of each box culvert unit may vary depending upon the manufacturer's specifications provided that the opening size is maintained and the width and thickness limitations on the plans are adhered to. The Contractor shall be responsible for modifying the dimensions of the box culvert elements to compensate for elastic shortening, shrinkage, grade corrections, and other phenomena that make in-process fabricating dimensions different from those shown on the drawings. Approval of the shop drawings shall not relieve the Contractor from responsibility for the correctness of the dimensions shown.

**1. Joints.**

Joints between the precast reinforced concrete box culvert units shall be produced utilizing standard details provided by the manufacturer and approved by the Engineer. Joints shall be sealed using a butyl rubber sealing gasket. Gasket material shall be provided by the box culvert manufacturer and installed by the Contractor. The ends of the culvert shall be manufactured such that when the sections are laid together, they will make a continuous line of units with a smooth interior surface free of appreciable irregularities, and in compliance with the permissible variations.

Joints in the box culvert structure shall be located to align with the overall staged reconstruction of Route 16. Variable width box culvert sections may be required to complete construction per the suggested construction sequence depicted on the plans. All joints for the box culvert structure shall be clearly located on the shop drawings.

**ITEM 995.01** (Continued)**2. Precast Curtain Walls**

Precast curtain walls shall be provided at the inlet and outlet of the box culvert structure as shown on the plans. A conceptual design for the precast curtain walls is provided on the plans. The Contractor shall be responsible for the final design and detailing of the precast curtain walls, including their connections to the box culvert structure. Leveling shims and grout may be required to facilitate installation. Details of the precast curtain walls shall be depicted on the shop drawings. Cost of the precast curtain walls, including any leveling devices and grout, shall be considered incidental to the precast concrete box culvert Sub-Item 916.1.

**3. Temporary Cast-in-Place Concrete Support Block**

A temporary cast-in-place concrete support block shall be constructed on the roof slab of the box culvert structure to support the pavement structure and temporary limited deflection barrier. Temporary limited deflection barrier shall not be anchored to the temporary support block. Temporary cast-in-place concrete support block will be paid for under Sub-Item 904.3.

The width of the temporary support block shall be as depicted on the plans, ensuring adequate working width is provided for the selected temporary limited-deflection barrier system. The height of the temporary support block will vary along the width of the box culvert and shall align with the top of Stage 3 pavement.

Reinforcement anchoring the temporary support block shall be fully developed into roof slab of the box culvert structure. Mechanical reinforcing bar splicers shall be utilized to facilitate this connection. The location of the proposed reinforcement anchoring for the temporary support block shall be depicted on the shop drawings.

In the final condition, the Contractor shall remove the temporary support block and patch the membrane waterproofing and bituminous pavement as shown on the plans and specified under Item 127.1 within these special provisions.

Details of the temporary cast-in-place concrete support block shall be depicted on the shop drawings for review and approval prior to fabricating the precast concrete box culvert structure.

Bond breaker shall be placed on the roof of the box culvert prior to casting the temporary support block to facilitate its future removal. Cost of bond breaker shall be considered incidental to the cost of the precast concrete box culvert structure sub-item.



**ITEM 995.01** (Continued)

**4. Mechanical Reinforcing Bar Splicers**

Mechanical Reinforcing Bar Splicers shall be used to connect the cast-in-place concrete headwalls and temporary support block to the precast concrete box culvert structure. The cost of Mechanical Reinforcing Bar Splicers shall be considered incidental to the cost of the precast concrete box culvert structure sub-item.

All work shall be performed in accordance with this Special Provision and Subsection M8.01.9 of the Standard Specifications, including the latest Standard Special Provisions. Mechanical Reinforcing Bar Splicers shall be on the MassDOT Qualified Construction Materials List and shall be epoxy coated to match that of the reinforcing bars being spliced.

**5. Marking.**

The following information shall be clearly marked on the interior of each box culvert unit by indentation, waterproof paint, or other approved means:

- (a) Frame span and rise
- (b) Date of manufacture and lot number
- (c) Name and trademark of the manufacturer

**ITEM 995.01** (Continued)**F. Pre-Production Meeting.**

The Contractor shall notify the MassDOT Research and Materials Section to determine if a pre-production meeting will be required to review the specification, shop drawings, curing plan, schedule, and discuss any specific requirements. The meeting shall be held prior to scheduling a MassDOT Inspector (refer to Section Quality Assurance – Precast Concrete, C. Acceptance, A. Inspection), and at least seven (7) days prior to the scheduled casting of any Precast Concrete Bridge Element or control section. The Contractor shall schedule the meeting, which shall include representatives of the Fabricator and MassDOT.

**G. Reinforcement.**

The reinforcing bars shall be installed in accordance with Section 901.62 of the Supplemental Specifications, including tolerances for cover and horizontal spacing of bars. Components of mechanical reinforcing bar splicers shall be set with the tolerances shown on the plans. The reinforcing bars and mechanical reinforcing bar splicers shall be assembled into a rigid cage that will maintain its shape in the form and which will not allow individual reinforcing bars to move during the placement of concrete. This cage shall be secured in the form so that the clearances to all faces of the concrete, as shown on the plans, shall be maintained.

Where reinforcing bars are to protrude from one Precast Concrete Bridge Element in order to mate with reinforcing bar splicers in a second precast concrete element, the fabricator shall set the reinforcing bars and the reinforcing bar splicers with a template in order to ensure proper fit up within the tolerances specified on the plans.

**H. Tolerances.**

Fabrication shall comply with tolerances specified on the plans. Tolerances for steel reinforcement placement shall be in accordance with 901.62. In the absence of specifications on the plans, tolerances shall comply with the latest version of the PCI MNL 135, Precast Tolerance Manual.

**I. Forms.**

Concrete shall be cast in rigidly constructed forms, which will maintain the Precast Concrete Bridge Elements within specified tolerances to the shapes, lines and dimensions shown on the approved fabrication drawings. Forms shall be constructed from flat, smooth, non-absorbent material and shall be sufficiently tight to prevent the leakage of the plastic concrete. When wood forms are used, all faces in contact with the concrete shall be laminated or coated with a non-absorbent material. All worn or damaged forms, which cause irregularities on the concrete surface or damage to the concrete during form removal, shall be repaired or replaced before being reused. Any defects or damage of more than “Category 2, Minor Defects” made to the concrete, due to form work, stripping or handling, shall be subject to repair or rejection, as defined in the Repairs and Replacement section. If threaded inserts are cast into the elements for support of formwork, the inserts shall be recessed a minimum of 1 inch and shall be plugged after use with a grout of the same color as that of the precast cement concrete.

**ITEM 995.01** (Continued)**J. Mixing of Concrete.**

The concrete shall be proportioned and mixed in conformance with the Fabricator's MassDOT approved mix design and M4.02.10 Mixing and Delivery Fabrication shall not occur without prior MassDOT mix design approval. The Fabricator shall provide copies of batch tickets to the MassDOT Plant Inspector. The MassDOT Plant Inspector will verify if the batch ticket quantities are within the tolerances of the Fabricator's MassDOT approved mix design.

**K. Placement of Concrete.**

Prior to the placement of concrete, the temperature of the forms shall be greater than or equal to 50°F. Quality Control inspection shall be performed by the Fabricator as specified in the Fabricator Quality Control section. Placement of the concrete shall not proceed until the MassDOT Plant Inspector is present to perform inspection and begin monitoring Fabricator Quality Control inspection activities, and is in compliance with specifications. The MassDOT Plant Inspector shall inspect and accept the placement of the reinforcing steel prior to the placement of concrete into the forms. The Fabricator shall verify all materials and equipment required for protecting and curing the concrete are readily available and meet the requirements of the Final Curing Methods section below. All items encased in the concrete shall be accurately placed in the position shown on the Plans and firmly held during the placing and setting of the concrete. Clearance from the forms shall be maintained by supports, spacers, or hangers and shall be of approved shape and dimension.

During placement, the concrete shall maintain a concrete temperature range between 50°F and 90°F. The Fabricator shall minimize the time to concrete placement (measured from start of mixing to completion of placement). In no event shall time to placement exceed 90 minutes. The Fabricator shall perform additional Quality Control sampling and testing on concrete that has been retempered with admixtures or hold-back water during the placement of the concrete as specified in the Fabricator Quality Control section above. Delays or shutdowns of over 30 minutes shall not be allowed during the continuous filling of individual forms.

**L. Consolidation of Concrete.**

Suitable means shall be used for placing concrete to prevent segregation or displacement of reinforcing steel or forms. The concrete shall be thoroughly consolidated by external or internal vibrators or a combination of both. Vibrators shall not be used to move concrete within the forms. Vibrators shall be used as specified in 901.63C and as directed by the Engineer. Concrete shall be placed and consolidated in a way that minimizes the presence of surface voids or bug holes on the formed surfaces. When used, self-consolidating concrete (SCC) shall meet the requirements of M4.02.17.

**ITEM 995.01** (Continued)**M. Finishing of Concrete.**

The finish of the Precast Concrete Bridge Elements shall be as indicated on the plans. Where Precast Concrete Bridge Elements have keyways for grout or closure pours, the surfaces of these shear keys shall be abrasive blasted prior to shipment. The Fabricator may utilize a surface retarder with water blast, sandblast, or a combination of both to achieve the desired keyway finish. At a minimum, the profile of the keyway surfaces shall be similar to that of 60 grit sandpaper. The exposed reinforcing steel in the precast slab shall be protected from damage during the cleaning of the keyways. Damaged epoxy coating of steel reinforcement shall be repaired, and the reinforcing steel shall be cleaned as directed by the Engineer.

The Fabricator shall permanently mark each precast concrete bridge element with its type and/or piece mark, date of casting, and supplier identification either by stamp markings in fresh concrete, waterproof paint, or other approved means on a surface that will not be exposed after assembly.

**N. Exposed Surfaces of Precast Concrete Bridge Elements.**

As soon as conditions permit, before the concrete has fully hardened, all dirt, laitance, and loose aggregate shall be removed from the exposed concrete surfaces. Contractor shall not allow foot traffic on the uncured concrete until it has reached sufficient strength to prevent damage.

**O. Exposed Surfaces of Closure Pour Shear Keys.**

The closure pour shear key cast in the sides of the beam flanges shall have an exposed aggregate finish. The closure pour reinforcing steel and its coating shall not be damaged by the process for creating the exposed aggregate surface. Fabricator may utilize a surface retarder with water blast, abrasive blast, or a combination of both to achieve the desired shear key finish. The abrasive blast shall use oil free compressed air. The profile of the shear key surfaces shall be similar to that of 60 grit sandpaper.

**P. Initial Curing Methods.**

After the placement of concrete and prior to concrete finishing, the Fabricator shall initiate initial curing methods when the concrete surface begins to dry, to reduce moisture loss from the surface. Application of one or more of the following initial curing methods shall occur immediately after the bleed water sheen has disappeared.

**1. Fogging.**

Fogging nozzles shall atomize water into a fog-like mist. The fog spray shall be directed and remain visibly suspended above the concrete surface, to increase the humidity of the air and reduce the rate of evaporation. Water from fogging shall not be worked into the surface during finishing operations and shall be removed or allowed to evaporate prior to finishing.

**2. Liquid-applied Evaporation Reducers**

Evaporation reducers shall be sprayed onto the freshly placed concrete surface to produce an effective monomolecular film that reduces the risk of plastic-shrinkage cracking and rate of evaporation of the bleed water from the concrete surface. Evaporation reducers shall be applied in accordance with manufacturer's recommendations.

**ITEM 995.01** (Continued)**Q. Intermediate Curing Methods.**

The Fabricator shall initiate intermediate curing methods if concrete finishing has taken place prior to the concrete reaching final set. The freshly finished concrete surface shall be protected from moisture loss, by the continuation of initial curing methods (fogging and evaporation reducers) until final curing methods are applied or by the use of liquid membrane-forming curing compounds (see Liquid Membrane-Forming Compounds for Curing section).

**R. Final Curing Methods.**

The Fabricator shall initiate and apply final curing methods to the concrete immediately after the following conditions are met:

- (a) Completion of concrete finishing
- (b) Final set of concrete
- (c) Concrete has hardened sufficiently enough to prevent surface damage

During fabrication of Precast Concrete Bridge Elements, the Fabricator shall maintain the required concrete temperature ranges throughout the entire duration of the final curing method cycle as specified herein. Controlled and gradual termination of the final curing method shall occur after all specified conditions are met. The concrete temperature shall be reduced at a rate not to exceed 36°F per hour until the concrete temperature is within 20°F of the ambient temperature outside of the final curing method enclosure. The Fabricator shall maintain a minimum concrete temperature of 40°F until 100% f<sub>c</sub> is attained (see Handling and Storage section below).

**1. Water Spray Curing.**

All exposed concrete surfaces shall remain moist with a continuous fine spray of water throughout the entire duration of the final curing method cycle (see *Table 4: Final Curing Method Cycle for Water Spray*).

**Table 4: Final Curing Method Cycle for Water Spray**

Sustained Concrete Temperature	Final Curing Method Cycle Duration	Compressive Strength
50°F ≤ °F ≤ 90°F	≥ Five (5) days	≥ 80% f <sub>c</sub>

**2. Saturated Covers for Curing.**

All exposed concrete surfaces shall remain moist with a continuous application of saturated covers throughout the entire duration of the final curing method cycle (see *Table 5: Final Curing Method Cycle for Saturated Covers*). Saturated covers shall be allowed to dry thoroughly before removal to provide uniform, slow drying of the concrete surface.

**ITEM 995.01** (Continued)**Table 5: Final Curing Method Cycle for Saturated Covers**

Sustained Concrete Temperature	Final Curing Method Cycle Duration	Compressive Strength
50°F ≤ °F ≤ 90°F	≥ Three (3) days	≥ 80% f <sub>c</sub>

Saturated covers, such as burlap, cotton mats, and other coverings of absorbent materials shall meet the requirements of AASHTO M 182, Class 3. Saturated covers shall be in good condition, free from holes, tears, or other defects that would render it unsuitable for curing concrete. Saturated covers shall be dried to prevent mildew when storing. Prior to application, saturated covers shall be thoroughly rinsed in water and free of harmful substances that are deleterious or cause discoloration to the concrete. Saturated covers shall have sufficient thickness and proper positioning onto the concrete surface to maximize moisture retention.

Saturated covers shall contain a sufficient amount of moisture to prevent moisture loss from the surface of the concrete. Saturated covers shall be kept continuously moist so that a film of water remains on the concrete surface throughout the entire duration of the final curing method cycle. The Fabricator shall not permit the saturated covers to dry and absorb water from the concrete. Use of polyethylene film (see Polyethylene Film section) may be applied over the saturated cover to potentially decrease the need for continuous watering.

**3. Sheet Materials for Curing.**

All exposed concrete surfaces shall remain moist with a continuous application of curing sheet materials throughout the entire duration of the final curing method cycle (see *Table 6: Final Curing Method Cycle for Curing Sheet Materials*).

**Table 6: Final Curing Method Cycle for Sheet Materials**

Sustained Concrete Temperature	Final Curing Method Cycle Duration	Compressive Strength
50°F ≤ °F ≤ 90°F	≥ Three (3) days	≥ 80% f <sub>c</sub>

Sheet Materials used for curing, such as polyethylene film, white burlap-polyethylene sheeting, and reinforced paper shall meet the requirements of ASTM C171 and the specifications herein. Sheet materials shall inhibit moisture loss and reduce temperature rise in concrete exposed to radiation from the sun during the final curing method cycle. Adjoining covers shall overlap not less than 12 inches. All edges of the covers shall be secured to maintain a moist environment.

**ITEM 995.01** (Continued)**(a) Polyethylene Film.**

Polyethylene film shall meet the requirements of ASTM C171, consist of a single sheet manufactured from polyethylene resins, be free of visible defects, and have a uniform appearance. Careful considerations shall be taken by the Fabricator to prevent the film from tearing during storage and application, so as to not disrupt the continuity of the film (polyethylene film reinforced with glass or other fibers is more durable and less likely to be torn). The Fabricator shall monitor the application of the film to prevent uneven spots from appearing (mottling) on the concrete surface, due to variations in temperature, moisture content, or both. The Fabricator shall prevent mottling from occurring on the concrete surface by applying additional water under the film or applying a combination of polyethylene film bonded to absorbent fabric to the concrete surface to retain and evenly distribute the moisture.

Immediately following final finishing, polyethylene film shall be placed over the surface of the fresh concrete surface, so as to not damage the surface of the concrete and shall be placed and weighted so that it remains in contact with the concrete throughout the entire duration of the final curing method cycle. The film shall extend beyond the edges of the concrete surface. The film shall be placed flat on the concrete surface, avoiding wrinkles, to minimize mottling. Edges of adjacent polyethylene film shall overlap a minimum of 6 inches and be tightly sealed with the use of sand, wood planks, pressure-sensitive tape, mastic, or glue to maintain close contact with the concrete surface, retain moisture, and prevent the formation of air pockets throughout the entire duration of the final curing method cycle.

**(b) White Burlap-Polyethylene Sheeting**

White burlap-polyethylene sheeting shall meet the requirements of ASTM C171, be securely bonded to the burlap so to avoid separation of the materials during handling and curing of the concrete, and be applied in the same manner as the polyethylene film.

**(c) Reinforced Impervious Paper.**

Reinforced impervious paper shall meet the requirements of ASTM C171, consist of two sheets of kraft paper cemented together with a bituminous adhesive and reinforced with embedded cords or strands of fiber running in both directions, and be white in color. Reinforced impervious paper shall be treated to prevent tearing when wetted and dried.

Reinforced impervious paper can be reused so long as it is effective in retaining moisture on the concrete surface. The Fabricator shall visually inspect the reinforced impervious paper for all holes, tears, and pin holes from deterioration of the paper through repeated use by holding the paper up to the light. The paper shall be discarded and prohibited from use when the moisture is no longer retained.

After the concrete has hardened sufficiently to prevent surface damage, the concrete surface shall be thoroughly wetted prior to the application of the reinforced impervious paper, and be applied in the same manner as the polyethylene film.

**ITEM 995.01** (Continued)**4. Liquid Membrane-Forming Compounds for Curing.**

All exposed concrete surfaces shall remain moist with a continuous application of liquid membrane-forming compounds throughout the entire duration of the final curing method cycle (see Table 7: Final Curing Method Cycle for Liquid Membrane-Forming Compounds).

**Table 7: Final Curing Method Cycle for Liquid Membrane-Forming Compounds**

Sustained Concrete Temperature	Final Curing Method Cycle Duration	Compressive Strength
50°F ≤ °F ≤ 90°F	≥ Seven (7) days	≥ 80% f <sub>c</sub>

Liquid membrane-forming compounds shall meet the requirements of ASTM C 1315, Type I, Class A and shall exhibit specific properties, such as alkali resistance, acid resistance, adhesion-promoting quality, and resistance to degradation by ultraviolet light, in addition to moisture-retention capabilities. Liquid membrane-forming compounds shall consist of waxes, resins, chlorinated rubber, or other materials to reduce evaporation of moisture from concrete. Liquid membrane-forming compounds shall be applied in accordance with the manufacturer's recommendations.

Liquid membrane-forming compounds shall be applied immediately after the disappearance of the surface water sheen following final finishing. All exposed surfaces shall be wetted immediately after form removal and kept moist to prevent absorption of the compound, allowing the curing membrane to remain on the concrete surface for proper membrane moisture retention. The concrete shall reach a uniformly damp appearance with no free water on the surface prior to the application of the compound.

If patching or finishing repairs are to be performed prior to the application of the compound, the Precast Concrete Bridge Element shall be covered temporarily with saturated covers until the repairs are completed and the compound is applied. Only areas being repaired shall be uncovered during this period. While the saturated covers are removed to facilitate the patching process, the work shall continue uninterrupted. If for any reason the work is interrupted, saturated covers shall be placed onto the uncovered concrete surface, until the work continues and is completed, at which time the curing compound shall be applied to the repaired area.

Careful considerations shall be made by the Fabricator to determine if the evaporation rate is exceeding the rate of bleeding, thus causing the surface to appear dry even though bleeding is still occurring. Under such conditions, the application of liquid membrane-forming compounds to the concrete surface shall be delayed, in order to prevent bleed water from being sealed below the concrete surface and avert map cracking of the membrane films, reduction in moisture-retention capability, and reapplication of the compound. To diagnose and prevent this condition, the Fabricator shall place a transparent plastic sheet over a test area of the uncured and unfinished concrete surface and shall determine if any bleed water accumulates under the plastic.



**ITEM 995.01** (Continued)

The compound shall be applied in two applications at right angles to each other to ensure uniform and more complete coverage. On very deeply textured surfaces, the surface area to be treated shall be at least twice the surface area of a troweled or floated surface. In such cases, two separate applications may be needed, each at 200 ft<sup>2</sup>/gal., with the first being allowed to become tacky before the second is applied.

The curing compound shall be applied by power sprayer, using appropriate wands and nozzles with pressures between 25 and 100 psi. For very small areas such as repairs, the compound shall be applied with a wide, soft-bristled brush or paint roller. The compound shall be stirred or agitated before use and applied uniformly in accordance with the manufacturer's recommended rate. The Fabricator shall verify the application rates are in accordance with the manufacturer's recommended rate.

When the concrete surface is to receive paint, finishes, or toppings that require positive bond to the concrete, it is critical that the curing procedures and subsequent coatings, finishes, or toppings be compatible to achieve the necessary bond

After the termination of the final curing method cycle has occurred, liquid membrane-forming compounds shall be removed by blast-cleaning from any concrete surface that is to receive paint, finishes, plastic concrete from secondary pour, grout, or any other toppings that require bonding to the concrete surface. These surfaces shall be further blast-cleaned to remove the cement matrix down to exposed aggregate to ensure proper bonding to the material. The method used to remove the curing compound shall not damage the reinforcement and coating. Compounds are prohibited on any concrete surface that will have a penetrating or coating type treatment such as a sealer, stain, or waterproofing membrane applied to it.

**5. Accelerated Curing.**

Accelerated curing shall use live steam or radiant heat with moisture in accordance with PCI MNL-116 as modified herein. The concrete temperature shall meet the maximum heat increase and cool down rates as specified herein. Concrete temperature monitoring shall meet the requirements of the Temperature Monitoring section. Excessive and fluctuating rates of heating and cooling shall be prohibited. The concrete temperature shall not exceed 158°F at any time. The Fabricator shall meet the following accelerated curing sequencing and requirements.

**ITEM 995.01** (Continued)

**(a) Initial Delay Period.**

The initial delay period shall be defined as the duration immediately following the placement of the concrete and the attainment of initial set of the concrete. The Fabricator shall determine the time of initial set-in accordance with AASHTO T 197 specifications. Throughout the entire duration of the preset period, initial curing shall be implemented. The temperature increase period (see Temperature Increase Period section) shall not occur until initial set of the concrete is attained. During the initial delay period, the concrete temperature shall meet the following requirements:

- i. Concrete temperature rate of increase shall not exceed 10°F per hour.
- ii. Total concrete temperature increase shall not exceed 40°F higher than the placement concrete temperature or 100°F, whichever is less

**(b) Temperature Increase Period.**

The temperature increase period shall be defined as the duration immediately following the completion of the initial delay period (after initial set) and immediately prior to the start of the constant maximum temperature period. Application of steam to the enclosure shall not occur until the initial delay period is complete. After the initial delay period is complete, all exposed concrete surfaces shall be cured in a moist environment where the concrete temperature increases at a rate not to exceed 36°F per hour.

**(c) Constant Maximum Temperature Period.**

The constant maximum temperature period shall be defined as the duration immediately following the completion of the temperature increase period and immediately prior to the start of the temperature decrease period. After the temperature increase period is complete, all exposed concrete surfaces shall be cured in a moist environment at a controlled and constant elevated temperature throughout the entire duration of the constant maximum temperature period. Termination of the constant maximum temperature period and the start of the termination decrease period shall occur after all specified conditions are met (see Table 8: Constant Maximum Temperature Period).

**Table 8: Constant Maximum Temperature Period**

Sustained Concrete Temperature	Constant Maximum Temperature Period	Compressive Strength
120°F ≤ °F ≤ 158°F	6 hrs ≤ Time ≤ 48 hrs	≥ 80% f <sub>c</sub>

**(d) Temperature Decrease Period.**

After the constant maximum temperature period is complete, the concrete temperature shall be cured in a moist environment at a controlled and reduced rate not to exceed 36°F per hour until the concrete temperature is within 20°F of the ambient temperature outside of the curing enclosure.

**ITEM 995.01** (Continued)**S. Stripping.**

The Fabricator shall not strip forms or handle the Precast Concrete Bridge Element until Quality Control compressive strength cylinders attain a minimum compressive strength of 80% Design Strength ( $f'_c$ ) or the value indicated on the approved drawings has been achieved. After removal from the form, all exposed concrete surfaces shall continue to be cured in conformance with the Final Curing Methods sections until completion.

**T. Handling and Storage of Precast Concrete Bridge Elements.**

Precast Concrete Bridge Elements may be exposed to temperatures below freezing (32°F) when the chosen curing cycle has been completed, provided that the following conditions are met:

- (a) Precast Concrete Bridge Elements are protected from precipitation with polyethylene curing covers until 100%  $f'_c$  is attained
- (b) Precast Concrete Bridge Elements maintain a minimum concrete temperature of 40°F until 100%  $f'_c$  is attained

Precast Concrete Bridge Elements damaged during handling and storage will be repaired or replaced at MassDOT's direction at no cost to MassDOT. Precast Concrete Bridge Elements shall be lifted at the designated points by approved lifting devices embedded in the concrete and in accordance with proper lifting and handling procedures. Storage areas shall be smooth and well compacted to prevent damage due to differential settlement. Precast Concrete Bridge Elements shall be supported on the ground by means of continuous blocking, in accordance with the approved dunnage plan.

Precast Concrete Bridge Elements shall be loaded on a trailer with blocking as described above, in accordance with the approved dunnage plan. Shock-absorbing cushioning material shall be used at all bearing points during transportation of the Precast Concrete Bridge Elements. Blocking shall be provided at all locations of tie-down straps. Precast Concrete Bridge Elements stored prior to shipment shall be inspected by the Contractor prior to being delivered to the site to identify damage that would be cause for repair or rejection.

**U. Repairs and Replacement.**

In the event defects are identified, they shall be classified in the following categories and a non-conformance report (NCR) shall be filed if required. The NCR shall be submitted to MassDOT for review. Defects in all categories shall be documented by plant Quality Control personnel and made available to MassDOT upon request. Any required repairs shall utilize materials listed on the MassDOT QCML.

Where noted, defects shall be repaired according to the PCI Northeast Region Guidelines for Resolution of Non-Conformances in Precast Concrete Bridge Elements, Report Number PCINE-18-RNPCBE. Please note that reference to PCINE-18-RNPCBE is made for repair details only. In the case of conflicts with this Special Provision, this Special Provision shall govern.

**ITEM 995.01** (Continued)**1. Category 1, Surface Defects.**

Category 1 defects do not need to be repaired, and an NCR does not need to be filed. Surface defects are defined as the following:

- (a) Surface voids or bug holes that are less than 5/8-inch in diameter and less than 1/4-inch deep, except when classified as Category 4
- (b) Cracks less than or equal to 0.006 inches wide
- (c) Cracks less than or equal to 0.125 inches wide on surfaces that will receive a field-cast concrete overlay

**2. Category 2, Minor Defects.**

Category 2 defects shall be repaired, but an NCR does not need to be filed. Minor defects are defined as the following:

- (a) Spalls, honeycombing, surface voids that are less than 2 inches deep and have no dimension greater than 12 inches
- (b) Cracks less than or equal to 0.016 inches that will not receive a concrete overlay
- (c) Broken or spalled corners that will be covered by field-cast concrete

Minor defects shall be repaired according to PCINE-18-RNPCBE. Cracks shall be sealed according to the PCI Repair Procedure #14 in PCINE-18-RNPCBE.

**3. Category 3, Major Defects.**

For Category 3 defects, the Fabricator shall prepare an NCR that documents the defect and describes the proposed repair procedure. The NCR shall be submitted to MassDOT for approval prior to performing the repair. Major defects are defined as the following:

- (a) Spalls, honeycombing and surface voids that are deeper than 2 inches or have any dimension greater than 12 inches, when measured along a straight line
- (b) Concentrated area of defects consisting of four or more Category 2 Defects within a 4-square foot area.
- (c) Exposed reinforcing steel
- (d) Cracks greater than 0.016 inches and less than or equal to 0.060 inches in width that will not receive a concrete overlay
- (e) Bearing area spalls with dimensions not exceeding 3 inches
- (f) Cracks, spalls and honeycombing that will be encased in cast in place concrete need not be repaired, but the limits and location of the defects shall be documented with an NCR

Upon MassDOT approval, defects and cracks shall be repaired according to PCINE-18-RNPCBE and this specification. All repairs shall be completed at the expense of the Contractor.

**ITEM 995.01** (Continued)**4. Category 4, Rejectable Defects.**

Rejectable defects as determined by the MassDOT Inspector, RMS, and Engineer may be cause for rejection. Fabricator may submit an NCR with a proposed repair procedure, requesting approval. Some rejectable defects are defined as the following:

- (a) Surface defects on more than 5% of the surface area which will be exposed to view after installation
- (b) Minor defects that in total make up more than 5% of the surface area of the unit
- (c) Cracks greater than 0.060 inches in width except as noted in Category 1
- (d) Elements fabricated outside of the specified tolerances
- (e) MassDOT compressive strength testing that does not meet the specified Design Strength,  $f'_c$

**V. Loading.**

Prior to the Fabricator loading the Precast Bridge Element on to the truck for shipping, the Fabricator shall provide the MassDOT Plant Inspector and RMS a minimum seven (7) days' notice of the Fabricator's intent to load the Precast Bridge Element. Inspection by the MassDOT Plant Inspector shall take place while the element is still on dunnage in the yard. The element shall not be loaded onto the truck until the MassDOT Plant Inspector has performed the inspection.

**W. Shipping.**

Prior to shipment, the Fabricator shall perform the following actions and provide the required documentation to the MassDOT Plant Inspector:

- (a) Precast Concrete Bridge Elements shall remain at the Fabricator's plant for a minimum of 7 days after cast date.
- (b) QC Inspection Reports shall be signed by the Quality Control Manager and provided to the MassDOT Plant Inspector.
- (c) QC Compressive Strength Test Report Forms attaining Design Strength,  $f'_c$  for the Precast Concrete Bridge Element's representative Sublot shall be generated by the Fabricator and provided to the MassDOT Plant Inspector.
- (d) Certificate of Compliance shall be generated by the Fabricator as described under the Fabricator Quality Control section and provided to the MassDOT Plant Inspector.
- (e) All MassDOT RMS approved Corrective Actions submitted on the Non-Conformance Reports (NCR), shall be verified to have been completed by the MassDOT Plant Inspector and Quality Control Manager.
- (f) All NCRs shall be signed off by the Quality Control Manager, MassDOT Inspector and MassDOT RMS.

**ITEM 995.01** (Continued)

**X. Delivery.**

Upon Delivery, the following documentation shall be provided to the MassDOT Resident Engineer or designee:

- (a) QC Compressive Strength Test Report Forms attaining Design Strength,  $f'c$  for the Precast Concrete Bridge Element's representative subplot.
- (b) Certificate of Compliance generated by the Fabricator as described under the Fabricator Quality Control section.
- (c) QC Inspection Reports signed by the Quality Control Manager.

The Contractor shall inspect Precast Concrete Bridge Elements upon receipt at the site. Precast Concrete Bridge Elements damaged during delivery shall be repaired or replaced at MassDOT's direction at no cost to MassDOT.

**CONSTRUCTION METHODS – FIELD CONSTRUCTION**

**A. General.**

All of the Contractor's field personnel involved in the erection and assembly of the Precast Concrete Bridge Elements shall have knowledge of and follow the approved Erection Procedure and Quality Control Plan for Precast Concrete Bridge Element Assembly.

Prior to installation, the following documentation shall be reviewed and confirmed by the MassDOT Resident Engineer or designee:

- (a) QC Compressive Strength Test Report Forms attaining Design Strength,  $f'c$  for the Precast Concrete Bridge Element's representative subplot.
- (b) Certificate of Compliance generated by the Fabricator as described under the Fabricator Quality Control section.
- (c) QC Inspection Reports signed by the Quality Control Manager.

Field construction staff shall verify that the Resident Engineer has accepted all Precast Concrete Bridge Elements prior to installation.

**B. Erection Procedure and Quality Control Plan for Precast Concrete Bridge Element Assembly.**

Prior to the erection, the Contractor shall submit an Erection Procedure and a Quality Control Plan for Precast Concrete Bridge Element Assembly for approval by the Engineer. This submittal shall include computations and drawings for the transport, hoisting, erection and handling of the Precast Concrete Bridge Elements. The Erection Procedure and Quality Control Plan for Precast Concrete Bridge Element Assembly shall be prepared and stamped by a Professional Engineer registered in the Commonwealth of Massachusetts with working knowledge of the Contractor's equipment, approved shop drawings, and materials to build the bridge. The Erection Procedure and Quality Control Plan for Precast Concrete Bridge Element Assembly shall, at a minimum, include the following:

**ITEM 995.01** (Continued)**1. Erection Procedure**

The Erection Procedure shall be prepared to conform to the requirements of 960.61, Erection and the applicable sections in Chapter 8 of the PCI Design Handbook (seventh edition) for handling, erection, and bracing requirements. At a minimum, the Erection Procedure shall provide:

- (a) Minimum concrete compressive strength for handling the Precast Concrete Bridge Elements.
- (b) Concrete stresses during handling, transport, and erection.
- (c) Crane capacities, pick radii, sling geometry, and lifting hardware.
- (d) Verification that the equipment can handle all pick loads and weights with the required factor of safety.
- (e) Evaluation of construction sequence and evaluation of any geometric conflicts in the lifting of the Precast Concrete Bridge Elements and setting them as shown on the plans.
- (f) Design of crane supports including verification of subgrade for support.
- (g) Location and design of all temporary bracing that will be required during erection.

Non-shrink grout and concrete materials, approved by the Engineer, shall be placed as shown on the plans. Fill joints, keyways, and voids, in strict accordance with the specifications and manufacturer's recommendations and instructions.

For footings, approach slabs and highway guardrail transitions, once these Precast Concrete Bridge Elements have been set to the correct horizontal and vertical alignment, the void between them and the supporting soil shall be filled with Controlled Density Fill – Non-Excavatable to the limits as shown on the plans. Add additional grout ports in the footings to facilitate the bedding process if required.

Joints shall be filled flush to the top with non-shrink grout, and any vertical misalignment between adjacent elements shall be feathered out on a slope of 1 to 12.

Curing of grout or concrete shall be performed in strict accordance with the specifications and manufacturer's recommendations. Filling shall not be completed in cold weather when either the ambient temperature or the precast member's temperature is below the manufacturer's recommendation. No localized heating of either the precast members or of the air surrounding the element will be permitted in an attempt to reach application temperatures.

If the joints or voids are not filled within five days after the Precast Bridge Elements are erected, the Contractor shall cover and protect the openings from weather and debris until they are filled.

**ITEM 995.01** (Continued)**2. Quality Control Plan for Precast Concrete Bridge Element Assembly**

The Quality Control Plan for Precast Concrete Bridge Element Assembly is a document prepared and submitted by the Contractor prior to the start of work which requires the Contractor to identify and detail the sequence of construction in accordance with the project schedule and which clearly identifies all stages of field construction. The assembly procedures for the Precast Concrete Bridge Elements shall be submitted on full size 24"x36" sheets. This document will be treated as a Construction Procedure and will be reviewed by both the Designer and the District Construction Office. The approval of this document will serve as a guideline for setting interim concrete and grout strengths and curing procedures to allow construction to proceed without waiting for the final in-service strengths to be achieved.

The following list details the minimum criteria that should be included in the Quality Control Plan for Precast Concrete Bridge Element Assembly:

- (a) A detailed schedule showing the sequence of operations that the Contractor will follow. The schedule shall include a timeline for installation of all major elements of the bridge accounting for the installation of temporary works and cure times of grouts or closure pour concrete and other selected materials.
- (b) Calculations that support the schedule outlined above should be included verifying that the selected materials have adequate interim strength to proceed from one step to another. Final material strengths are not normally required until the bridge is opened to vehicular traffic. The minimum factor of safety of two (2) will be required for the interim strength of grouts and closure pour concrete before construction is allowed to proceed to subsequent steps. The factor of safety is applied to the service loads that are supported by the elements and materials during various stages of construction. For example, if the Contractor calculates that the grout between the precast pier cap and pier wall requires a strength of 100 psi to support the dead load of the beams in the next step, a cylinder break of 200 psi will be required prior to allowing the pier cap to be loaded with the beams. The required strength of materials for subsequent construction stages shall also be calculated and the material strength verified.
- (c) The Contractor is responsible for determining the center of gravity for all elements. Special care shall be used for unusual elements that are not symmetric. These elements may require special lifting hardware to allow for installation in a plumb or flat position.



**ITEM 995.01** (Continued)

- (d) Plan of the work area, depicting items such as temporary earth support, utilities within the immediate vicinity of the work, drainage structures, etc. The Contractor shall coordinate the various subcontractors that will need to occupy the same area and shall ensure that there are no conflicts. For example, if the Contractor is having different Subcontractors prepare and submit plans for temporary earth support and demolition, and the earth support is required to be installed prior to the demolition, it shall be the Contractor's responsibility to ensure that the Quality Control Plan for Precast Concrete Bridge Element Assembly submission allows both operations to be performed without field modification.
- (e) Details of all equipment that shall be employed for the construction of the bridge.
- (f) Methods of providing temporary support of the elements. Include methods of adjusting and securing the element after placement.
- (g) Vertical Adjustment Assemblies to be used as a means of setting precast concrete footings to the correct elevations.
- (h) Procedures for controlling the overall horizontal dimensions and the vertical elevations as each precast concrete bridge element is erected by using the tolerance limits of the joints as detailed on the plans.
- (i) Methods for curing grout.
- (j) Proposed methods for installing non-shrink grout and the sequence and equipment for the grouting operation.
- (k) Methods for sealing the keyways in preparation for filling with non-shrink grout, including the use of backer rods. The Contractor shall not assume that the backer rods will restrain the pressure from the grout in vertical grout joints. Provide additional forming to retain the backer rod.

**C. Survey and Layout.**

Working points, working lines, and benchmark elevations shall be established prior to placement of all elements. The Contractor is responsible for field survey as necessary to complete the work. MassDOT reserves the right to perform additional independent survey. If discrepancies are found, the Contractor may be required to verify previous survey data.

**ITEM 995.01** (Continued)**D. Preparation of Closure Pour Keyways.**

Immediately prior to erecting the Precast Concrete Bridge Elements, the closure pour shear keys shall be cleaned at the job site of all dust, dirt, carbonation, laitance, and other potentially detrimental materials which may interfere with the bonding of the closure pour concrete and precast concrete using a high-pressure water blast. The exposed reinforcing steel in the precast concrete shall be protected from damage during the cleaning of the keyways. Damaged epoxy coating of steel reinforcement shall be repaired, and the reinforcing steel shall be cleaned as directed by the Engineer. The surfaces of the shear keys shall be wetted so that the surfaces shall have a Saturated Surface Dry (SSD) condition for at least 24 hours prior to the placement of the closure pour concrete.

**E. Erection.**

The elements shall be placed in the sequence and according to the methods outlined in the Erection Procedure and Quality Control Plan for Precast Concrete Bridge Element Assembly. As the erection proceeds, the Contractor shall constantly monitor the assembly to ensure that the precast concrete bridge element is within proper horizontal and vertical location and tolerances prior to releasing it from the crane and setting the next unit. The Contractor may use shims to maintain proper setting tolerances.

The concrete elements shall be lifted only by the lifting devices, and the utmost care shall be taken to prevent distortion of the elements during handling, transportation, or storage.

Suitable spreaders shall be used during lifting so that only a vertical pull will be made on the lifting device. A non-vertical lifting force may be permitted if prior written approval is given by the Engineer. This approval will be contingent on the Contractor demonstrating by calculations, prepared by a Professional Engineer registered in Massachusetts, that the elements will not be damaged by the non-vertical lifting force and by documentation that the capacity of the lifting devices is adequate for the non-vertical lifting force.

Precast components shall be pre-bed with non-shrink grout thicker than shim stacks prior to placing other precast elements on top of them.

After all Precast Concrete Bridge Elements have been placed, the actual overall dimensions of the structure both horizontal and vertical, as laid out shall not deviate from the nominal dimensions shown on the plans beyond a tolerance of +0 inches and -1 inches. Once the layout of Precast Concrete Bridge Elements has been accepted by the Engineer, the Contractor shall cut all lifting devices off below the surfaces of the elements.

**ITEM 995.01** (Continued)**F. Box Culverts**

Backfilling operations shall not begin until the following checks have been made:

- (a) The box culvert to curtain wall joints are grouted as shown on the plans;
- (b) The joints between exterior box culvert units and the highway guardrail transitions are complete as shown on the plans;
- (c) All joint seals are properly placed.

Backfill shall be paid for under separate items. The backfilling procedures shall be in accordance with Sections 120, 150, and 170 of the Standard Specifications and Supplemental Specifications modified as follows:

- (a) Fill shall be placed and compacted in layers not exceeding one foot in depth;
- (b) Dumping of fill shall not be allowed any nearer to the structure than 3.25 feet from a vertical plane extending from the back of the box culvert;
- (c) Backfill shall be placed as symmetrically as possible around the structure with differential depths of backfill on each side of the structure not exceeding 1.5 feet with respect to each other;
- (d) Compaction shall be achieved using hand compaction equipment for all fill within one foot of the structure;
- (e) The bare structure shall not be crossed by any equipment heavier than that specified by the frame manufacturer. All damage resulting from equipment damage shall be rectified to the satisfaction of the Engineer at no cost to the Department;
- (f) Construction equipment will not be permitted atop an uncompleted structure;
- (g) Construction equipment whose weight exceeds the design capacity shall not be permitted atop the completed structure under any circumstances;
- (h) The use of vibratory rollers for compaction purposes will not be permitted.

A representative of the manufacturer shall be on site at the commencement of the installation, at no cost to the Department, to assist the Contractor. The representative shall offer advisory assistance only and shall not supplant the Contractor's representative, or the Engineer.

**G. Filling of Blockouts for Lifting Devices and Threaded inserts.**

If the blockouts in the Precast Concrete Bridge Elements where the lifting devices were located will be exposed and visible after assembly is complete, the Contractor shall fill these blockouts with Cement Mortar (M4.02.15) or grout.

After the formwork has been removed, all threaded inserts that have been cast into the precast concrete bridge deck for support of the formwork shall be filled with a grout of the same color as that of the precast concrete.

**ITEM 995.01** (Continued)**SCHEDULE OF BASIS FOR PARTIAL PAYMENT**

Within ten (10) days after the Notice to Proceed, the Contractor shall submit on his/her proposal form a schedule of unit prices for the major component Sub-Items that make up Item 995.01 as well as his/her total bridge structure Lump Sum cost for Bridge No. W-12-030 (C83). The bridge structure Lump Sum breakdown quantities provided in the proposal form are estimated and not guaranteed. The total of all partial payments to the Contractor shall equal the Lump Sum contract price regardless of the accuracy of the quantities furnished by the Engineer for the individual bridge components. The cost of labor and materials for any Item not listed but required to complete the work shall be considered incidental to Item 995.01 and no further compensation will be allowed.

The schedule on the proposal form applies only to Bridge No. W-12-030 (C83). Payment for similar materials and construction at locations other than at this bridge structure shall not be included under this Item. Sub-Item numbering is presented for information only in coordination with MassDOT Standard Nomenclature.

**ITEM 995.01**                      **ESTIMATED LUMP SUM BREAKDOWN QUANTITIES**  
**(NOT GUARANTEED)**

<u>SUB-ITEM NO.*</u>	<u>ITEM</u>	<u>QTY.</u>	<u>UNIT</u>	<u>UNIT PRICE</u>	<u>TOTAL</u>
904.3	5000 PSI, 3/4 INCH, 685 HP CEMENT CONCRETE	65	CY		
904.31	PRECAST CONCRETE HIGHWAY GUARDRAIL TRANSITIONS	4	EA		
910.1	STEEL REINFORCEMENT FOR STRUCTURES – EPOXY COATED	3500	LB		
916.1	PRECAST CONCRETE BOX CULVERT AND CURTAIN WALLS	70	FT		
970.	DAMP-PROOFING	3000	SF		
975.5	ALUMINMUM HANDRAIL	30	FT		

Total Cost of Item 995.01 = \_\_\_\_\_

The above schedule applies only to Bridge No. W-12-030 (C83). Payment for similar materials and construction at locations other than at this bridge structure shall not be included under this Item. \* - Sub-Item numbering is presented for information only in coordination with MassDOT Standard Nomenclature.

DOCUMENT A00802

# **DETAIL SHEETS**

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THE COMMONWEALTH OF MASSACHUSETTS  
MassDOT - HIGHWAY DIVISION  
TEN PARK PLAZA, BOSTON, MA

**PRELIMINARY ESTIMATE OF QUANTITIES - DETAIL SHEETS**

TOWN-CITY	<u>Webster, MA</u>	ROAD	<u>Route 16</u>
FISCAL YEAR	<u>2024</u>	CLASS	<u>                    </u>
STA.	<u>12+05 to 35+25</u>	DATE	<u>June 12, 2024</u>
Type of Project	<u>Intersection Improvements at I-395 Ramps</u>		

Earth Excavation	<u>9,040</u> CY	Gravel Borrow	<u>5,102</u> CY
Bridge Excavation	<u>460</u> CY	Ordinary Borrow	<u>340</u> CY
Class "A" Trench Excavation	<u>70</u> CY	Special Borrow	<u>960</u> CY
Class "B" Trench Excavation	<u>745</u> CY	Gravel Borrow for Backfilling Structures and Pipes	<u>2,733</u> CY
Class "A" Rock Excavation	<u>2,750</u> CY		
Class "B" Rock Excavation	<u>1,425</u> CY		

**PAVEMENT NOTES:**

**PROPOSED FULL DEPTH PAVEMENT:** **AREA= 4,071 SY**

SURFACE: 2" SUPERPAVE SURFACE COURSE – 12.5 POLYMER (SSC-12.5-P)

INTERMEDIATE: 2.5" SUPERPAVE INTERMEDIATE COURSE - 19.0 (SIC-19.0)

BASE: 4.5" SUPERPAVE BASE COURSE – 37.5 (SBC-37.5)

SUBBASE: 4" DENSE GRADED CRUSHED STONE OVER  
8" GRAVEL BORROW (TYPE b)

**PROPOSED FULL DEPTH PAVEMENT RECLAMATION:** **AREA= 5,480 SY**

SURFACE: 2" SUPERPAVE SURFACE COURSE – 12.5 POLYMER (SSC-12.5-P)

INTERMEDIATE: 2.5" SUPERPAVE INTERMEDIATE COURSE - 19.0 (SIC-19.0)

BASE: 4.5" SUPERPAVE BASE COURSE – 37.5 (SBC-37.5)

SUBBASE: 12" RECLAIMED PAVEMENT BORROW

**PROPOSED FULL DEPTH BOX WIDENING (<4'):**

**AREA= 234 SY**

SURFACE: 2" SUPERPAVE SURFACE COURSE – 12.5 POLYMER (SSC-12.5-P)

INTERMEDIATE: 2.5" SUPERPAVE INTERMEDIATE COURSE - 19.0 (SIC-19.0)

BASE: 6" HIGH EARLY STRENGTH CEMENT CONCRETE BASE COURSE

SUBBASE: 8" GRAVEL BORROW (TYPE b)

**PROPOSED MILLING AND OVERLAY:**

**AREA= 8,280 SY**

SURFACE: 2" SUPERPAVE SURFACE COURSE – 12.5 POLYMER (SSC-12.5-P)

INTERMEDIATE: SHIM AS REQUIRED TO MEET PROPOSED GRADES AND CROSS SLOPES  
SUPERPAVE LEVELING COURSE – 9.5 (SLC-9.5) (1" TO 1.5" LIFTS)  
SUPERPAVE INTERMEDIATE COURSE – 12.5 (SIC-12.5) (1.5" TO 2" LIFTS)

MILLING: 2" PAVEMENT FINE MILLING

**PROPOSED PEDESTRIAN CURB RAMP:**

**AREA= 2,189 SY**

**PROPOSED BICYCLE RAMP:**

**PROPOSED CEMENT CONCRETE SIDEWALK:**

**PROPOSED CEMENT CONCRETE MEDIAN:**

SURFACE: 4" CEMENT CONCRETE, AIR ENTRAINED  
(4000 PSI, ¾ IN., 610 CEMENT CONCRETE)

FOR STAMPED SIDEWALKS AND MEDIANS

COLOR: BRICK RED: PATTERN: NEW BRICK RUNNING BOND

BASE: 8" GRAVEL BORROW (TYPE b)

**PROPOSED CEMENT CONCRETE SIDEWALK AT DRIVEWAYS:**

**AREA= 56 SY**

SURFACE: 6" CEMENT CONCRETE, AIR ENTRAINED  
(4000 PSI, ¾ IN., 610 CEMENT CONCRETE)

BASE: 8" GRAVEL BORROW (TYPE b)



**PROPOSED TRUCK APRON (STAMPED CONCRETE PAVEMENT):      AREA= 558 SY**

SURFACE:            9" CEMENT CONCRETE, AIR ENTRAINED  
                          (4000 PSI, ¾ IN., 610 CEMENT CONCRETE)  
                          COLOR: BRICK RED: PATTERN: NEW BRICK RUNNING BOND

BASE:                8" GRAVEL BORROW (TYPE b)

**PROPOSED HOT MIX ASPHALT SHARED USE PATH:                      AREA= 1,992 SY**  
**PROPOSED HOT MIX ASPHALT DRIVEWAY:**

SURFACE:            1.5" SUPERPAVE SURFACE COURSE – 9.5 (SSC-9.5)

INTERMEDIATE: 2.5" SUPERPAVE INTERMEDIATE COURSE – 12.5 (SIC-12.5)

SUBBASE:           8" GRAVEL BORROW (TYPE b)

**PROPOSED TEMPORARY FULL DEPTH PAVEMENT:                      AREA= 1,116 SY**

SURFACE:            1.5" SUPERPAVE SURFACE COURSE – 9.5 (SSC-9.5)

INTERMEDIATE: 2.5" SUPERPAVE INTERMEDIATE COURSE – 12.5 (SIC-12.5)

SUBBASE:           8" GRAVEL BORROW (TYPE b)

**ITEM 100.9**      **AS-BUILT SURVEY AND PLANS**

To be used as specified for the relocated MassDOT ITS service meter pedestal.

**ITEM 101.**      **CLEARING AND GRUBBING**

To be used for clearing and grubbing between the edge of the existing road/sidewalk to the limit of slope work shown on the Plans.

**ITEM 101.1**      **CLEARING**

To be used for clearing at the top of ledge outcroppings to be excavated as shown on the Plans.

**ITEM 102.1**      **TREE TRIMMING**

To be used tree for trimming along the limits of clearing and grubbing as directed by the Landscape Architect, where approved by the Engineer.

**ITEM 102.3**      **HERBICIDE TREATMENT OF INVASIVE PLANTS**  
**ITEM 102.33**      **INVASIVE PLANT MANAGEMENT STRATEGY**

To be used for chemical treatment of invasive plant species around the project site at locations shown on the Plans and as directed by the Landscape Architect, where approved by the Engineer.

**ITEM 102.511**      **TREE PROTECTION – ARMORING & PRUNING**

To be used for protection of existing trees which are to be retained and are located within the limits of clearing and grubbing and selective clearing and thinning when construction activities are likely to occur within the canopy of individual trees or where there may be any risk of damage to trees as shown on the Plans or as directed by the Engineer.

**ITEM 102.521**      **TREE AND PLANT PROTECTION FENCE**

To be used along limits of clearing and grubbing within wooded areas as directed by the Landscape Architect, where approved by the Engineer.

**ITEM 120.**      **EARTH EXCAVATION**

Includes removal and disposal of existing bituminous and concrete pavement, sidewalks, medians, and curbing as well as any bounds and unsuitable material at locations shown on the Plans as well as any drainage pipes designated to be removed that lie within areas that would otherwise need to be excavated to complete the Work.

**ITEM 121.**      **CLASS A ROCK EXCAVATION**

To be used for excavation of ledge slopes and as required for removal of ledge or boulders encountered in areas of Earth Excavation. Based on subsurface exploration, it is anticipated that shallow ledge will be encountered along Route 16 between stations 18+00 to 27+50.

**ITEM 121.11**      **MONITORING FOR ROCK EXCAVATION**

To be used for monitoring and ensuring the protection of existing structures and utilities during the construction, including Class A Rock Excavation activities.

**ITEM 122.**      **PRESPLITTING ROCK**

To be used prior to the excavation of rock / ledge along Route 16 between stations 20+00± and 26+00±.

**ITEM 141.**      **CLASS A TRENCH EXCAVATION**

To be used for excavation associated with proposed concrete barriers.

**ITEM 141.1**      **TEST PIT FOR EXPLORATION**

To be used as required for locating existing utilities and drainage as well as for checking for shallow ledge within areas of installation for guardrail and utility poles.

**ITEM 144.**      **CLASS B ROCK EXCAVATION**

To be used for excavation of ledge or boulders encountered within areas of Class B Trench Excavation, for removal of ledge or boulders as required for installation of guardrail posts, to enable the installation of utility poles, subdrains, drainage structures, drainage pipes and underground water and gas main utilities, and for removal of rock encountered during excavation for the Bridge No. W-12-030 box culvert.

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**ITEM 151.2**      **GRAVEL BORROW FOR BACKFILLING STRUCTURES AND PIPES**

To be used for backfilling the proposed culvert and channel walls, for backfilling proposed concrete barriers and as required for backfilling proposed pipes when there is not enough suitable excavated material.

**ITEM 153.**      **CONTROLLED DENSITY FILL - EXCAVATABLE**

To be used within lighting conduits trenches within roadways, for backfilling guardrail posts within areas of Class B Rock Excavation, and for backfilling frangible leave-outs for guardrail posts within areas of concrete.

**ITEM 156.**      **CRUSHED STONE**

To be used below the proposed culvert and channel walls, below drainage structures and pipes as required, in conduit trenches, below modified rockfill slopes, at the bottom of drainage ditches along ledge slopes, at proposed 48" fence behind concrete barrier, and below proposed check dams and riprap at Stormwater BMP's.

**ITEM 156.5**      **CRUSHED STONE FOR FILTER BLANKET**

To be used below proposed modified rockfill slope protection and below riprap scour protection within Mill Brook.

**ITEM 221.**      **FRAME AND COVER**

To be used for drainage manholes on Route 16 and Sutton Road: both proposed manholes and, as approved by the Engineer, for existing manholes to remain whose frame and cover require replacement.

**ITEM 221.1**      **FRAME AND COVER - SECURED**

To be used for drainage manholes on I-395 NB Ramps and I-395 SB Ramps: both proposed manholes and, as approved by the Engineer, for existing manholes to remain whose frame and cover required replacement.

**ITEM 222.1**      **FRAME AND GRATE – MASSDOT CASCADE TYPE**

To be used for catch basins and gutter inlets within the roadway on Route 16 and Sutton Road: both proposed structures and, as approved by the Engineer, for existing catch basins to remain whose frame and grate require replacement.

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**ITEM 222.2**      **FRAME AND GRATE – MASSDOT DROP INLET**

To be used at proposed drop inlets located off the roadway and for proposed outlet control structures at stormwater BMP's.

**ITEM 222.4**      **LARGE HOOK LOCK BAR GRATE - FURNISHED AND INSTALLED**

To be used for frames and grates for catch basins within the roadway on I-395 NB Ramps and I-395 SB Ramps: both proposed catch basins and, as approved by the Engineer, for existing catch basins to remain whose frame and grate require replacement.

**ITEM 224.12**      **12 INCH HOOD**

To be used at the outlet drainage pipe at each proposed catch basin and drop inlet.

**ITEM 227.3**      **REMOVAL OF DRAINAGE STRUCTURE SEDIMENT**

To be used for cleaning of existing drainage inlets and manholes to be retained within the limits of work and as directed by the Engineer.

**ITEM 227.31**      **REMOVAL OF DRAINAGE PIPE SEDIMENT**

To be used for cleaning of existing drainage pipes to be retained within limits of work and as directed by the Engineer.

**ITEM 258.**      **STONE FOR PIPE ENDS**

To be used at proposed flared end drainage outlets, at existing pipe ends shown on the Plans, and over proposed stone check dams.

**ITEM 269.06**      **6 INCH SLOT-PERFORATED CORRUGATED PLASTIC PIPE (SUBDRAIN)**

To be used below proposed drainage ditches located at the bottom of ledge slopes.

**ITEM 281.**      **CEMENT CONCRETE PAVING (WATERWAY)**

To be used for the proposed inlet aprons around drop inlets DI-05 and DI-44.

**ITEM 281.2**

**JUTE MESH (WATERWAYS)**

To be used within proposed drainage ditches.

**ITEM 402.13**

**PAVEMENT MILLING MULCH FOR SHOULDERS**

To be used along shared-use path between the edge of path and adjacent proposed guardrail.

**ITEM 403.1**

**CRUSHED STONE FOR BLENDING**

To be used for supplementing reclaimed asphalt pavement material as required to meet the proposed base thickness.

**ITEM 415.2**

**PAVEMENT FINE MILLING**

To be used at areas of proposed Milling & Overlay and also for milling existing roadway pavement as required in areas of proposed traffic islands or the center of the proposed roundabout.

**ITEM 451.**

**HMA FOR PATCHING**

To be used as a contingency for any pavement patching required during pavement milling operation and as directed by the Engineer.

**ITEM 452.**

**ASPHALT EMULSION FOR TACK COAT**

To be used on all newly paved surfaces as shown on the Plans.

**ITEM 453.**

**HMA JOINT ADHESIVE**

To be used on all newly constructed pavement joints.

**ITEM 472.**

**TEMPORARY ASPHALT PATCHING**

To be used for temporary surface patching of test pits and or pavement transitions at drop-offs.

**ITEM 476.01**

**STAMPED CONCRETE PAVEMENT**

To be used for proposed truck aprons.

**ITEM 476.22**

**SCORED CONCRETE PAVEMENT**

To be used within the center of the proposed roundabout as shown on the Landscaping Plans.

**ITEM 507.10.**  
**ITEM 507.15**

**GRANITE CURB TYPE T-100 – STRAIGHT**  
**GRANITE CURB TYPE T-100 – CURVED**

To be used for proposed mountable granite curb at truck aprons.

**ITEM 631.**

**SPECIAL BASE ANCHOR FOR GUARDRAIL POST**

To be used as required for guardrail posts installed over existing or proposed utilities.

**ITEM 632.**  
**ITEM 632.4**  
**ITEM 633.**  
**ITEM 634.**

**GUARDRAIL POST – STEEL**  
**INDIVIDUAL POST REMOVED AND DISCARDED**  
**GUARDRAIL OFFSET BLOCK – W-BEAM**  
**W BEAM GUARD PANEL**

These items are to be used only as directed by the Engineer for repairing damaged sections of existing guardrail to be retained.

**ITEM 638.11**

**PROTECTIVE SCREEN (CHAIN LINK) WITH HANDRAIL**

To be used as required for proposed 48” chain link fence with railing along the shared-use path.

**ITEM 698.3**

**GEOTEXTILE FABRIC FOR SEPARATION**

To be used below proposed special slope paving, below modified rockfill slope protection, below proposed stormwater BMP’s, and below gravel driveways as shown on the Plans.

**ITEM 701.21**

**DETECTABLE WARINING PANEL**

To be used for detectable warning panels proposed splitter islands and traffic islands (outside limits of pedestrian curb ramps paid for under Item 701.2).

**ITEM 701.22****DIRECTIONAL TACTILE WARNING PANEL**

To be used for detectable warning panels at bicycle-only curb ramps as shown on the Plans.

**ITEM 734.****SIGN REMOVED AND RESET**

To be used for removing, stacking (if required), relocating, and resetting the existing private “Welcome to Webster” sign and associated landscaping at the location shown on the Plans.

**ITEM 765.21****ANNUAL COVER CROP FOR NATIVE SEEDING****ITEM 765.635****NATIVE SEEDING AND ESTABLISHMENT**

To be used in conjunction with Short Grassland seed mix, Urban Native Meadow seed mix, and Wetland Riparian seed mix.

**ITEM 801.22****2 INCH ELECTRICAL CONDUIT – TYPE NM (DOUBLE)**

To be used for proposed highway lighting to carry branch circuit conductors (8 AWG) outside of roadways between the proposed load center and proposed handholes.

**ITEM 801.32****3 INCH ELECTRICAL CONDUIT – TYPE NM (DOUBLE)**

To be used for proposed highway lighting to carry service feeders outside of roadways from utility pole to the proposed load center.

**ITEM 801.42****4 INCH ELECTRICAL CONDUIT – TYPE NM (DOUBLE)**

To be used for proposed underground cable TV conduits.

**ITEM 804.1****1 INCH ELECTRICAL CONDUIT – TYPE NM – PLASTIC –(UL)**

To be used for proposed highway lighting to carry branch circuit conductors (10AWG) between proposed handholes and proposed light poles.

**ITEM 804.3****3 INCH ELECTRICAL CONDUIT TYPE NM – PLASTIC –(UL)**

To be used for the proposed Traffic Control Signal Location No. 1.



**ITEM 804.31**      **3 INCH SCHEDULE 80 PVC CONDUIT**

To be used for relocating MassDOT ITS service meter pedestal.

**ITEM 806.1**      **1 INCH ELECTRICAL CONDUIT TYPE RM – GALVANIZED STEEL**

To be used for proposed highway lighting ground rod connections.

**ITEM 806.2**      **2 INCH ELECTRICAL CONDUIT TYPE RM – GALVANIZED STEEL**

To be used for proposed highway lighting to carry branch circuit conductors (8 AWG) under roadways between the proposed load center and proposed handholes.

**ITEM 806.3**      **3 INCH ELECTRICAL CONDUIT TYPE RM – GALVANIZED STEEL**

To be used for proposed highway lighting to carry service feeders under roadways from utility pole to the proposed load center.

**ITEM 811.10**      **ELECTRIC MANHOLE – SD2.010**

To be used for proposed Cable TV manholes.

**ITEM 811.22**      **ELECTRIC HANDHOLE – SD2.022**

To be used for proposed highway lighting and traffic signal handholes.

**ITEM 811.23**      **ELECTRIC HANDHOLE – SD2.023**

To be used for proposed MassDOT ITS CCTV handholes.

**ITEM 811.31**      **PULL BOX 12 X 12 INCHES – SD2.031**

To be used for proposed traffic signal pull boxes.

**ITEM 811.36**      **ELECTRIC MANHOLE ADJUSTED**

To be used for adjusting proposed Cable TV manholes to finished grade once pavement reclamation is complete.

**ITEM 813.40**

**WIRE TYPE 8 NO. 10 DIRECT BURIAL**

To be used for proposed highway lighting branch circuit conductors between proposed handholes and proposed light poles.

**ITEM 813.41**

**WIRE TYPE 8 NO. 8 DIRECT BURIAL**

To be used for proposed highway lighting branch circuit conductors between the proposed load center and proposed handholes.

**ITEM 813.435**

**WIRE TYPE 8 NO. 3 DIRECT BURIAL**

To be used for proposed highway lighting service circuit conductors between the utility pole and the proposed load center.

**ITEM 813.60**

**ITEM 813.72**

**EQUIPMENT GROUNDING  
GROUND ROD 10 FEET LONG**

To be used for grounding of highway lighting as detailed on the Plans.

**ITEM 813.801**

**POWER SERVICE CONNECTION – I-395NB – CCTV – 2.4**

To be used for making the service connection to MassDOT ITS service meter.

**ITEM 813.81**

**SERVICE CONNECTION (UNDERGROUND)**

To be used for making the service connection to proposed highway lighting load center.

**ITEM 819.752**

**FIELD SITE AND INTEGRATED SYSTEMS TESTING**

To be used for testing MassDOT ITS CCTV systems after relocation.

**ITEM 821.01**

**6 FOOT BRACKET ARM**

To be used for highway lighting mounted on utility poles.

**ITEM 829.**

**ROADSIDE GUIDE SIGN (G) – ALUMINUM PANEL (TYPE B)**

To be used for proposed guide signs with a unit area measuring over 20 SF.

**ITEM 877.1**

**SIGN POST REMOVED AND DISCARDED**

To be used for removal of individual posts (along with their foundation) for existing guide signs to be removed or relocated.

**ITEM 901.3**

**4000 PSI, 1.5 INCH, 565 CEMENT CONCRETE FOR POST FOUNDATION**

To be used for fence post foundations at end posts, for all posts for 48" fencing with railing, and as directed by the Engineer.

**ITEM 904.**

**4000 PSI. 3/4 INCH, 610 CEMENT CONCRETE**

To be used for cast-in-place barrier heel.

**ITEM 970.**

**DAMP-PROOFING**

To be used above cast-in-place concrete barrier heel.

**ITEM 983.**

**DUMPED RIPRAP**

To be used or riprap within proposed stormwater BMP's.

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# **PROJECT UTILITY COORDINATION FORM**

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# Project Utilities Coordination (PUC) Form

CONTACTS AND GENERAL UTILITY INFORMATION

Revision Date: 4/11/2024  
PRINTED

<b>City/Town:</b> Webster	<b>Project File #:</b> 608433	<b>Utility Pole Set:</b> National Grid
<b>Route/Street:</b> I-395 @ Route 16	<b>Resident Engineer:</b> TBD	<b>Scheduled Ad Date:</b> 6/29/2024
<b>Consultant:</b> WSP	<b>Office #:</b> 508-980-7170	<b>Total Poles Relocated:</b> 12 New, 5 R&R, 7 Rem.
<b>Route/Street:</b> I-395 @ Route 16	<b>Mass DOT PM:</b> Greg Frazier	

Utility Company	Contact	Office #	Cell #	Email	Scope, Budget, Duration Submitted		Reimbursement		Notes	Potential for District Initiated Early Relocation *		Utilities On Bridge/Structure		Utilities Underground (UG)/Aerial (OH)	
					Yes	No	Non-Reimb	Reimb		Yes	No	Yes	No	UG	OH
National Grid	Sandra Annis	413-582-424		<a href="mailto:Sandra.Annis@nationalgrid.com">Sandra.Annis@nationalgrid.com</a>	X		X				X		X		X
Charter	John Yurkevicius	774-243-9786		<a href="mailto:john.yurkevicius@charter.com">john.yurkevicius@charter.com</a>	X		X				X		X		X
Verizon	Paul Shyspeck	413-575-7058		<a href="mailto:Paul.M.Shyspeck@verizon.com">Paul.M.Shyspeck@verizon.com</a>	X		X				X		X		X
National Grid Gas	Meliss Owens	781-907-2845		<a href="mailto:Melissa.Owens@nationalgrid.com">Melissa.Owens@nationalgrid.com</a>	X		X				X		X		X
Webster Highway Department	Tom Cutler	508-949-3861 x 1036		<a href="mailto:tcutler@webster-ma.gov">tcutler@webster-ma.gov</a>	n/a	n/a	X		Water main relocation outside of culvert limits is non-participating. All other water main and drainage work is participating.		X		X		X
Webster Fire Department	Brian Hickey	508-949-3875	508-942-8591	<a href="mailto:bhickey@webster-ma.gov">bhickey@webster-ma.gov</a>	n/a	n/a			All the fire alarm wire in Webster is inactive. Webster Fire has an agreement with National Grid Electric to remove it as they replace poles.	n/a	n/a		X		X

**Utility Relocation Notes for MassDOT Contractor**  
 Unless otherwise noted by Contract, the MassDOT Contractor is to provide the District Construction Office with 7 Calendar Days advance notification in order to validate the current progress and provide the required 30 Days advance notice-to-proceed for the first Utility - and each subsequent Utility. These advance notifications are to be identified in the Contractor's Schedules (Pre-Con preparation, Baseline, Subnets, and Updated/Monthly Schedules) as specified in Subsection 8.02 (for DBB Contracts) and/or Section 9 (of DB Contracts). Note: The durations included below do not include these lead-times. See Additional 'Important Basis notes for Contractor' - on last PUC Form page.

Additional notes:

**Suggested Sequence of Relocation (Based on Consultant proposed construction staging)**  
 The sequence as detailed on the following pages is based on the consultants proposed staging plan. This information was compiled through meetings that included all of the utilities listed below along with the designer and the (Town of Webster). The information provided is the best available information prior to project advertisement.

PUC FORM - CONTINUED

Is 'enabling' (prep) work, by the Contractor, necessary prior to the start of the first series of utility relocations:	Yes	No
	X	
Has any of the Utility work been identified to work concurrently	Yes	No
	X	

4/11/2024  
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DESCRIPTION - Utility Relocation Phases, Tasks and Activities

RESPONSIBLE PARTY	C = Contractor U = Utility Co.	DESCRIPTION	Estimated Duration (Work Days) by Utilities (Lead time not included)	Concurrent / Exclusive Utility Work				Access Restraint & Limitations of Operations Notes	
				Exclusion Utility on site	Concurrent Utilities	Contractor Off-Site	Contractor Concurrent	Potential Access Restraint (Yes/No)	Reason/Note (optional)
	C	Enabling work by the Contractor - Coordinate with National Grid Electric for underground work under I-395 and as detailed in the plans. Contractor to layout riser pole locations by survey. Coordinate utility walkthrough and stake proposed pole locations. Ensure tree clearing, tree removal, ledge removal and grading is completed prior to utility pole relocation. NGRID to install manholes and conduit to proposed riser poles per plan. Contractor to install conduit and manholes for Charter Communications to location of proposed riser poles in preparation for utility underground work at I-395. NGRID and Charter underground infrastructure to be installed under short term temporary setups and prior to Stage 1 TTCP, per plans. Pole relocation and underground utility relocation needs to be completed prior to Stage 2 TTCP implementation as existing pole locations would interfere with the proposed TTCP for Stage 2. Verizon underground relocation from proposed manhole at STA 25+75:4LT to the Eastern limits and up Sutton Road to be completed prior to Stage 1 TTCP implementation. Contractor to mark out proposed gas main layout. Contractor to dig test pits to confirm conflicts prior to gas relocation from STA 100+25 to STA 102+00. Culvert Work: Relocate water main under proposed culvert extension and as detailed in plans. Build culvert extension and coordinate proposed location of the Verizon conduit and National Grid Gas Line. NGRID Gas to provide a prefabricated gas main within a sleeve to be placed under the culvert by the Contractor. NGRID Gas will need ample notice prior to installation, and requires personnel on-site during installation. Verizon to install proposed telephone manhole at STA 16+55:4LT and conduit to existing telephone manhole at STA 18+00:4LT to facilitate relocation at the culvert. Relocation of Verizon conduit and NGRID Gas to be completed during Stage 1 TTCP at the culvert.							
Task: 1		<b>UTILITY OPERATIONS</b>							
	U	National Grid							
	U	Civil (Install ~ 145' (2) 5" concrete encased conduit, install ~ 235' (6) 5" concrete encased conduit. Install two 2-way MHS)	10	X				Yes	
	U	Poles and anchors- replacement of 3 poles, installation of 15 poles, installation of 1 push brace (45/3) and installation or replacement of 10 anchors.	30	X			X	No	
	U	Primary conductor (~6.450 477 B AL)	35	X			X	No	
	U	Secondary conductor (~1,860' 1/0 Triplex)	4	X			X	No	
	U	Equipment (Replace 1 transformer, replace 1 cap bank, replace 1 loadbreak, install 2 loadbreaks)	6	X			X	No	
	U	Switching and outages	15	X			X	No	
		<b>Sub-Total</b>	<b>100</b>						
Task: 2		<b>Charter</b>							
	U	Construct stand and set ground rods.	5	X			X	No	
	U	Construct new coax onto new strand.	5	X			X	No	
	U	Pull coax into new Underground conduits	5	X			X	No	
	U	Splice all new coax	4	X			X	No	
	U	Splice amps and activate, swing and replace drops to new coax	3	X			X	No	
	U	Construct new fiber onto new pole line (6)	5	X			X	No	
	U	Pull Fibers into new Underground conduits. (6)	5	X			X	No	
	U	Delash existing fibers and relocate slack for splicing	14	X			X	No	
	U	Prepare/Splice multiple fibers at new locations	14	X			X	No	
	U	Splice multiple fibers - Existing fiber to new fiber (6)	30	X			X	No	
	U	Lash all slack spans	5	X			X	No	
	U	Wreck out fiber and coax throughout project.	5	X			X	No	
		<b>Sub-Total</b>	<b>100</b>						
Task: 3		<b>Verizon</b>							
	U	Contract work to place two (2) manholes, new duct bank over new culvert and riser conduits through Sutton Rd. intersection.	26	X			X	Yes	
	U	Contract work to relocate VZ duct bank from STA 22+68± to STA 23+26±.	6	X			X	No	
	U	Place pole to anchor guy wires on new poles where required.	2	X			X	No	
	U	Place new underground and aerial, copper and fiber cables.	26	X			X	No	
	U	Splice new aerial/riser copper and fiber cables.	76	X			X	No	
	U	Transfer aerial cables and drop wires where possible.	3	X			X	No	
	U	Trimout underground and aerial copper and fiber cables.	27	X			X	No	
	U	Remove copper and fiber cables from duct banks and old poles.	15	X			X	No	
	U	Remove old poles, anchors and pole to anchor guy wires.	6	X			X	No	
		<b>Sub-Total</b>	<b>187</b>						
Task: 4		<b>National Grid Gas</b>							
	U	Install/Backfill/Pave 725 FT of 6-inch Gas Main from STA 17+75 to STA 25+00	15	X			X	No	
	U	Install/Backfill/Pave 125 FT of 6-inch Plastic Gas Main from STA 100+25 to STA 102+00	20	X			X	No	
	U	Install/Backfill/Pave 75 FT of 6-inch Plastic Gas Main Under Culvert from STA 17+00 to STA 17+75	15	X			X	No	
		<b>Sub-Total</b>	<b>50</b>						

IMPORTANT BASIS NOTES - FOR CONTRACTOR



RESPONSIBLE PARTY	DESCRIPTION - Utility Relocation Phases, Tasks and Activities	Estimated Duration (Work Days) by Utilities (Lead time not included)	Concurrent / Exclusive Utility Work				Access Restraint & Limitations of Operations Notes
			Exclusive Utility on site	Concurrent Utilities	Contractor Off-Site	Contractor Concurrent	
C = Contractor			Utility working with no other Utilities in vicinity	Utility working with other Utilities on site	No Contractor physical construction operations on-site (while Utility Contractor and Utility are working on-site - but NOT in the same vicinity	Potential Access Restraint (Yes/No)	Should an AR be considered for the Contractor ?
U = Utility Co.	1	Unless otherwise specified in the MassDOT Construction Contract, or unless specifically noted within this PUC Form, these durations (herein) are based upon the Contractor providing <i>unimpeded access</i> to the Utility company to perform Utility relocations (see Note 5 - Access).					
	2	"Concurrent Utilities" operations noted herein, are to signify those Utility Company operations that can be worked concurrently (e.g. Utility A and Utility B work on-site together) - MassDOT and the Contractor are to prepare NTPs to Utilities accordingly.					
	3	"Potential Access Restraints" noted within this PUC Form are for planning purposes. See MassDOT Contract for Contractual Access Restraints (refer to Subsections 8.02, 8.03, and/or 8.06 for Design Bid Build Contracts and Volume II Section 9 for Design-Build Contracts).					
	4	Utility non-work periods - For planning purposes, the durations above contain some non work days (contingency) for New England conditions (precipitation, high temperatures, low temperatures, snow, ice). Gas line work however, typically has a seasonal restriction and can NOT be installed from 15-November to 15-April. Municipally Owned Electric and Gas Utilities are also restricted from proceeding from 15-November to 15-March. The Contractor shall (and the CTD plan) reflect this calendar restriction within the schedule (unless otherwise note).					
	5	Access - Unless otherwise noted in the Contract, and in addition to the 'enabling' notes above, the Contractor must provide safe and unimpeded access (for trucks, lifts, cranes, etc.) to the Utilities, to allow for the proposed relocation(s) - including but not limited to snow removal, clearing and grubbing, guard rail removal, barrier removal, tree removal, and grading. Any costs associated with these tasks are deemed to be incidental to the project.					
	6	For all MassDOT construction contracts issued after January 2014, the new Utility Coordination/documentation specification is required. This is Section 8.14 in Design-Bid-Build Contracts (see Design-Build index reference for applicable section #).					
	7	Prior to starting any and all enabling work for Utilities, the Contractor is to plan in advance with submittals and approved durations.					
	8	* Potential District Initiated Early Utility Relocation - If noted herein, the District reserves the right to initiate early utility relocation in advance of the Contract NTP. In submitting a bid price and in the development/basis of the Baseline Schedule, the Contractor shall not plan the Work with the potential benefit of any form of 'early utility relocation.' As a requirement of the Baseline submission, unless otherwise noted in this Specification, the earliest that the first Utility company is to receive the 30 days advance notification to mobilize to the site, will be 7 calendar days after the pre-construction meeting and never sooner than 7 days after the Contract NTP.					
	9	It is the Contractor's responsibility to coordinate all Utility relocations, including at the culvert replacement. A feasible Staging Plan is provided in the Bridge Plans which has been developed in collaboration with the Utility companies. Any changes to the construction sequencing shown in the Bridge Plans that require additional utility relocations would require coordination & approval by the Utilities and the adjustment of their force accounts.					

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DOCUMENT A00810

# **MASSDOT HERBICIDE USE REPORT**

# MassDOT Herbicide Use Report

Date Submitted:

Use multiple sheets for multiple application techniques or sites as needed.

Contractor Performing Work:

Project or Contract No:

Town/s:

Associated Route:

Project Description:

Treatment Description:

**Area Treated (as applicable)**

Acres:  Sq Yds:  Miles:

Weeds Targeted:

Gallons Formula Used:

Application Method:

Date/Time Began:

Date/Time End:

**Product Used:**

Name: _____ EPA Reg. No: _____ % Active Ingredient Dry: _____ Liquid: _____ Formulation (dilution rate): _____	Name: _____ EPA Reg. No: _____ % Active Ingredient Dry: _____ Liquid: _____ Formulation (dilution rate): _____	Name: _____ EPA Reg. No: _____ % Active Ingredient Dry: _____ Liquid: _____ Formulation (dilution rate): _____
---	---	---

**Additional products used (surfactants, etc.) or other information:**

**Applicators:**

**License Numbers:**

_____	_____
_____	_____
_____	_____
_____	_____

Upon completion, please submit form to MassDOT District Engineer and Landscape Design Section in Boston office.  
11-16-2017



# WORK ZONE SAFETY

*Temporary Traffic Control*

*Typical Details and  
Massachusetts Guidelines  
for MassDOT, Municipalities,  
Utilities, and Contractors*

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## INTRODUCTION

This guide has been prepared to assist in the planning and installing of temporary traffic controls in maintenance, utility, or short-term construction work areas (work lasting 10 hours or less). This guide serves to assist with the many decisions that must be made for each work site. Special planning for traffic control is necessary on a case by case basis because conditions can vary widely among work locations. **Since this guide cannot cover every situation, representative illustrations covering typical short-term construction, maintenance, and utility operations are presented.**

**All typical traffic control device setups illustrated should be considered as guides.** The traffic control devices that are shown, the arrangement or position of the devices, and the distances prescribed in the tables are based on the Federal Highway Administration's (FHWA) Manual on Uniform Traffic Control Devices (MUTCD) and the Massachusetts Amendments to the MUTCD (MA Amendments), but these illustrations only present minimum standards. The provision of safe work zones for all roadway users and roadway workers affected by these activities is paramount. Traffic controls may be expanded or improved upon whenever deemed necessary. Traffic movement through the work site all traffic control devices shall be periodically observed and inspected at all locations.

If necessary, Part 6 of the MUTCD and the MA Amendments, Chapter 17 (Work Zone Management) of MassDOT's Project Development & Design Guide, and the "Traffic Engineering and Safety Section" of the MassDOT web site: (<https://www.massdot.state.ma.us/highway/Departments/TrafficandSafetyEngineering.aspx>), as well as MassDOT District offices can provide additional guidance, information, and suggestions for work zone setups.

## RESPONSIBILITIES FOR TRAFFIC CONTROL

Short-term construction, maintenance, and utility work on or near the roadway creates a potentially hazardous situation, typically requiring the use of temporary traffic controls. These controls are important to protect both work crews and the road users. It is the responsibility of each maintenance foreman to establish and maintain safe and effective controls.

Usually the supervisor, working with the crew, plans the traffic control procedures for proposed work sites. The foreman is responsible for re-requesting, storing, and maintaining all traffic control devices necessary for their crews.

The foreman is responsible for placing the devices according to these guidelines. They must inspect each installation and observe traffic flow through the area. The foreman is generally authorized to make adjustments to the original installations that, in their judgment, are necessary to improve the control of traffic and establish greater safety.

All necessary traffic control devices must be installed before work begins and properly maintained during the work period. They must also be removed as soon as they are no longer relevant to the roadway conditions.

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In situations such as night time road or lane closures, detours, or other unusual conditions on state highways, the District Traffic Maintenance Engineer (DTME) should be advised. If the DTME is absent, the section foreman shall follow the instructions of the District Maintenance Engineer.

### **TRAFFIC CONTROL DEVICES**

Traffic control devices regulate the movement of road users, warn of unexpected or unusual roadway conditions, and inform them how to maneuver safely through or around the work area. All signs, channelizing devices, barricades, and other miscellaneous traffic control devices should work together to guide traffic safely and efficiently. Common temporary traffic control devices are outlined and described below.

#### **Signs**

Temporary traffic control zone (TTCZ) signs are the primary means of providing information and directions to roadway users. All signs must be retroreflective per MassDOT's latest standard.

Warning signs call attention to unexpected conditions and to situations that might not be readily apparent to road users on or adjacent to a roadway. Warning signs alert road users to conditions that might call for a reduction of speed or an action in the interest of safety and efficient traffic operations. Nearly all warning signs for construction and work areas have black legends and borders on a fluorescent orange background.

Regulatory signs shall be used to inform road users of selected traffic laws or regulations and indicate the applicability of the legal requirements. Regulatory signs typically have black legends and borders on a white background.

#### **Channelizing Devices**

When used properly, traffic cones, reflectorized plastic drums, and barricades guide traffic through the work area along an appropriate travel path. It takes roadway users a certain distance along the roadway to safely move away from the upcoming active work site. These transition distances are based on the following taper length (L) formulas:

$L = WS^2/60$  for speeds of 40 mph or less; or

$L = WS$  for speeds of 45 mph or more; where

- $L$  = minimum length of taper in feet,
- $S$  = posted speed limit or typical travel speed in miles per hour prior to the work, and
- $W$  = width of lane closure in feet.

The spacing of channelizing devices (in feet) is approximately equal to the existing speed of traffic (in mph).

#### **Warning Lights**

Rotating beacons and other flashing lights mounted on work vehicles, signs, or channelizing devices help alert roadway users to the work area. They may also be used to warn roadway users of hazards within the work area. The first 10 drums in any taper shall be equipped with sequential flashing lights.

### **Arrow Boards**

Arrow boards are a special type of sign that are highly visible work zone warning devices. They are particularly effective on highways, where both speed and volume are high. Arrow boards in the non-directional, CAUTION, mode (four corner flashing) may be used to indicate that a shoulder is closed. Arrow boards in the arrow mode shall only be used when a travel lane is dropped on a multi-lane road and one lane of traffic must merge with another. All arrow boards should be located at the beginning of each lane or shoulder closure taper without extending outside of it. Arrow boards shall flash at a rate of 25 to 40 flashes per minute. Arrow boards shall not be used to indicate a lane shift.

### **BASIC REQUIREMENTS**

In every work situation, the temporary traffic control setup must: Give roadway users sufficient advance warning of the work area; advise roadway users of the proper actions to take and travel paths to follow; and provide protection to roadway users, workers, and the work area. These three general requirements can be met as outlined below.

#### **Provide Advance Warning**

Warning devices along the approaches to a work area alert roadway Users to changes to road and operating conditions. Roadway users are usually alerted to these dangers via a sign or series of signs installed in the same order as the roadway user generally would expect to see them on long-term construction projects.

The initial project limit sign is usually a general warning such as "ROAD WORK 1500 FT". Other operational warning signs then provide the roadway user with more specific information about the situation. A minimum of three advance warning signs (the initial project limit sign and two operational warning signs) is recommended when work is located on the traveled way. Warning lights and flags can be used to attract attention to the signs. A highly visible work area helps reinforce the advance warnings.

#### **Advise and Direct Travelers**

Operational warning signs provide information to the road-way user such as the type of work being performed, special conditions to watch for, or actions to take. These include signs such as, SHOULDER WORK, RIGHT LANE CLOSED, DETOUR 500 FT, ROAD CLOSED to THRU TRAFFIC, POLICE OFFICER AHEAD, etc. All of these signs must be located far enough in advance of the work area that the roadway user has sufficient time to react to them appropriately. For projects in Urban Areas, see detail: Typical Device Spacing for minimum sign spacing.

#### **Protect Travelers, Workers, and the Work Area**

The primary protection of any work area is its own visibility. Traffic cones, reflectorized plastic drums, portable breakaway barricades, etc. are used to make the work area visible and separate workers from traffic.

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Other devices, such as flashing lights, flags, delineators, temporary lighting, and portable changeable message signs (PCMS) can be used to provide additional emphasis and visibility.

Workers must protect themselves by being alert to their work situation, wearing safety vests and hard hats, and by facing traffic whenever possible.

Work vehicles can also add protection when they are equipped with truck mounted attenuators, rotating beacons, flashing lights, flashing arrow boards, etc. and are parked between workers and oncoming traffic. However, workers should not position themselves between two closely parked vehicles. No private personal vehicles are allowed within the work site.

### PLANNING GUIDELINES

Decisions regarding selection of work area traffic control devices require a knowledge and understanding of the specifics of each work zone. As there may be vast differences between situations, three main variables need to be considered prior to determining the need for, or the selection of, traffic control devices: 1) location of work, 2) type of roadway, and 3) speed of traffic.

Compiling information about these variables will help with planning a safe work area control. Each of these variables is explained below.

#### Location of Work

The choice of traffic controls needed for a short-term construction, maintenance, or utility operation depends upon the work zone's location. As a general rule, the closer the active work site is to the roadway, the more control devices are needed. Work can take place:

- Away from the shoulder or edge of pavement. No special devices are needed if work is confined to an area 15 or more feet from the edge of the shoulder. A general warning sign, such as ROAD WORK AHEAD, should be used if workers and equipment must occasionally move closer to the roadway.
- On or near the shoulder/ edge of pavement. This area should be signed as if work were on the road itself, since it is part of the roadway users' recovery area. Advance warning and operational signs are needed, as well as channelization devices to direct traffic and keep the work area visible to roadway users.
- On the median of a divided highway. Work in this location may require traffic control in both directions of traffic. Advance warning and channelization devices should be used if the median is narrow.
- On the roadway. This condition requires detailed protection for workers and sufficient warning to roadway users. Advance warning must provide a general message that work is taking place as well as information about specific hazards and specific actions the roadway user must take.

### TYPE OF ROADWAY

The characteristics of the roadway also have an important influence on the selection of work area traffic control. The roadway, itself, may present special hazards. You should plan for maximum protection, using the worst hazard present as your guide to signing the work area. Some general considerations are described below for road conditions.

**One-way roads:** A one-way road requires signage on both sides of the road if it carries two or more lanes in one direction, ensuring roadway users in all lanes are alerted and informed.

#### Two-way roads:

- **Undivided:** Two-way, undivided roads will usually require controls for both directions of traffic. When the active work site is well off the roadway, controls for the opposite lane may be eliminated.
- **Divided:** Work on divided multi-lane roadways can often be handled as work along a one-way road (i.e. signs are provided along both sides of the roadway along the direction affected). If the work is in the median, both directions of traffic must be controlled, and both approaches should be double signed (i.e. have all 3 advance warning signs on both sides of each direction).

### EFFECTS OF SPEED ON WORK ZONES

Speed is an important consideration in the use of work area traffic control devices. As a general rule, the greater the speed of traffic approaching a work area, the greater the size, number, and spacing of control devices.

**Size.** The standard size for most warning signs is 36 x 36 inches on conventional roadways and 48 x 48 inches on freeways and expressways. Signs larger than the standard 36 x 36 inches may be desirable on high-speed conventional roads.

**Position.** Install signs far enough in advance of the work area so the roadway users have time to react to them (see charts associated with diagrams for spacing).

### OTHER FACTORS

**Sight Obstructions.** To ensure safety, work areas must be visible. Assess the placement of the temporary traffic control devices by driving through the area, and determine if the devices can be easily seen and provide sufficient time for roadway users to react in a safe manner. Extra precaution should be enacted in areas where horizontal or vertical curves may obstruct a roadway user's clear view of road activities ahead.

**Police/Flaggers.** It should be noted that the MUTCD does not require police/flaggers for stationary setups. If police/flaggers are used, a police/flagger ahead sign should be used in advance of any point where the police/flagger is stationed to control road users.

## PROCEDURES FOR WORK AREA TRAFFIC CONTROL

### 1. PLAN YOUR WORK

**Inspect** location of work area and its surroundings.

**Analyze:**

- Location of work in relation to the traveled way, intersecting road-ways, driveways, and sight distances;
- Type of roadway and traffic involved; and
- Volume and speed of traffic.

**Meet and discuss** the work and necessary traffic control with the crew.

**Study** representative illustrations in this guide to develop a temporary traffic control plan (TTCP).

**Other Considerations:**

- Base your traffic control plan on the premise that all roadway users are unfamiliar with the area.
- The closer the work area location is to traffic, the more controls are needed.
- Plan for maximum protection.
- Select and inspect the temporary control devices needed (including all warning signs), if they are not in good condition, REPLACE THEM!
- Then collect and transport them to the work site.
- Determine their proper placement.
- Install signs and other traffic control devices prior to allowing personnel or equipment onto the roadway.
- Make sure signs are reflective, accurate, clean, and meet specifications. Completely cover any existing permanent signs that will conflict with the messages of the new work area control signs.

### 2. INSTALLING/REMOVING TEMP. TRAFFIC CONTROL DEVICES

Care must be exercised when installing and removing temporary traffic control (TTC) devices. The traffic control needed to perform the operation safely is dictated by the location on the roadway the operation will occur: in a shoulder or a lane, in the left lane or right, etc. In all cases, installing TTC begins and ends as a mobile operation.

A shadow vehicle with a truck mounted attenuator (TMA) shall be used to protect workers installing and removing TTC devices on all roadways with a posted speed limit of 45 MPH or greater as directed by the engineer. TTC devices shall not be installed or removed from a shadow vehicle with a TMA. TTC devices shall be installed or removed from a work operation vehicle only and a shadow vehicle with a TMA shall be used to protect the workers installing or removing the devices.

## **PROCEDURES FOR WORK AREA TRAFFIC CONTROL (CONT.)**

### **3. INSTALL TRAFFIC CONTROL DEVICES AT WORK SITE FOR LOWER SPEED ( $\leq 40$ MPH) ROADWAYS:**

- 1) All devices shall be installed in order with the flow of traffic.
- 2) Where one direction of traffic is being affected, the first sign installed should be the sign farthest from the work site, and on the same side as the work.
- 3) Where two directions of traffic are affected, install signs for opposing traffic first, starting with the sign farthest from the work area. When signs for opposing traffic have been installed, install signs on the same side as the work area, again beginning with the sign farthest from the active work site.
- 4) Once signs are in place, other traffic control devices shall be installed in the same manner as the signs.

### **FOR HIGHER SPEED ( $\geq 45$ MPH) ROADWAYS:**

- 1) All devices shall be installed in order with the flow of traffic.
- 2) Install all advance warning signs, beginning with the ROAD WORK XXX (W20-1) sign and ending with the END ROAD WORK/DOUBLE FINES END (MA-R2-10E) sign.
- 3) Install all signs beginning with the opposite side which will be closed (for a right lane closure; first, install all signs on the left side (shoulder) and then install all signs on the right side (shoulder). No signs shall be erected on the roadway unless delineated by traffic control devices.
- 4) If required, install shoulder taper as the mobile operation advances.
- 5) Install arrow board on the shoulder prior to the merging taper or as close to the beginning of the merging taper as possible.
- 6) Install channelizing devices to form a merging taper. Use of a shadow vehicle with a TMA during installation is required on roads with speed limits of 45 MPH or greater or as directed by the Engineer.
- 7) Install traffic control devices along the buffer space at the appropriate spacing.
- 8) Continue placing devices along the work space at the appropriate spacing.
- 9) Install devices for the termination area as necessary.
- 10) Place the shadow vehicle with a TMA in advance of the first work crew or hazard approached by motorists. Multiple shadow vehicles may be required based on the number of lane and shoulder closures implemented.

### **4. INSPECT WORK AREA SIGNING AND CONTROL DEVICES**

- 1) Assess the placement of the temporary traffic control devices by driving through the work area. All approaches to the work zone should be checked.
- 2) Ensure roadway users will have sufficient time to read signs and react in a safe manner.

### PROCEDURES FOR WORK AREA TRAFFIC CONTROL (CONT.)

- 3) Check visibility of entire work area. If approaching roadway users can't see the work area well, or if they can't see ahead to traffic that may already be queued on the approach because of the work, additional traffic control devices should be deployed.
- 4) Check to ensure the proper temporary traffic control devices are positioned to protect workers from traffic (where possible).
- 5) Ensure all workers wear safety vests, hard hats, and all other necessary safety equipment. All worker safety gear should be in good condition. All reflective gear should be clean and highly visible in the dark.
- 6) Record in the log book the number and location of all signs and devices.

#### Considerations:

- Work area signs should never be blocked from view or obscured by vegetation, existing signs, or other obstructions.
- Flags, flashing lights, and edge line traffic cones can be used to improve visibility.

### 5. REMOVE TRAFFIC CONTROL DEVICES AT WORK SITE

**All workers and equipment should be clear from work site BEFORE removing signs and other devices.**

#### FOR LOWER SPEED ( $\leq 40$ MPH) ROADWAYS:

- 1) Remove signs and other devices within the delineated area when work is complete.
- 2) Remove other traffic control devices in the reverse order in which they were installed
- 3) Remove signs in the reverse order in which they were installed (i.e. sign closest to the work area to be removed first).
- 4) When the operation is complete, uncover any existing permanent signs covered in Step 2.
- 5) Record in the log book the time at which the signs were removed.

#### FOR HIGHER SPEED ( $\geq 45$ MPH) ROADWAYS:

All TTC devices for a stationary lane closure on a multi-lane roadway, except advance warning signs, should be removed against the flow of traffic in the following sequence:

- 1) Remove the channelizing devices starting from the end of the activity area working back to the widest part of the merging taper.
- 2) A shadow vehicle with TMA shall be positioned to protect workers removing devices and work backwards as the setup is removed from the roadway.



### **PROCEDURES FOR WORK AREA TRAFFIC CONTROL (CONT.)**

- 3) Place the removal vehicle on the shoulder, and remove the channelizing devices from the merging taper by hand onto the work vehicle.
- 4) Remove the arrow board once traffic is clear and it is safe to do so.
- 5) Circle back and moving with the flow of traffic, remove the advance warning signs starting with the opposite side from previous lane closure first.
- 6) At no time shall workers run across the multilane roadway to remove signs on both sides of the road simultaneously.
- 7) Record in the log book the time at which the signs were removed

### **RAMP FACILITIES**

At all times it is necessary to control the on and off-ramp traffic during the installation and breakdown of traffic control devices. Use of temporary traffic slow-downs or rolling roadblocks is recommended to allow for the safety of workers handling temporary traffic control devices on ramp facilities. A shadow vehicle with a TMA shall be used to protect the workers installing or removing the devices. At no time shall the work operation vehicle be used as the shadow vehicle with the TMA.

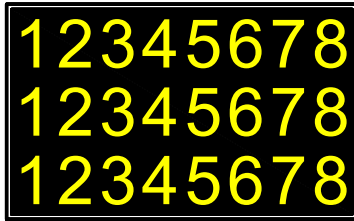
### **USE OF THIS GUIDE**

Illustrations showing minimum standards for short-term construction, maintenance, and utility operations are arranged in this guide by type of operation. The users of this guide should compare all illustrated examples and examine their differences. After gathering information about the work zones using the general guidelines as outlined, proceed as follows:

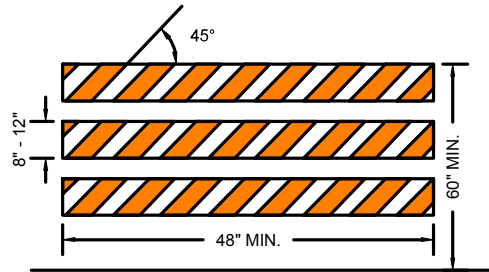
- 1) Turn to the Index. Consider the type of operations and the type of roadway upon which work will occur.
- 2) Select the figure that most closely matches the conditions where you plan to work. Remember that all diagrams represent minimum standards.
- 3) Read the title of the illustration to ensure that it is appropriate to your location. Study the layout of traffic control devices and read all notes.
- 4) Consult the appropriate tables, as directed on each illustration to determine taper length and proper spacing of signs. Notice that distances change when speeds change. Also note that these are guidelines, only, and they must be adapted to your specific work area.
- 5) Use the **“PROCEDURES FOR WORK AREA TRAFFIC CONTROL”** for assistance in completing all necessary steps to provide effective and safe work area traffic control.



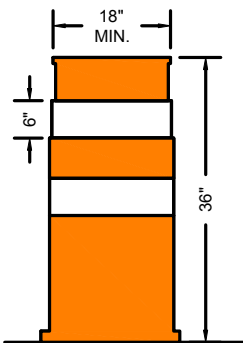
**SIGN**



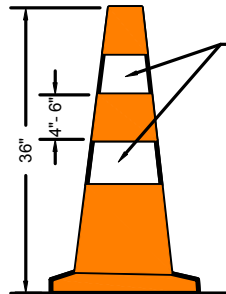
**PORTABLE CHANGEABLE MESSAGE SIGN (PCMS)**



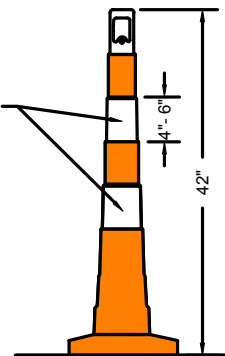
**TYPE III BARRICADE**



**DRUM**

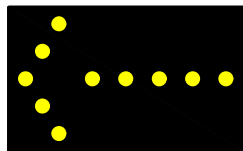


RETROFLECTIVE BANDS

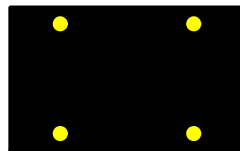


**CONES**

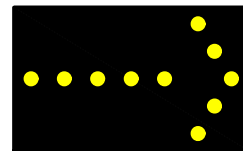
Cones may be used for all daytime operations. For night work, drums should be used to form the taper(s) and cones can be used along the tangent section of the work setup.



LEFT

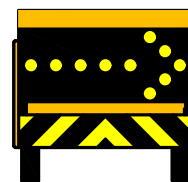


CAUTION



RIGHT

**ARROW BOARD (WITH MODE)**



**TRUCK MOUNTED ATTENUATORS**

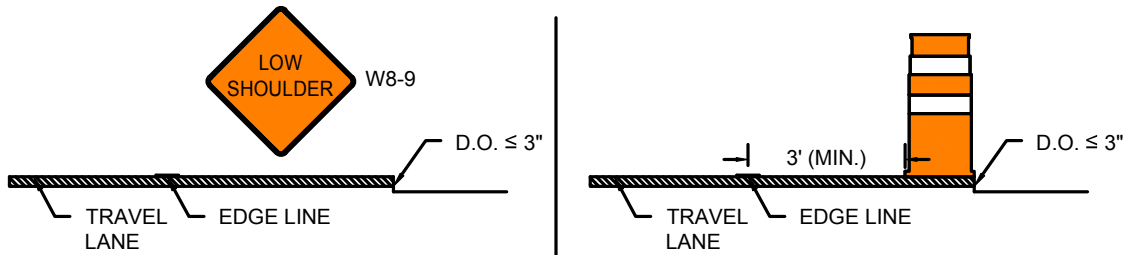
Truck Mounted Attenuators (TMA) shall be positioned between the start of the work area and the end of the designated buffer zone. The TMAs are to be positioned in each temporarily closed lane. This includes shoulders ( $\geq 8$  feet) whether combined with a travel lane closure or being closed alone. These TMA conditions are required on roadways with speeds of 45 MPH or greater. TMAs can be used on other roadways at the discretion of the engineer. TMAs shall be used for the deployment and removal of all traffic control devices, including all advance warning signs.

### SHORT-TERM PAVEMENT EDGE DROP-OFFS

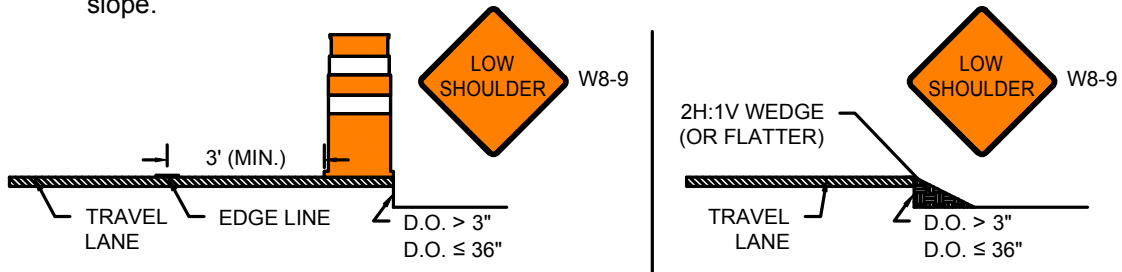
Note that this guidance is adopted from the Roadside Design Guide, 4th Edition.

Pavement drop-offs may occur during paving, excavation, and other construction activities. Drop-offs create hazards for vehicles if not properly mitigated. The following applies for all roads with speed limits greater than 30 mph; for roads with speed limits of 30 mph or less, treatments for pavement edge drop-offs are at the discretion of the Engineer. Drop-offs between adjacent, open travel lanes should not exceed 2", and any drop-off in excess of 3" should not be left unattended without one of these mitigation measures applied.

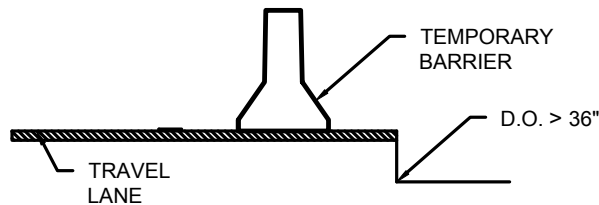
- Shoulder drop-offs 3" or less adjacent to a shoulder or active travel lane should be mitigated by:
  - ✓ A W8-9 (LOW SHOULDER) sign in advance of and at regular intervals throughout the treatment; or
  - ✓ The placement of drums on the traffic side of the drop-off.



- Shoulder drop-offs greater than 3" but less than or equal to 36" should be mitigated by:
  - ✓ A W8-9 (LOW SHOULDER) sign in advance of and at regular intervals throughout the treatment and the placement of drums on the traffic side off the drop-off, offset at least 3' from the travel lane; or
  - ✓ A W8-9 (LOW SHOULDER) sign in advance of and at regular intervals throughout the treatment and the placement of a temporary wedge of material along the face of the drop-off. The wedge should consist of stable material placed on a 2H:1V or flatter slope.



- Shoulder drop-offs greater than 36" must be protected by temporary barrier.



POSTED SPEED LIMIT (MPH)	SPACING FOR ADVANCE WARNING SIGNS (FT) (A,B,C)	CHANNELIZATION DEVICES (DRUMS OR CONES)			
		TRAVEL LANE CLOSURE LENGTH (L) (FT)	BUFFER ZONE LENGTH (FT)	DEVICE SPACING (FT)	MIN # OF DEVICES*
25-40	500 / 500 / 500	320	305	20	55
45-55	500 / 1000 / 1000	660	495	40	40
60-65	1000 / 1600 / 2600	780	645	40	50










\* NUMBER OF DEVICES BASED ON 400 FT WORK ZONE.

MINIMUM SPACING OF ADVANCE WARNING SIGNS FOR URBAN ROADWAYS	
ROAD TYPE	DISTANCE BETWEEN SIGNS
URBAN (LOW SPEED)	100 FT
URBAN (HIGH SPEED)	350 FT

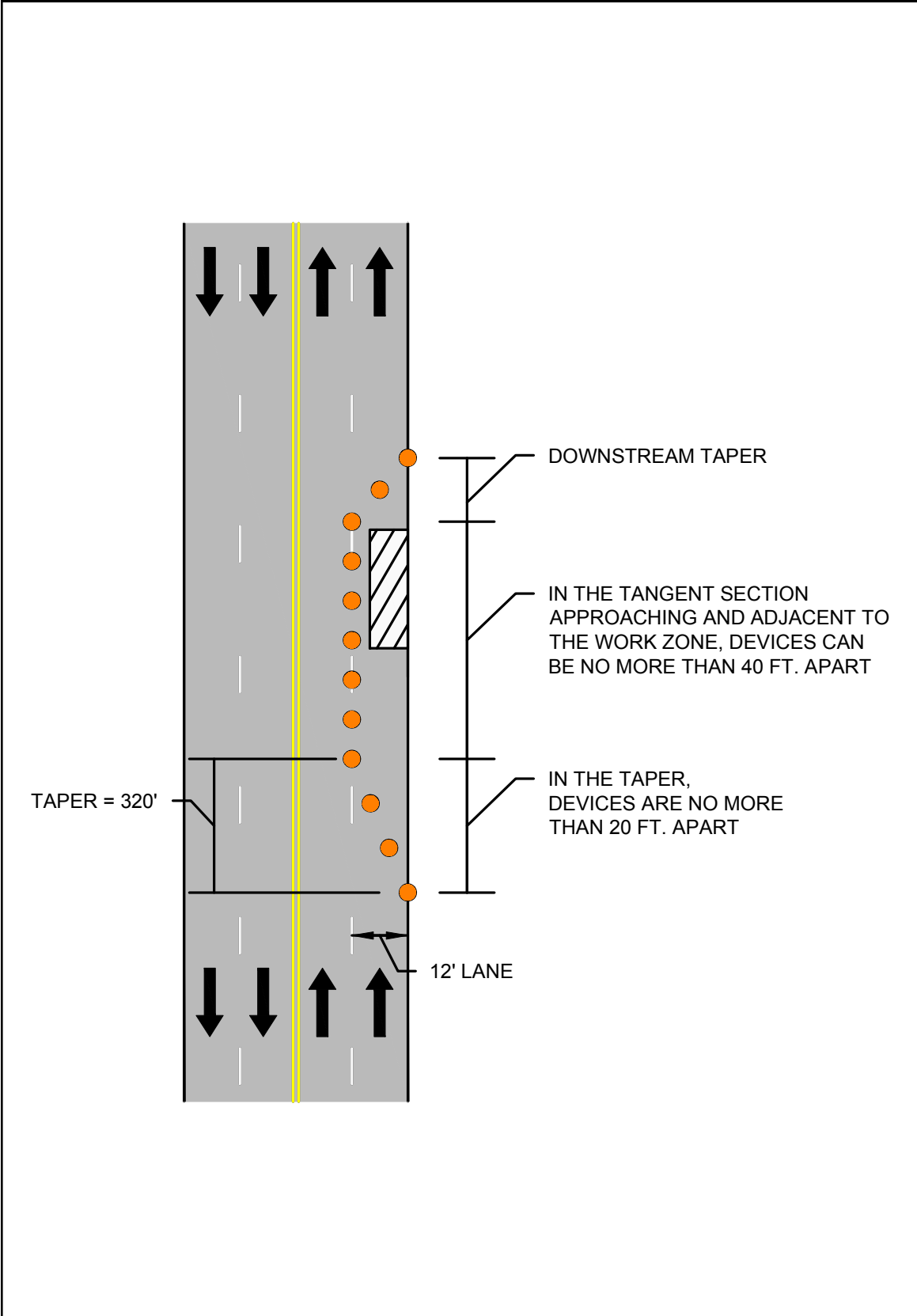
**NOTES**


1. 40 FT = 10 FT PAVEMENT MARKING + 30 FT SKIP

**LEGEND**

-  WORK ZONE
-  CHANNELIZATION DEVICE
-  FLASHING ARROW BOARD
-  PORTABLE CHANGEABLE MESSAGE SIGN
-  TRUCK MOUNTED ATTENUATOR
-  RADAR SPEED FEEDBACK BOARD
-  POLICE DETAIL OR UNIFORMED FLAGGER
-  TEMPORARY PORTABLE RUMBLE STRIP
-  TYPE III BARRICADE

NOT TO SCALE



 <p>PAGE 14</p>	<p>Work Zone Safety Standard Details and Drawings</p>	<p>FLAGGING GUIDANCE</p>
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**Guidance for Flagging Operations**

**NOTE:**

A flagger shall always be aware of their surroundings and have a good escape route. A flagger shall never be positioned directly beside or against construction equipment. When a flagger is required to direct traffic in an area where the escape route is partially blocked by a traversable obstruction such as a guardrail, the flagger shall be physically capable of traversing that obstruction. Prior to commencing a project, the supervisor in charge shall review the project, including guardrail areas, for safe flagging stations. The supervisor in charge shall clearly communicate with the flagger(s), indicating any locations where they cannot safely perform their duties.

Each flagger shall be equipped with the following high visibility clothing, signaling, and safety devices:

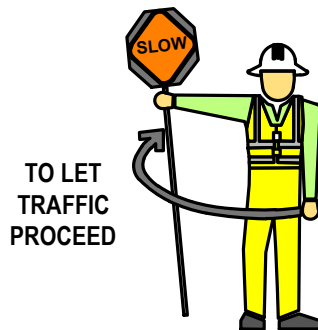
- 1) A white protective hard hat with a minimum level of reflectivity per the requirements of ANSI, Type I, Class E&G;
- 2) A clean, unfaded, untorn lime/yellow reflective safety vest and pants meeting the requirements of ANSI 107 Class 3 with the words "Traffic Control" on the front and rear panels in minimum two (2) inch (50 millimeter) high letters;
- 3) A 24 inch "STOP/SLOW" traffic paddle conforming to the requirements of Part 6E.03 of the Manual on Uniform Traffic Control Devices (MUTCD), a weighted, reflectorized red flag, flagger station advance warning signage, and two-way radios capable of providing clear communication within the work zone between flaggers, the Contractor, and the Engineer. The traffic paddle shall be mounted on a pole of sufficient length to be seven feet above the ground as measured from the bottom of the paddle;
- 4) A working flashlight with a minimum of 15,000 candlepower and a six inch red attachable wand, a whistle with a working lanyard, and a First Aid kit that complies with the requirements of ANSI Z308.1; and
- 5) An industrial/safety type portable air horn that complies with the requirements of the U.S. Coast Guard.

A "STOP/SLOW" paddle should be the primary hand-signaling device. It shall have an octagonal shape on a rigid handle. Flag use should be limited to emergency situations.



**Properly Trained Flaggers**

- Give clear messages to drivers.
- Allow distance for drivers to react.
- Coordinate with other flaggers.
- Use standard signaling methods.



**Properly Equipped Flaggers**

- Use approved stop/slow paddles.
- Use approved safety apparel.
- Use retroreflective equipment.
- Use hand held radios, as needed.
- All flaggers shall wear safety apparel that meets ANSI Class 3 requirements. The combination of vest and pants is required.



**Proper Flagging Stations**

- Good approach sight distance.
- Highly visible to traffic.
- Stand alone away from other machinery and people.
- Stand on right edge of pavement or shoulder- proceed to centerline only when first vehicle has come to stop.
- Have a good escape route.

**Proper Advance Warning Signs**

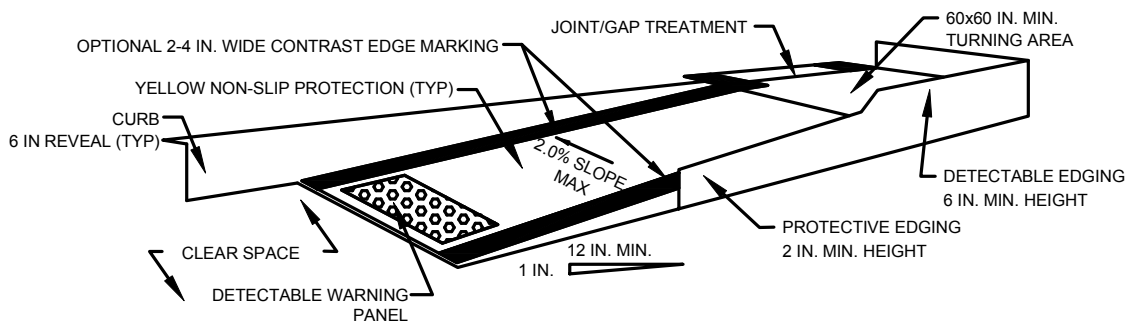
- Always use warning signs.
- Allow for reaction distance from signs.
- Remove signs if no longer necessary or not flagging.
- Use free hand in up-and-down motion to help slow traffic.



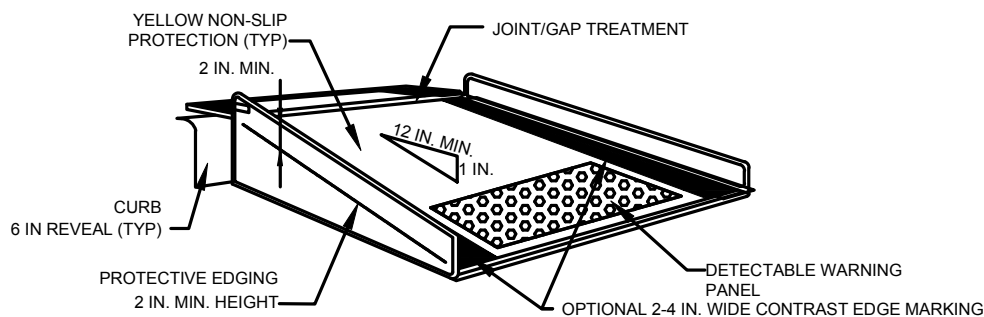
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FIGURE 4  
TYPICAL PEDESTRIAN DEVICES  
(1 OF 2)  
NOT TO SCALE



**TEMPORARY CURB RAMP-PARALLEL TO CURB**

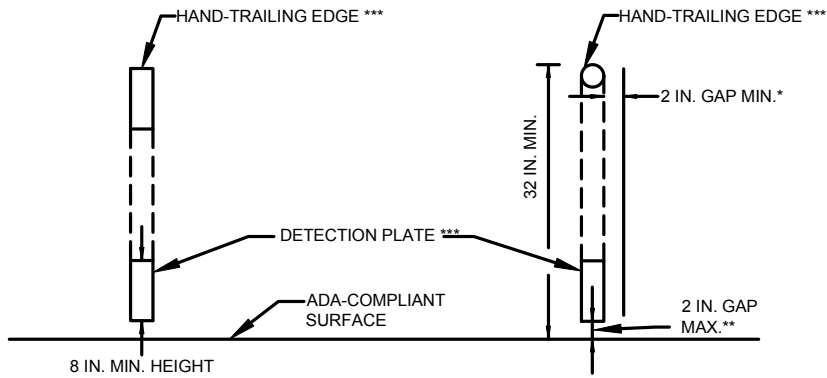


**TEMPORARY CURB RAMP-PERPENDICULAR TO CURB**

**NOTES:**

1. CURB RAMPS SHALL BE 60 IN. MINIMUM WIDTH WITH A FIRM, STABLE, AND NON-SLIP SURFACE.
2. PROTECTIVE EDGING WITH A 2 IN. MINIMUM HEIGHT SHALL BE INSTALLED WHEN THE CURB RAMP OR LANDING PLATFORM HAS A VERTICAL DROP OF 6 IN. OR GREATER OR HAS A SIDE APRON SLOPE STEEPER THAN 1:3 (33%). PROTECTIVE EDGING SHOULD BE CONSIDERED WHEN THE CURB RAMPS OR LANDING PLATFORMS HAVE A VERTICAL DROP OF 3 IN. OR MORE.
3. PROTECTABLE EDGING WITH 6 IN. MINIMUM HEIGHT AND CONTRASTING COLOR SHALL BE INSTALLED ON ALL CURB RAMP LANDINGS WHERE THE WALKWAY CHANGES DIRECTION (TURNS).
4. THE CURB RAMP WALKWAY AND LANDING AREA SURFACE SHALL BE OF A SOLID CONTINUOUS CONTRASTING COLOR ABUTTING UP TO THE EXISTING SIDEWALK.
5. CURB RAMPS AND LANDINGS SHOULD HAVE A 1:50 (2%) MAX CROSS-SLOPE.
6. CLEAR SPACE OF 48x48 IN. MINIMUM SHALL BE PROVIDED ABOVE AND BELOW THE CURB RAMP.
7. WATER FLOW IN THE GUTTER SYSTEM SHALL HAVE MINIMAL RESTRICTION.
8. LATERAL JOINTS OR GAPS BETWEEN SURFACES SHALL BE LESS THAN 0.5 IN. WIDTH.
9. CHANGES BETWEEN SURFACE HEIGHTS SHOULD NOT EXCEED 0.5 IN. LATERAL EDGES SHOULD BE VERTICAL UP TO 0.25 IN. HIGH, AND BEVELED AT 1:2 BETWEEN 0.25 IN. AND 0.5 IN. HEIGHT.
10. IF A TEMPORARY PEDESTRIAN RAMP LEADS TO A CROSSWALK, THEN A DETECTABLE WARNING PAD MUST BE ADHERED TO THE BASE OF THE RAMP. IF IT LEADS TO A PROTECTED PEDESTRIAN BYPASS THAT DOES NOT CONFLICT WITH VEHICULAR TRAFFIC, THEN A PAD SHALL NOT BE INSTALLED ON THE RAMP.

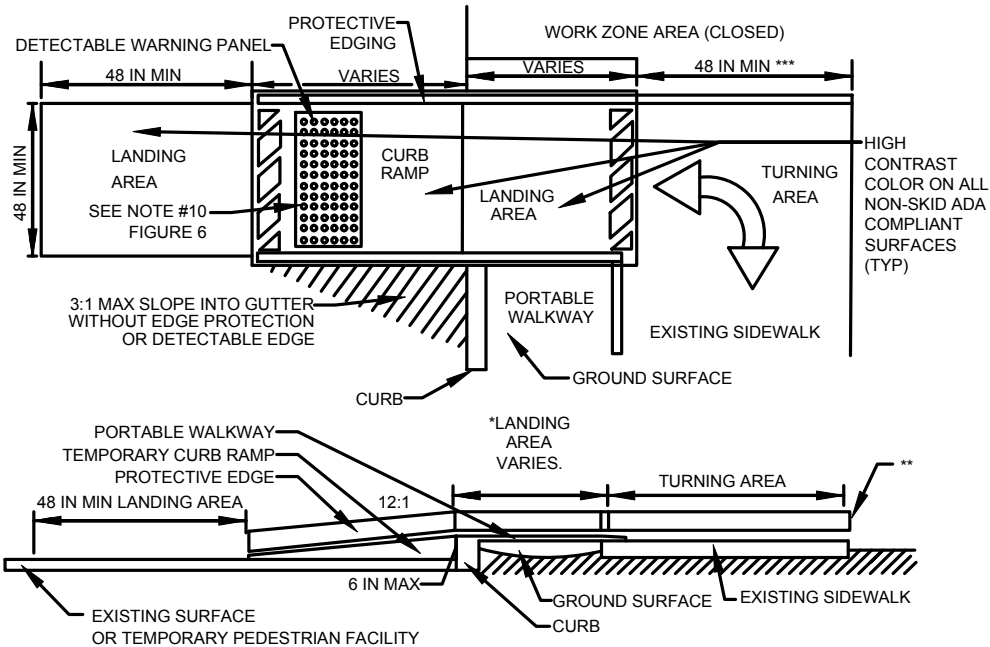




**CROSS SECTION VIEW**


**PEDESTRIAN CHANNELIZING DEVICE**

- \* THERE SHALL BE A 2 INCH GAP BETWEEN THE HAND-TRAILING EDGE AND ITS SUPPORT.
- \*\* A MAXIMUM 2 INCH GAP BETWEEN THE BOTTOM OF THE BOTTOM RAIL AND THE SURFACE MAY BE USED TO PROVIDE DRAINAGE.
- \*\*\* THE HAND-TRAILING EDGE AND DETECTION PLATE SHALL BE CONTINUOUS THROUGHOUT THE LENGTH OF THE PATH SUCH THAT A PEDESTRIAN USER WITH A LONG CANE CAN FOLLOW IT.



**TEMPORARY CURB RAMP**

- \* LANDING AREA USED TO OVERLAP NON-ADA COMPLIANT SURFACES.
- \*\* DETECTABLE EDGE REMOVED IF A CONTINUOUS SIDEWALK.
- \*\*\* 60 IN. IF AN OBSTRUCTION IS AT BACK OF SIDEWALK.

 Massachusetts Department of Transportation Highway Division	Work Zone Safety Standard Details and Drawings	FIGURE 5 TYPICAL PEDESTRIAN DEVICES (2 OF 2) NOT TO SCALE
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STATIONARY OPERATIONS  
TWO LANE UNDIVIDED ROADWAY  
HALF OF ROADWAY CLOSED  
WORK NEAR CURVE










POSTED SPEED LIMIT (MPH)	SPACING FOR ADVANCE WARNING SIGNS (FT) (A,B,C)	CHANNELIZATION DEVICES (DRUMS OR CONES)			
		TRAVEL LANE CLOSURE LENGTH (L) (FT)	BUFFER ZONE LENGTH (FT)	DEVICE SPACING (FT)	MIN # OF DEVICES*
25-40	500 / 500 / 500	50	100	20	30
45-55	500 / 1000 / 1000	100	150	40	20

\* NUMBER OF DEVICES BASED ON 400 FT WORK ZONE.

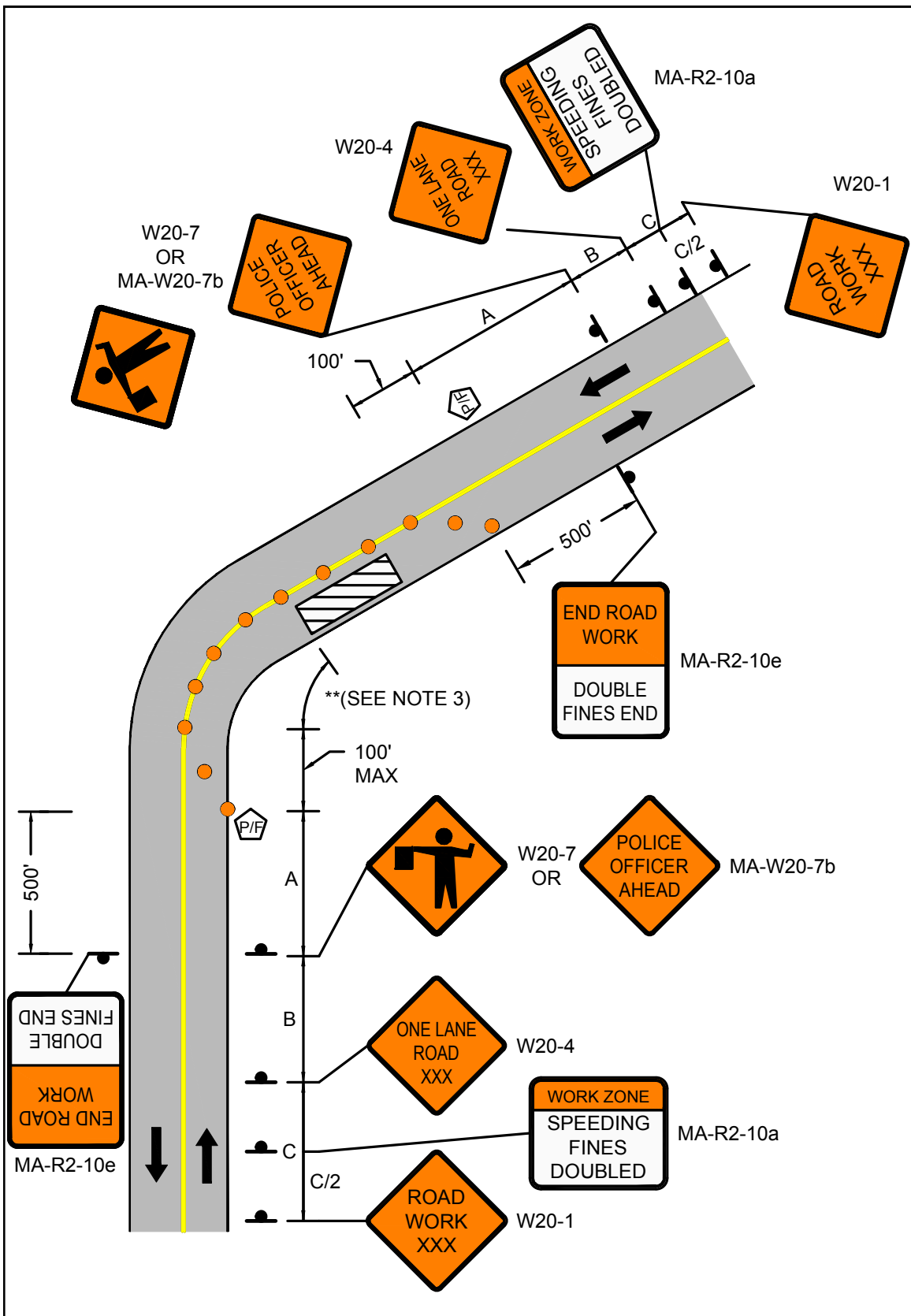
**NOTES**


1. IF POLICE DETAIL/UNIFORMED FLAGGER SUPPORT IS REQUIRED, PROVIDE TWO UNITS.
2. MA-R2-10a LOCATED AT C/2.
3. \*\* = EXTEND ENOUGH SO TAPER IS BEFORE CURVE

**LEGEND**

-  WORK ZONE
-  CHANNELIZATION DEVICE
-  FLASHING ARROW BOARD
-  PORTABLE CHANGEABLE MESSAGE SIGN
-  TRUCK MOUNTED ATTENUATOR
-  RADAR SPEED FEEDBACK BOARD
-  POLICE DETAIL OR UNIFORMED FLAGGER
-  TEMPORARY PORTABLE RUMBLE STRIP
-  TYPE III BARRICADE

NOT TO SCALE



 <p>PAGE 19</p>	<p>Work Zone Safety Standard Details and Drawings</p>	<p>FIGURE 6 STATIONARY OPERATIONS TWO LANE UNDIVIDED ROADWAY HALF OF ROADWAY CLOSED WORK NEAR CURVE</p>
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STATIONARY OPERATIONS  
TWO LANE UNDIVIDED ROADWAY  
HALF OF ROADWAY CLOSED

POSTED SPEED LIMIT (MPH)	SPACING FOR ADVANCE WARNING SIGNS (FT) (A,B,C)	CHANNELIZATION DEVICES (DRUMS OR CONES)			
		TRAVEL LANE CLOSURE LENGTH (L) (FT)	BUFFER ZONE LENGTH (FT)	DEVICE SPACING (FT)	MIN # OF DEVICES*
25-40	500 / 500 / 500	50	100	20	30
45-55	500 / 1000 / 1000	100	150	40	20










\* NUMBER OF DEVICES BASED ON 400 FT WORK ZONE.

POSTED REGULATORY OR WORK ZONE SPEED	SEPARATION BETWEEN RUMBLE STRIPS
36-mph to 55-mph	15-feet
35-mph and under	10-feet

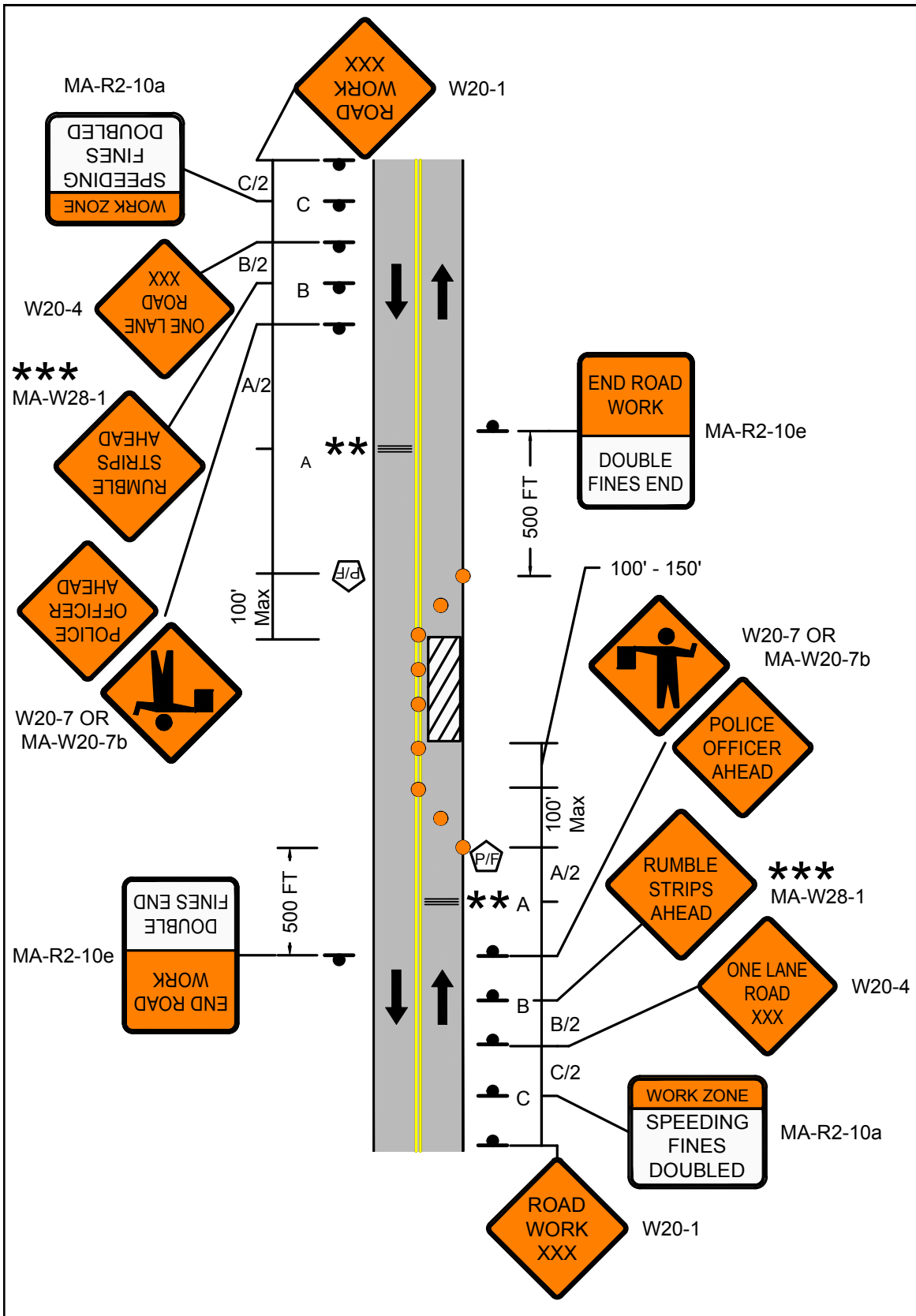
NOTES


1. IF POLICE DETAIL/UNIFORMED FLAGGER SUPPORT IS REQUIRED, PROVIDE TWO UNITS.
2. MA-R2-10a LOCATED AT C/2.
3. \*\* OPTIONAL AT THE ENGINEER'S DISCRETION.
4. \*\*\* SHALL BE DEPLOYED IF RUMBLE STRIPS ARE PRESENT.

LEGEND

-  WORK ZONE
-  CHANNELIZATION DEVICE
-  FLASHING ARROW BOARD
-  PORTABLE CHANGEABLE MESSAGE SIGN
-  TRUCK MOUNTED ATTENUATOR
-  RADAR SPEED FEEDBACK BOARD
-  POLICE DETAIL OR UNIFORMED FLAGGER
-  TEMPORARY PORTABLE RUMBLE STRIP
-  TYPE III BARRICADE

NOT TO SCALE



 <p>PAGE 21</p>	<p>Work Zone Safety Standard Details and Drawings</p>	<p>FIGURE 7 STATIONARY OPERATIONS TWO LANE UNDIVIDED ROADWAY HALF OF ROADWAY CLOSED</p>
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Work Zone Safety  
Standard Details  
and Drawings

STATIONARY OPERATIONS  
TWO LANE UNDIVIDED ROADWAY  
SHOULDER CLOSED










POSTED SPEED LIMIT (MPH)	SPACING FOR ADVANCE WARNING SIGNS (FT) (A,B,C)	CHANNELIZATION DEVICES (DRUMS OR CONES)			
		SHOULDER TAPER LENGTH (L/3) (FT)	BUFFER ZONE LENGTH (FT)	DEVICE SPACING (FT)	MIN # OF DEVICES*
25-40	500 / 500 / 500	110	305	20	45
45-55	500 / 1000 / 1000	220	495	40	30
60-65	1000 / 1600 / 2600	260	645	40	35

\* NUMBER OF DEVICES BASED ON 400 FT WORK ZONE.

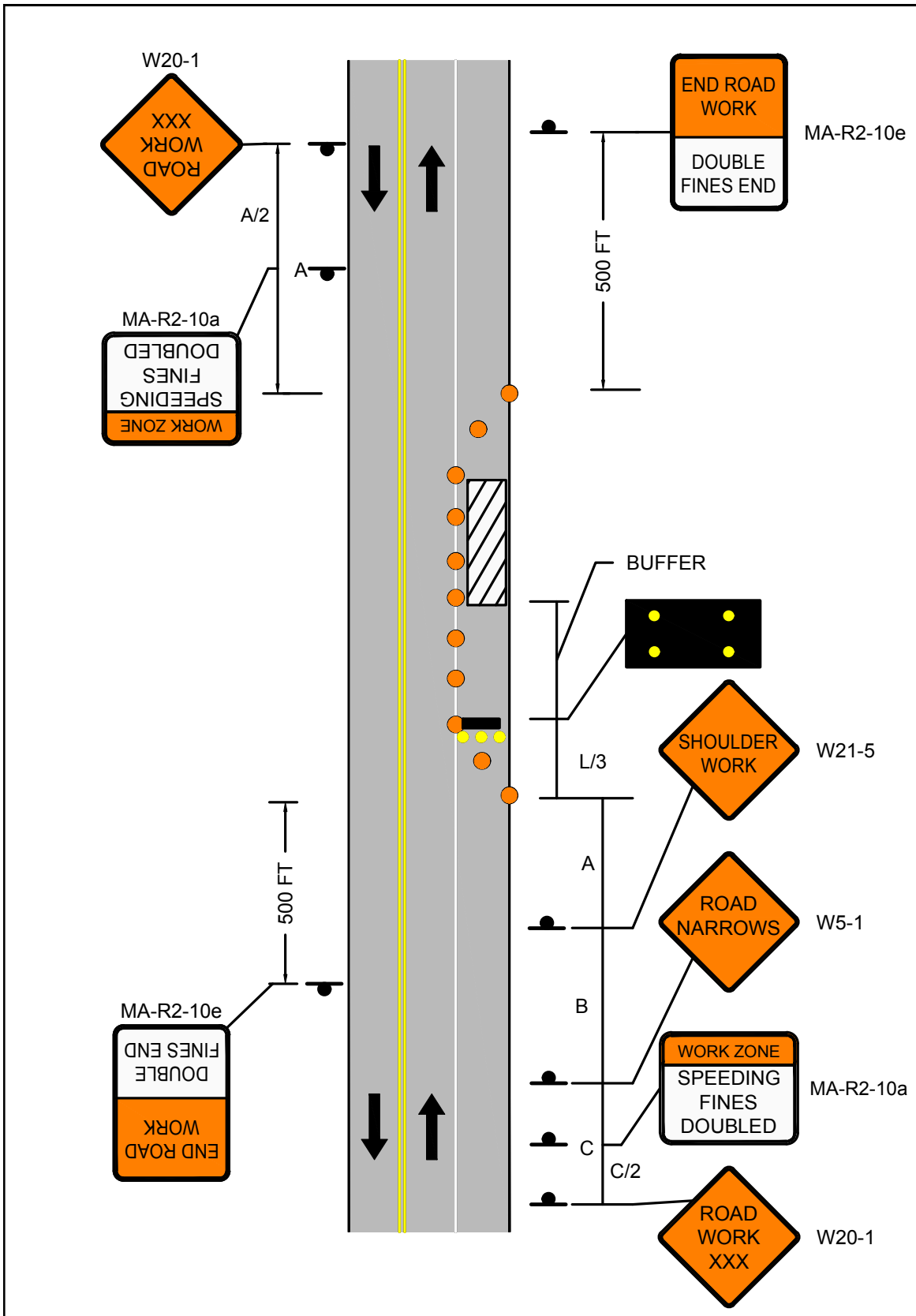
NOTES


1. MA-R2-10a at C/2 and A/2.

LEGEND

-  WORK ZONE
-  CHANNELIZATION DEVICE
-  FLASHING ARROW BOARD
-  PORTABLE CHANGEABLE MESSAGE SIGN
-  TRUCK MOUNTED ATTENUATOR
-  RADAR SPEED FEEDBACK BOARD
-  POLICE DETAIL OR UNIFORMED FLAGGER
-  TEMPORARY PORTABLE RUMBLE STRIP
-  TYPE III BARRICADE

NOT TO SCALE



 <p>PAGE 23</p>	<p>Work Zone Safety Standard Details and Drawings</p>	<p>FIGURE 8 STATIONARY OPERATIONS TWO LANE UNDIVIDED ROADWAY SHOULDER CLOSED</p>
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STATIONARY OPERATIONS  
TWO LANE UNDIVIDED ROADWAY  
WITH TRAVERSABLE SHOULDER  
HALF OF ROADWAY CLOSED  
MAINTAIN TWO-WAY TRAFFIC

POSTED SPEED LIMIT (MPH)	CHANNELIZATION DEVICES (DRUMS OR CONES)				
	SHOULDER TAPER LENGTH (L/3) (FT)	TRAVEL LANE SHIFT LENGTH (L/2) (FT)	BUFFER ZONE LENGTH (FT)	DEVICE SPACING (FT)	MIN # OF DEVICES*
25-40	110	160	305	20	125
45-55	220	330	495	40	100
60-65	260	390	645	40	115










\* NUMBER OF DEVICES BASED ON 400 FT WORK ZONE.

POSTED SPEED LIMIT (MPH)	SPACING FOR ADVANCE WARNING SIGNS (FT) (A,B,C)
25-40	500 / 500 / 500
45-55	500 / 1000 / 1000
60-65	1000 / 1600 / 2600

**NOTES**

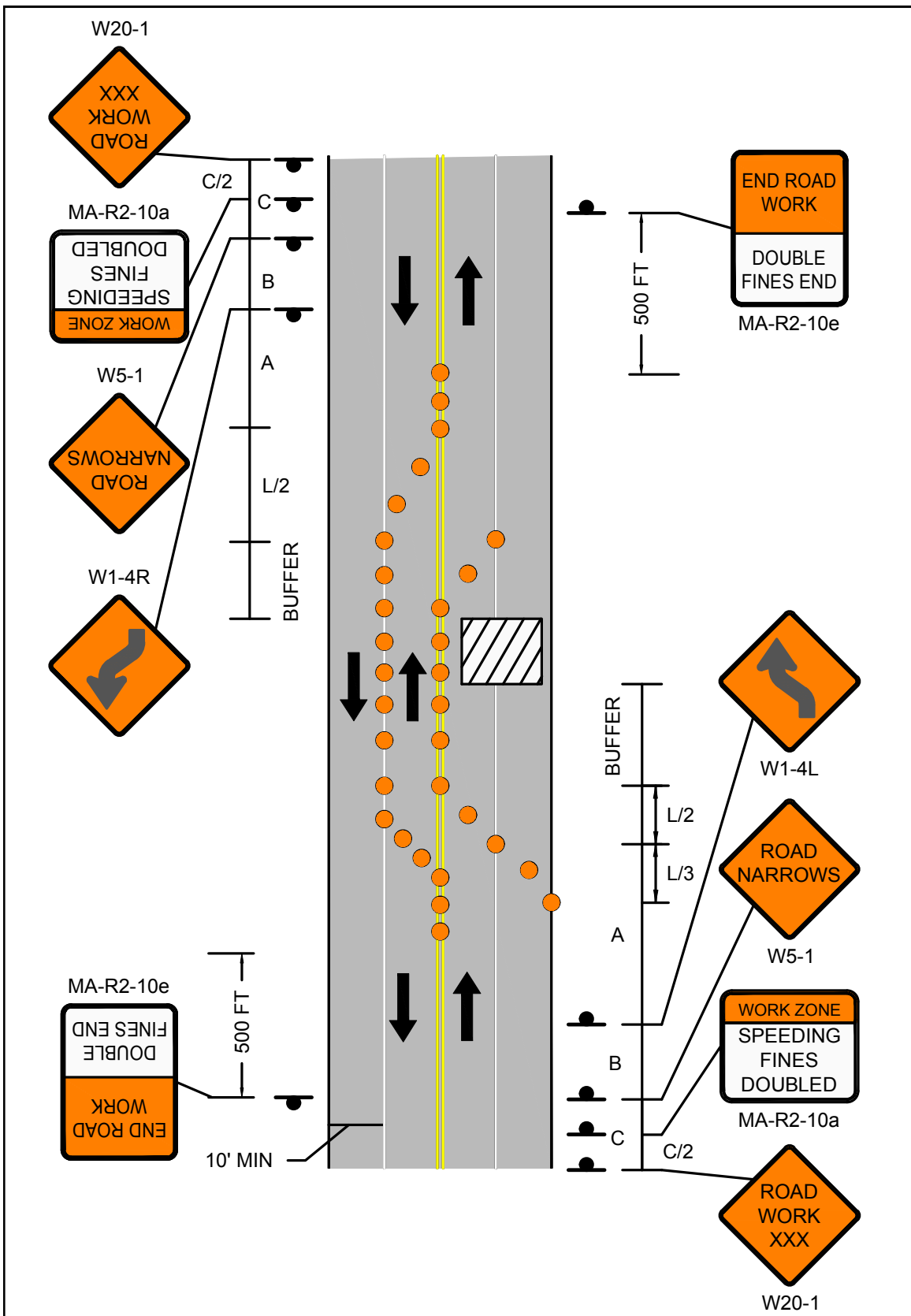
1. MA-R2-10a LOCATED AT C/2.

**LEGEND**

-  WORK ZONE
-  CHANNELIZATION DEVICE
-  FLASHING ARROW BOARD
-  PORTABLE CHANGEABLE MESSAGE SIGN
-  TRUCK MOUNTED ATTENUATOR
-  RADAR SPEED FEEDBACK BOARD
-  POLICE DETAIL OR UNIFORMED FLAGGER
-  TEMPORARY PORTABLE RUMBLE STRIP
-  TYPE III BARRICADE


NOT TO SCALE





**FIGURE 9**  
**STATIONARY OPERATIONS**  
**TWO LANE UNDIVIDED ROADWAY**  
**WITH TRAVERSABLE SHOULDER**  
**HALF OF ROADWAY CLOSED**  
**MAINTAIN TWO-WAY TRAFFIC**



 <p>Massachusetts Department of Transportation Highway Division</p> <p>PAGE 26</p>	<p>Work Zone Safety Standard Details and Drawings</p>	<p>STATIONARY OPERATIONS FOUR LANE UNDIVIDED ROADWAY RIGHT LANE CLOSED</p>
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POSTED SPEED LIMIT (MPH)	CHANNELATION DEVICES (DRUMS OR CONES)				
	SHOULDER TAPER LENGTH (L/3) (FT)	TRAVEL LANE CLOSURE LENGTH (L) (FT)	BUFFER ZONE LENGTH (FT)	DEVICE SPACING (FT)	MIN # OF DEVICES*
25-40	110	320	305	20	60
45-55	220	660	495	40	50
60-65	260	780	645	40	55










\* NUMBER OF DEVICES BASED ON 400 FT WORK ZONE.

POSTED SPEED LIMIT (MPH)	SPACING FOR ADVANCE WARNING SIGNS (FT) (A,B,C)
25-40	500 / 500 / 500
45-55	500 / 1000 / 1000
60-65	1000 / 1600 / 2600

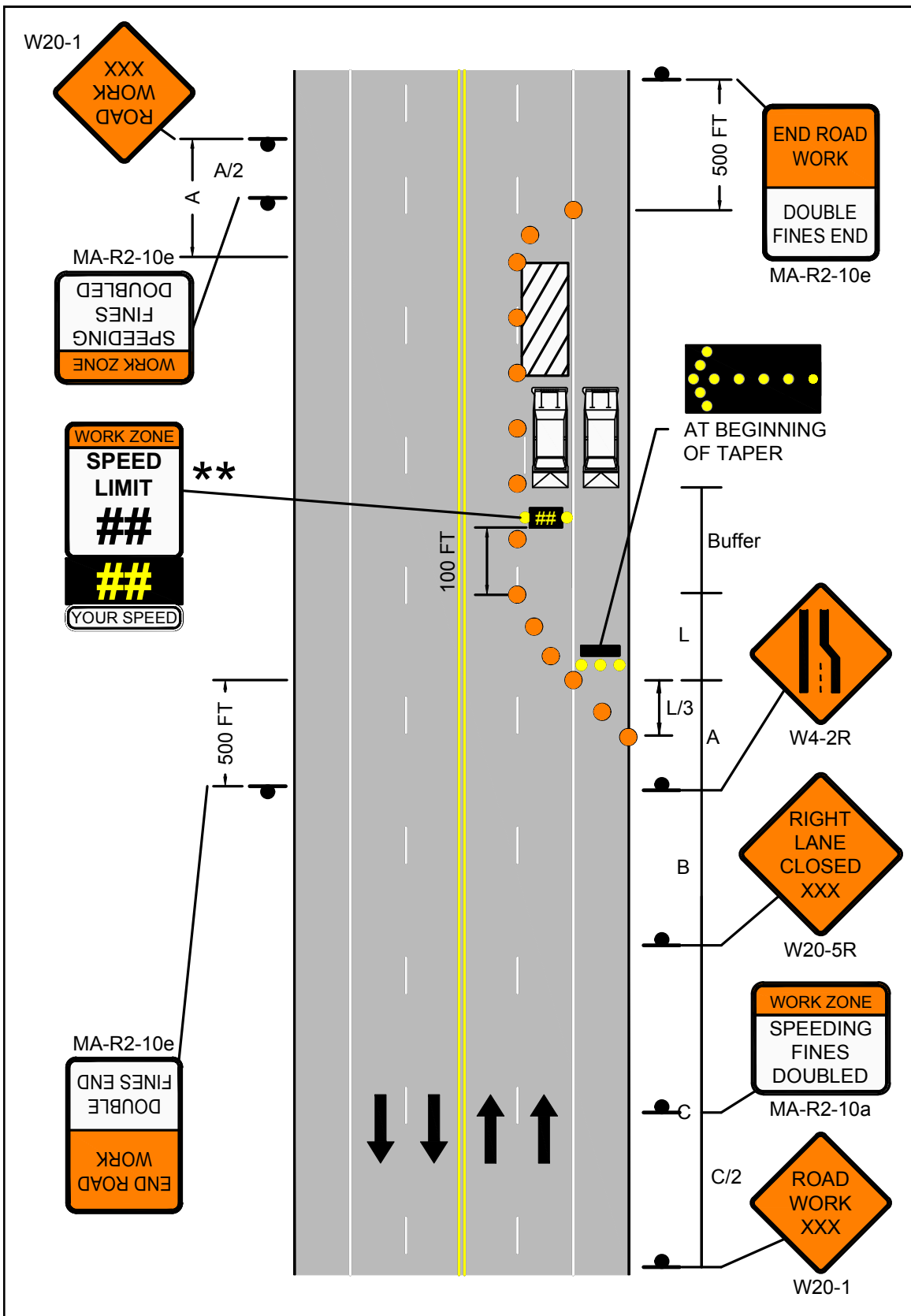
**NOTES**


1. MA-R2-10a LOCATED AT A/2 AND C/2.
2. \*\*OPTIONAL AT THE ENGINEER'S DISCRETION.

**LEGEND**

-  WORK ZONE
-  CHANNELIZATION DEVICE
-  FLASHING ARROW BOARD
-  PORTABLE CHANGEABLE MESSAGE SIGN
-  TRUCK MOUNTED ATTENUATOR
-  RADAR SPEED FEEDBACK BOARD
-  POLICE DETAIL OR UNIFORMED FLAGGER
-  TEMPORARY PORTABLE RUMBLE STRIP
-  TYPE III BARRICADE

NOT TO SCALE



 <p>PAGE 27</p>	<p>Work Zone Safety Standard Details and Drawings</p>	<p>FIGURE 10 STATIONARY OPERATIONS FOUR LANE UNDIVIDED ROADWAY RIGHT LANE CLOSED</p>
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Work Zone Safety  
Standard Details  
and Drawings

STATIONARY OPERATIONS  
FOUR LANE UNDIVIDED ROADWAY  
LEFT LANE CLOSED










POSTED SPEED LIMIT (MPH)	SPACING FOR ADVANCE WARNING SIGNS (FT) (A,B,C)	CHANNELIZATION DEVICES (DRUMS OR CONES)			
		TRAVEL LANE CLOSURE LENGTH (L) (FT)	BUFFER ZONE LENGTH (FT)	DEVICE SPACING (FT)	MIN # OF DEVICES*
25-40	500 / 500 / 500	320	305	20	105
45-55	500 / 1000 / 1000	660	495	40	80
60-65	1000 / 1600 / 2600	780	645	40	100

\* NUMBER OF DEVICES BASED ON 400 FT WORK ZONE.

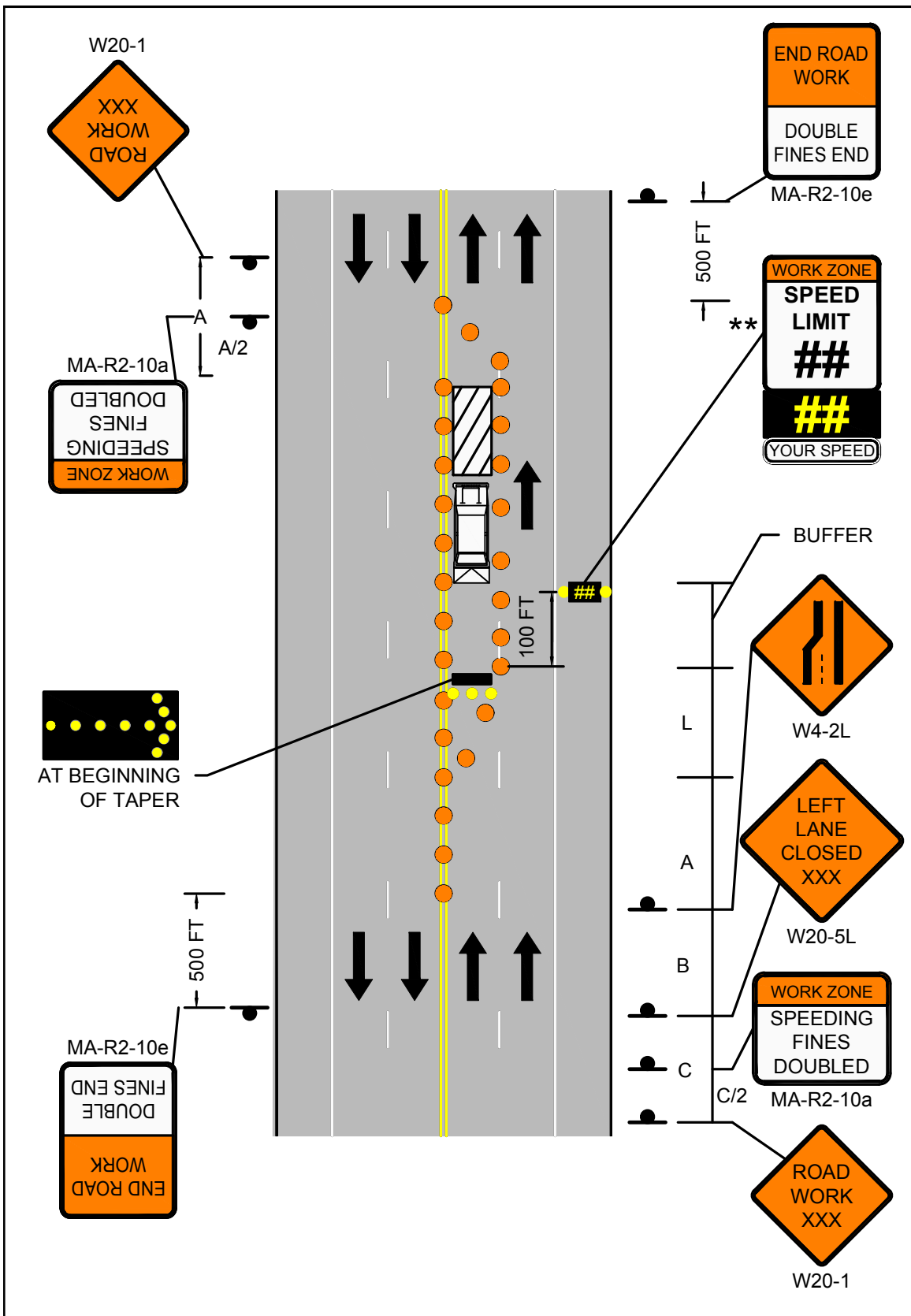
NOTES


1. MA-R2-10a LOCATED AT A/2 AND C/2.
2. \*\*OPTIONAL AT THE ENGINEER'S DISCRETION. 2' OFFSET FROM EDGE OF TRAVEL LANE TO RADAR SPEED FEEDBACK BOARD IS REQUIRED. BOARD MAY BE MOVED FULLY OR PARTIALLY OFF PAVED SHOULDER, IF REQUIRED.

LEGEND

-  WORK ZONE
-  CHANNELIZATION DEVICE
-  FLASHING ARROW BOARD
-  PORTABLE CHANGEABLE MESSAGE SIGN
-  TRUCK MOUNTED ATTENUATOR
-  RADAR SPEED FEEDBACK BOARD
-  POLICE DETAIL OR UNIFORMED FLAGGER
-  TEMPORARY PORTABLE RUMBLE STRIP
-  TYPE III BARRICADE

NOT TO SCALE



 <p>PAGE 29</p>	<p>Work Zone Safety Standard Details and Drawings</p>	<p>FIGURE 11 STATIONARY OPERATIONS FOUR LANE UNDIVIDED ROADWAY LEFT LANE CLOSED</p>
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Work Zone Safety  
Standard Details  
and Drawings

STATIONARY OPERATIONS  
FOUR LANE UNDIVIDED ROADWAY  
HALF OF ROADWAY CLOSED

POSTED SPEED LIMIT (MPH)	CHANNELIZATION DEVICES (DRUMS OR CONES)					
	SHOULDER TAPER LENGTH (L/3) (FT)	TRAVEL LANE CLOSURE LENGTH (L) (FT)	TRAVEL LANE SHIFT LENGTH (L/2) (FT)	BUFFER ZONE LENGTH (FT)	DEVICE SPACING (FT)	MIN # OF DEVICES*
25-40	110	320	160	305	20	140
45-55	220	660	330	495	40	120
60-65	260	780	390	645	40	140










\* NUMBER OF DEVICES BASED ON 400 FT WORK ZONE.

POSTED SPEED LIMIT (MPH)	SPACING FOR ADVANCE WARNING SIGNS (FT) (A,B,C)
25-40	500 / 500 / 500
45-55	500 / 1000 / 1000
60-65	1000 / 1600 / 2600

**NOTES**

1. MA-R2-10a LOCATED AT C/2.
2. \*\*OPTIONAL AT THE ENGINEER'S DISCRETION.
3. W1-4L SHALL BE PLACED AT THE MIDDLE OF THE TANGENT.

**LEGEND**

-  WORK ZONE
-  CHANNELIZATION DEVICE
-  FLASHING ARROW BOARD
-  PORTABLE CHANGEABLE MESSAGE SIGN
-  TRUCK MOUNTED ATTENUATOR
-  RADAR SPEED FEEDBACK BOARD
-  POLICE DETAIL OR UNIFORMED FLAGGER
-  TEMPORARY PORTABLE RUMBLE STRIP
-  TYPE III BARRICADE

NOT TO SCALE

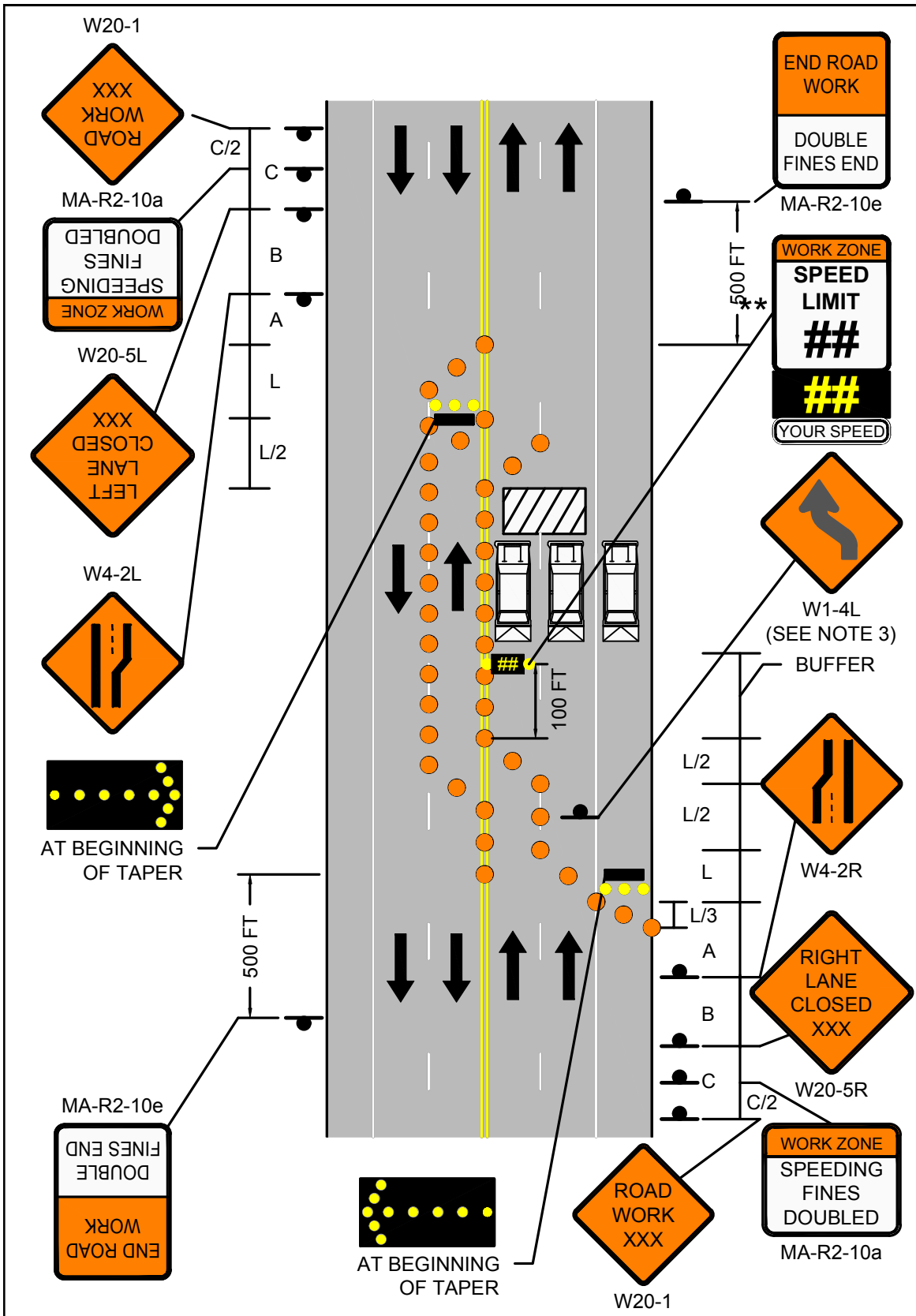


FIGURE 12  
STATIONARY OPERATIONS  
FOUR LANE UNDIVIDED ROADWAY  
HALF OF ROADWAY CLOSED





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Work Zone Safety  
Standard Details  
and Drawings

STATIONARY OPERATIONS  
MULTILANE DIVIDED ROADWAY  
RIGHT LANE CLOSED

POSTED SPEED LIMIT (MPH)	CHANNELIZATION DEVICES (DRUMS OR CONES)				
	SHOULDER TAPER LENGTH (L/3) (FT)	TRAVEL LANE CLOSURE LENGTH (L) (FT)	BUFFER ZONE LENGTH (FT)	DEVICE SPACING (FT)	MIN # OF DEVICES*
25-40	110	320	305	20	60
45-55	220	660	495	40	50
60-65	260	780	645	40	55










\* NUMBER OF DEVICES BASED ON 400 FT WORK ZONE.

POSTED SPEED LIMIT (MPH)	SPACING FOR ADVANCE WARNING SIGNS (FT) (A,B,C)
25-40	500 / 500 / 500
45-55	500 / 1000 / 1000
60-65	1000 / 1600 / 2600

**NOTES**

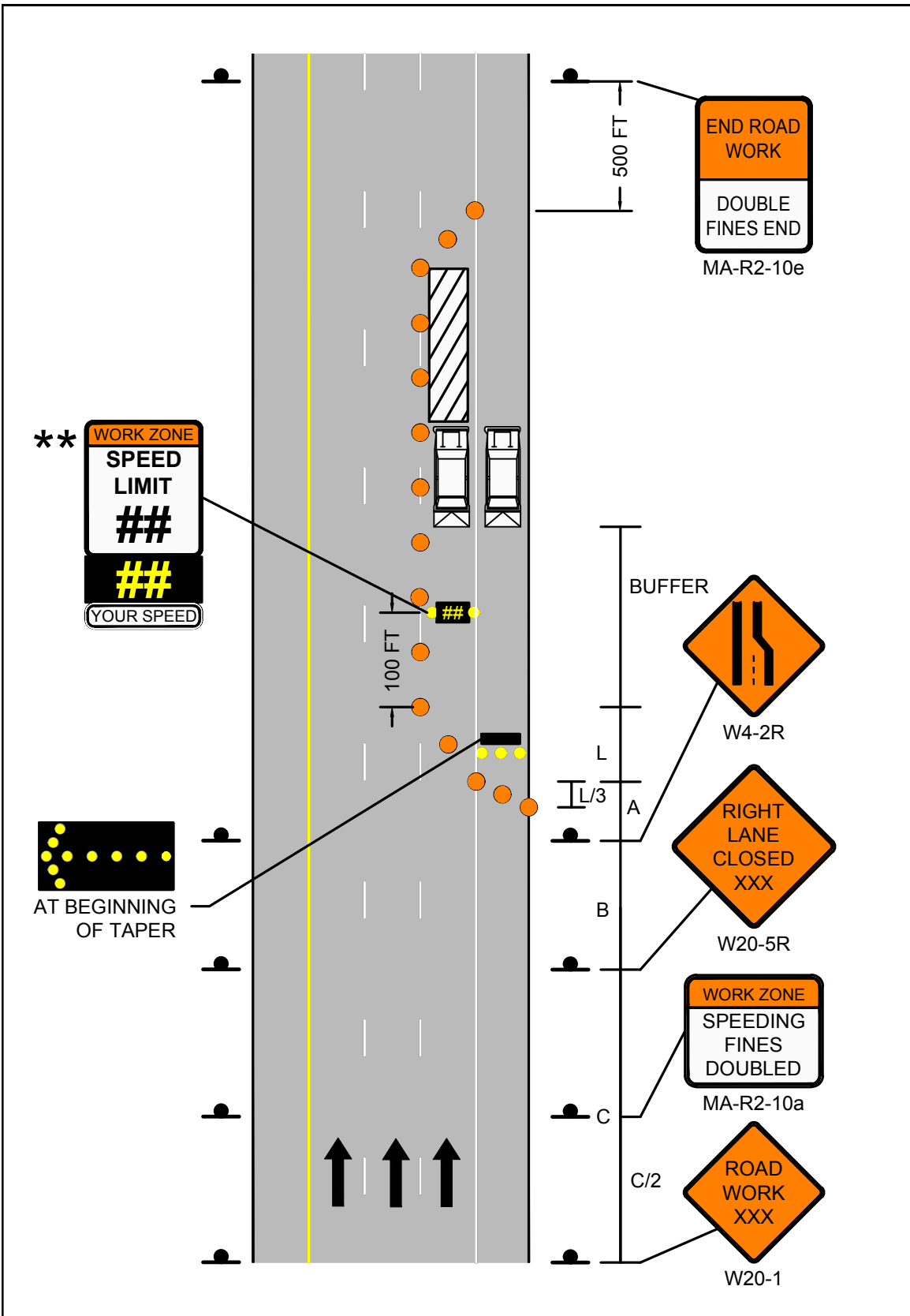
1. MA-R2-10a LOCATED AT C/2.
2. \*\*OPTIONAL AT THE ENGINEER'S DISCRETION.

**LEGEND**

-  WORK ZONE
-  CHANNELIZATION DEVICE
-  FLASHING ARROW BOARD
-  PORTABLE CHANGEABLE MESSAGE SIGN
-  TRUCK MOUNTED ATTENUATOR
-  RADAR SPEED FEEDBACK BOARD
-  POLICE DETAIL OR UNIFORMED FLAGGER
-  TEMPORARY PORTABLE RUMBLE STRIP
-  TYPE III BARRICADE

NOT TO SCALE







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Work Zone Safety  
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STATIONARY OPERATIONS  
MULTILANE DIVIDED ROADWAY  
LEFT LANE CLOSED

POSTED SPEED LIMIT (MPH)	CHANNELIZATION DEVICES (DRUMS OR CONES)				
	SHOULDER TAPER LENGTH (L/3) (FT)	TRAVEL LANE CLOSURE LENGTH (L) (FT)	BUFFER ZONE LENGTH (FT)	DEVICE SPACING (FT)	MIN # OF DEVICES*
25-40	110	320	305	20	60
45-55	220	660	495	40	50
60-65	260	780	645	40	55










\* NUMBER OF DEVICES BASED ON 400 FT WORK ZONE.

POSTED SPEED LIMIT (MPH)	SPACING FOR ADVANCE WARNING SIGNS (FT) (A,B,C)
25-40	500 / 500 / 500
45-55	500 / 1000 / 1000
60-65	1000 / 1600 / 2600

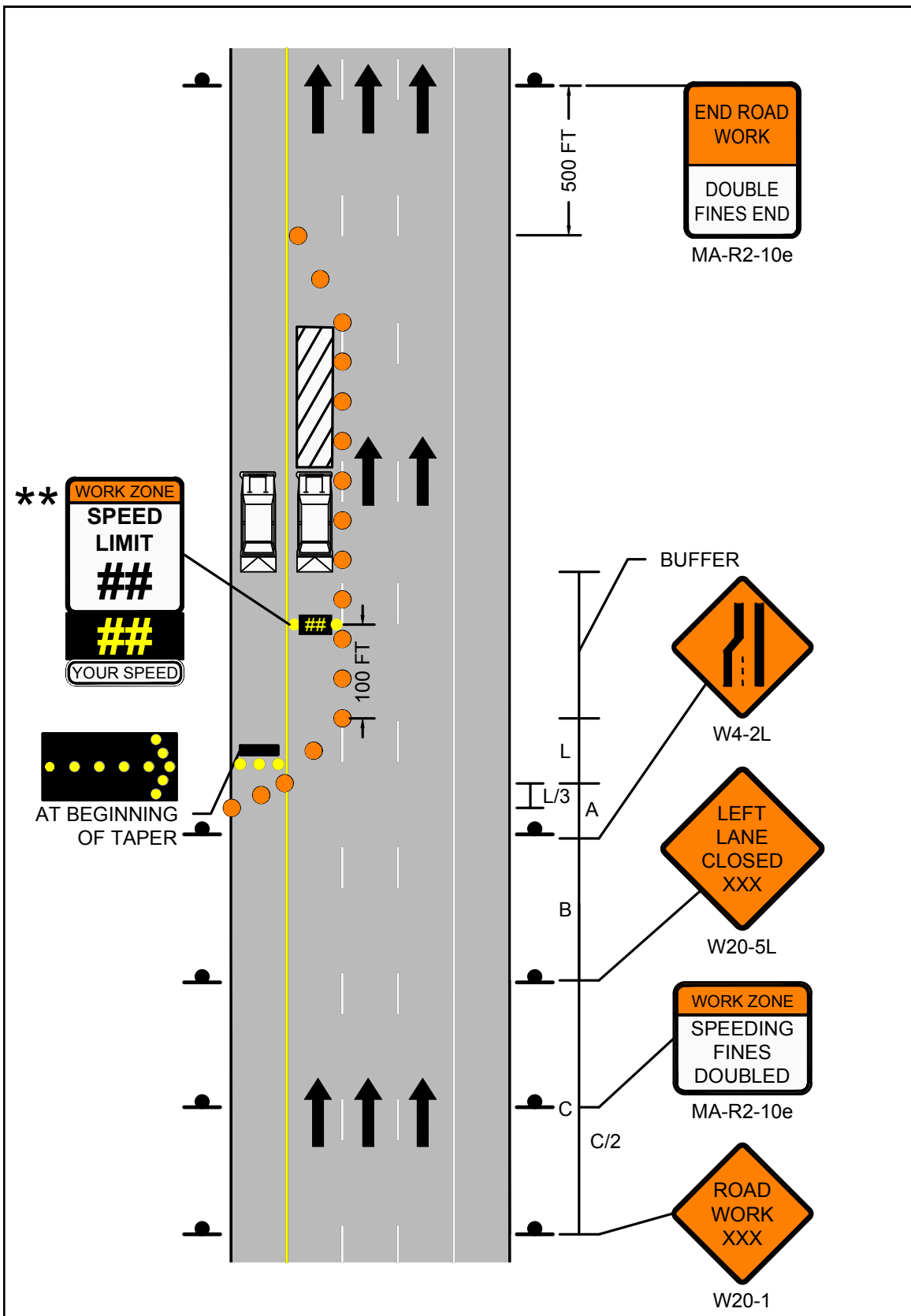
**NOTES**


1. MA-R2-10a LOCATED AT C/2.
2. \*\*OPTIONAL AT THE ENGINEER'S DISCRETION.

**LEGEND**

-  WORK ZONE
-  CHANNELIZATION DEVICE
-  FLASHING ARROW BOARD
-  PORTABLE CHANGEABLE MESSAGE SIGN
-  TRUCK MOUNTED ATTENUATOR
-  RADAR SPEED FEEDBACK BOARD
-  POLICE DETAIL OR UNIFORMED FLAGGER
-  TEMPORARY PORTABLE RUMBLE STRIP
-  TYPE III BARRICADE

NOT TO SCALE



 <p>Massachusetts Department of Transportation Highway Division</p> <p>PAGE 36</p>	<p>Work Zone Safety Standard Details and Drawings</p>	<p>STATIONARY OPERATIONS MULTILANE DIVIDED ROADWAY CENTER LANE OR RIGHT/CENTER LANES CLOSED</p>
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POSTED SPEED LIMIT (MPH)	CHANNELIZATION DEVICES (DRUMS OR CONES)					
	SHOULDER TAPER LENGTH (L/3) (FT)	TRAVEL LANE CLOSURE LENGTH (L) (FT)	TANGENT LENGTH BETWEEN TAPERS T (FT)	BUFFER ZONE LENGTH (FT)	DEVICE SPACING (FT)	MIN # OF DEVICES*
25-40	110	320	640	305	20	110
45-55	220	660	1320	495	40	100
60-65	260	780	1560	645	40	115










\* NUMBER OF DEVICES BASED ON 400 FT WORK ZONE.

POSTED SPEED LIMIT (MPH)	SPACING FOR ADVANCE WARNING SIGNS (FT) (A,B,C)
25-40	500 / 500 / 500
45-55	500 / 1000 / 1000
60-65	1000 / 1600 / 2600

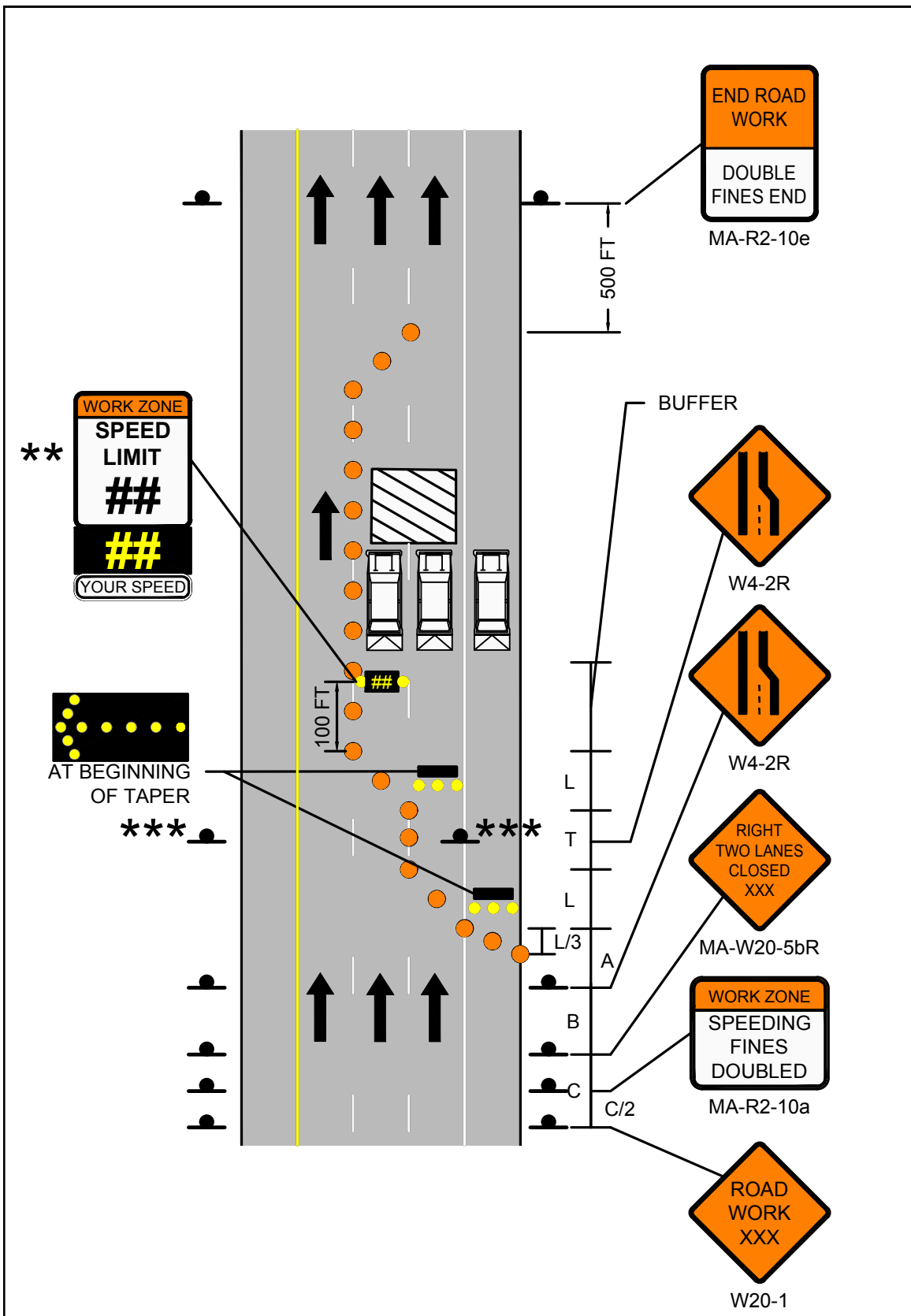
**NOTES**

1. MA-R2-10a LOCATED AT C/2.
2. \*\*\*OPTIONAL AT THE ENGINEER'S DISCRETION.
3. \*\*\*THIS SET OF SIGNS SHALL BE LOCATED AT T/2.

**LEGEND**


-  WORK ZONE
-  CHANNELIZATION DEVICE
-  FLASHING ARROW BOARD
-  PORTABLE CHANGEABLE MESSAGE SIGN
-  TRUCK MOUNTED ATTENUATOR
-  RADAR SPEED FEEDBACK BOARD
-  POLICE DETAIL OR UNIFORMED FLAGGER
-  TEMPORARY PORTABLE RUMBLE STRIP
-  TYPE III BARRICADE

NOT TO SCALE



**FIGURE 15**  
**STATIONARY OPERATIONS**  
**MULTILANE DIVIDED ROADWAY**  
**CENTER LANE OR RIGHT/CENTER**  
**LANES CLOSED**



 <p>PAGE 38</p>	<p>Work Zone Safety Standard Details and Drawings</p>	<p>STATIONARY OPERATIONS MULTILANE DIVIDED ROADWAY CENTER LANE OR LEFT/CENTER LANES CLOSED</p>
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POSTED SPEED LIMIT (MPH)	CHANNELIZATION DEVICES (DRUMS OR CONES)					
	SHOULDER TAPER LENGTH (L/3) (FT)	TRAVEL LANE CLOSURE LENGTH (L) (FT)	TANGENT LENGTH BETWEEN TAPERS T (FT)	BUFFER ZONE LENGTH (FT)	DEVICE SPACING (FT)	MIN # OF DEVICES*
25-40	110	320	640	305	20	110
45-55	220	660	1320	495	40	100
60-65	260	780	1560	645	40	115










\* NUMBER OF DEVICES BASED ON 400 FT WORK ZONE.

POSTED SPEED LIMIT (MPH)	SPACING FOR ADVANCE WARNING SIGNS (FT) (A,B,C)
25-40	500 / 500 / 500
45-55	500 / 1000 / 1000
60-65	1000 / 1600 / 2600

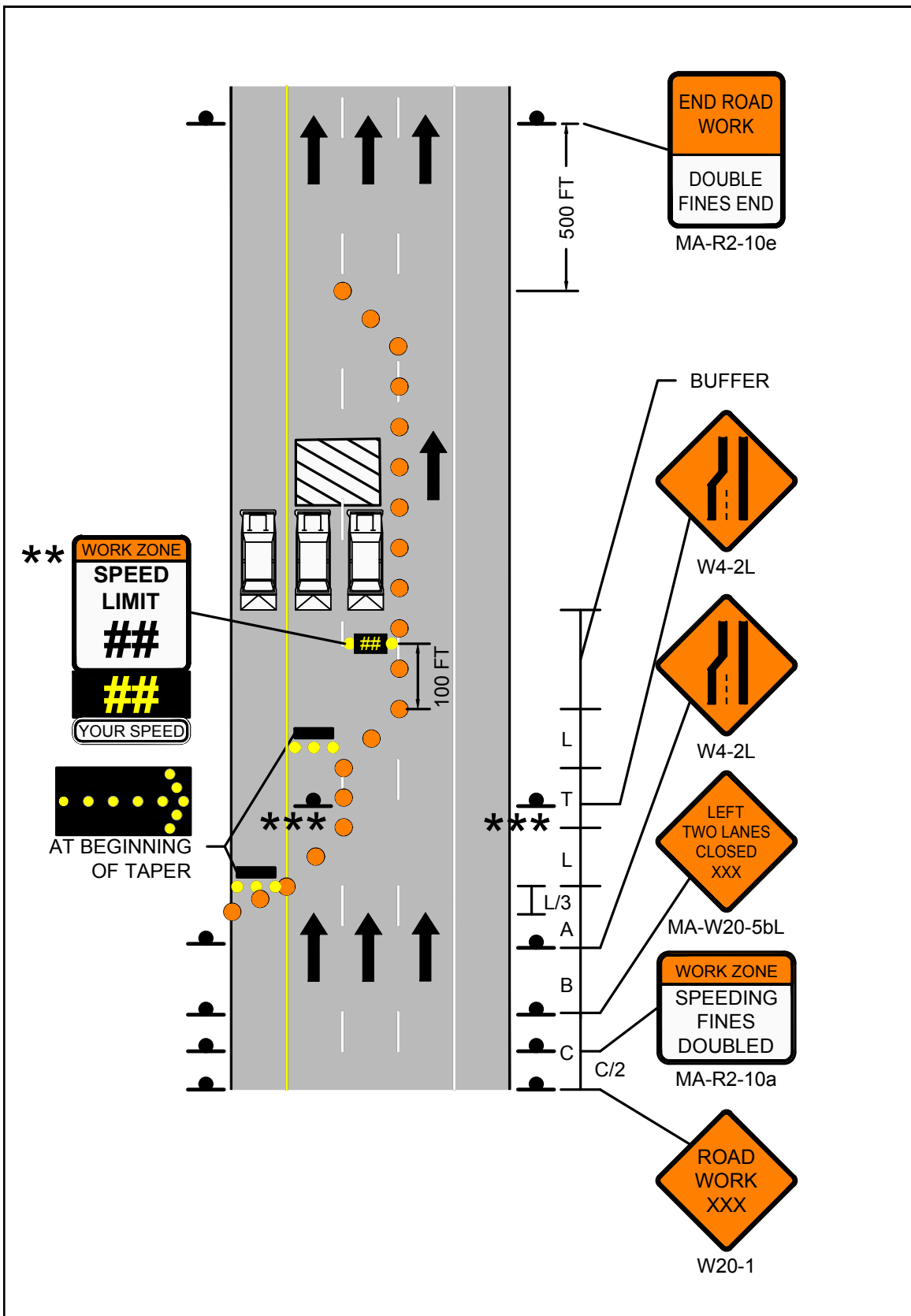
**NOTES**


1. MA-R2-10a LOCATED AT C/2.
2. \*\*\*OPTIONAL AT THE ENGINEER'S DISCRETION.
3. \*\*\*THIS SET OF SIGNS SHALL BE LOCATED AT T/2.

**LEGEND**

-  WORK ZONE
-  CHANNELIZATION DEVICE
-  FLASHING ARROW BOARD
-  PORTABLE CHANGEABLE MESSAGE SIGN
-  TRUCK MOUNTED ATTENUATOR
-  RADAR SPEED FEEDBACK BOARD
-  POLICE DETAIL OR UNIFORMED FLAGGER
-  TEMPORARY PORTABLE RUMBLE STRIP
-  TYPE III BARRICADE

NOT TO SCALE



 <p>Massachusetts Department of Transportation Highway Division</p> <p>PAGE 39</p>	<p>Work Zone Safety Standard Details and Drawings</p>	<p>FIGURE 16 STATIONARY OPERATIONS MULTILANE DIVIDED ROADWAY CENTER LANE OR LEFT/CENTER LANES CLOSED</p>
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Work Zone Safety  
Standard Details  
and Drawings

STATIONARY OPERATIONS  
MULTILANE DIVIDED ROADWAY  
RIGHT SIDE OF OFF RAMP CLOSED










POSTED SPEED LIMIT (MPH)	SPACING FOR ADVANCE WARNING SIGNS (FT) (A,B,C)	CHANNELIZATION DEVICES (DRUMS OR CONES)			
		TRAVEL LANE SHIFT LENGTH (L/2) (FT)	BUFFER ZONE LENGTH (FT)	DEVICE SPACING (FT)	MIN # OF DEVICES*
25-40	500 / 500 / 500	160	305	20	45
45-55	500 / 1000 / 1000	330	495	40	35

\* NUMBER OF DEVICES BASED ON 400 FT WORK ZONE.

NOTES

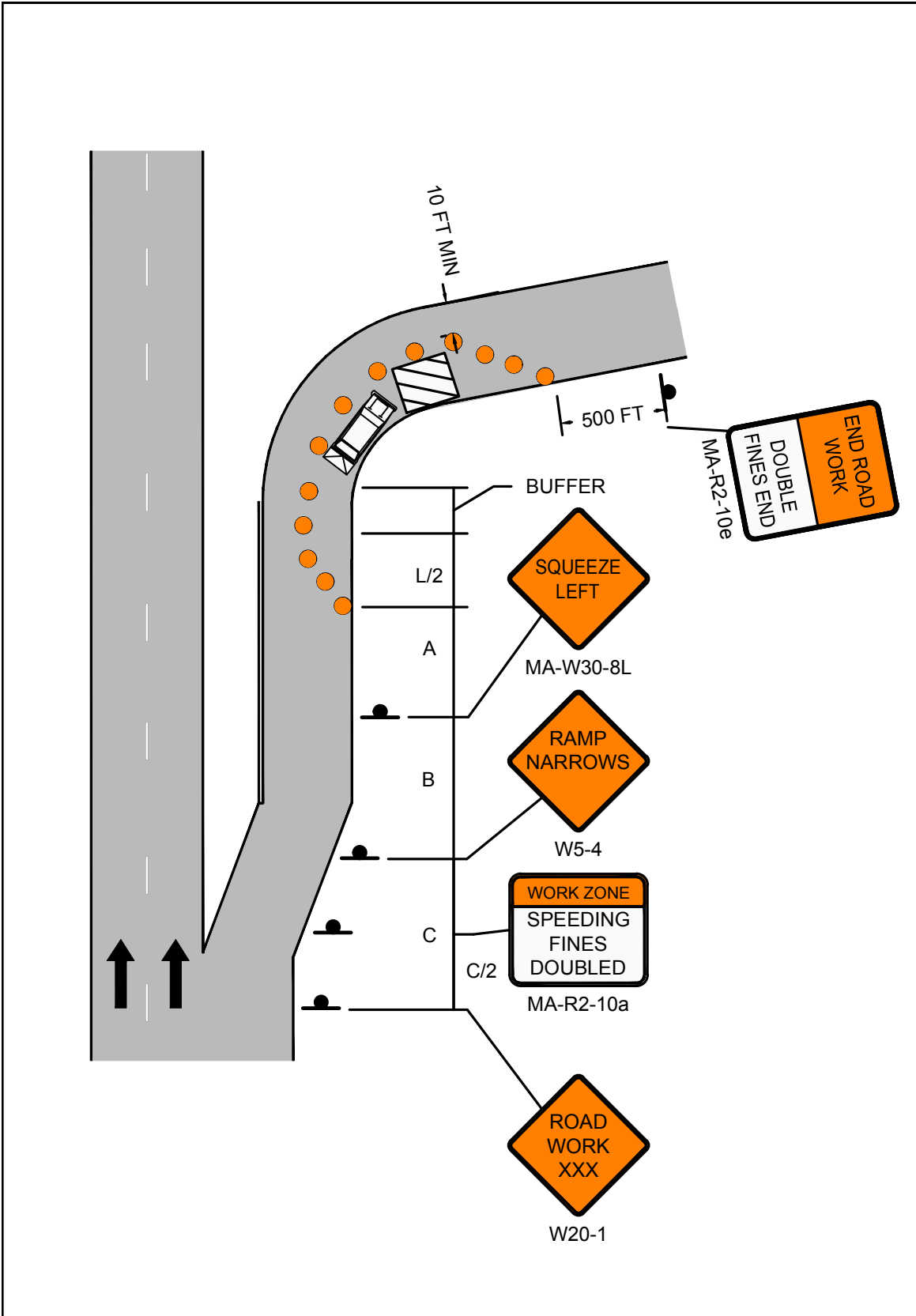
1. MA-R2-10a LOCATED AT C/2.


LEGEND

-  WORK ZONE
-  CHANNELIZATION DEVICE
-  FLASHING ARROW BOARD
-  PORTABLE CHANGEABLE MESSAGE SIGN
-  TRUCK MOUNTED ATTENUATOR
-  RADAR SPEED FEEDBACK BOARD
-  POLICE DETAIL OR UNIFORMED FLAGGER
-  TEMPORARY PORTABLE RUMBLE STRIP
-  TYPE III BARRICADE

NOT TO SCALE





 <p>PAGE 41</p>	<p>Work Zone Safety Standard Details and Drawings</p>	<p>FIGURE 17 STATIONARY OPERATIONS MULTILANE DIVIDED ROADWAY RIGHT SIDE OF OFF RAMP CLOSED</p>
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and Drawings

STATIONARY OPERATIONS  
MULTILANE DIVIDED ROADWAY  
LEFT SIDE OF OFF RAMP CLOSED










POSTED SPEED LIMIT (MPH)	SPACING FOR ADVANCE WARNING SIGNS (FT) (A,B,C)	CHANNELIZATION DEVICES (DRUMS OR CONES)			
		TRAVEL LANE SHIFT LENGTH (L/2) (FT)	BUFFER ZONE LENGTH (FT)	DEVICE SPACING (FT)	MIN # OF DEVICES*
25-40	500 / 500 / 500	160	305	20	45
45-55	500 / 1000 / 1000	330	495	40	35

\* NUMBER OF DEVICES BASED ON 400 FT WORK ZONE.

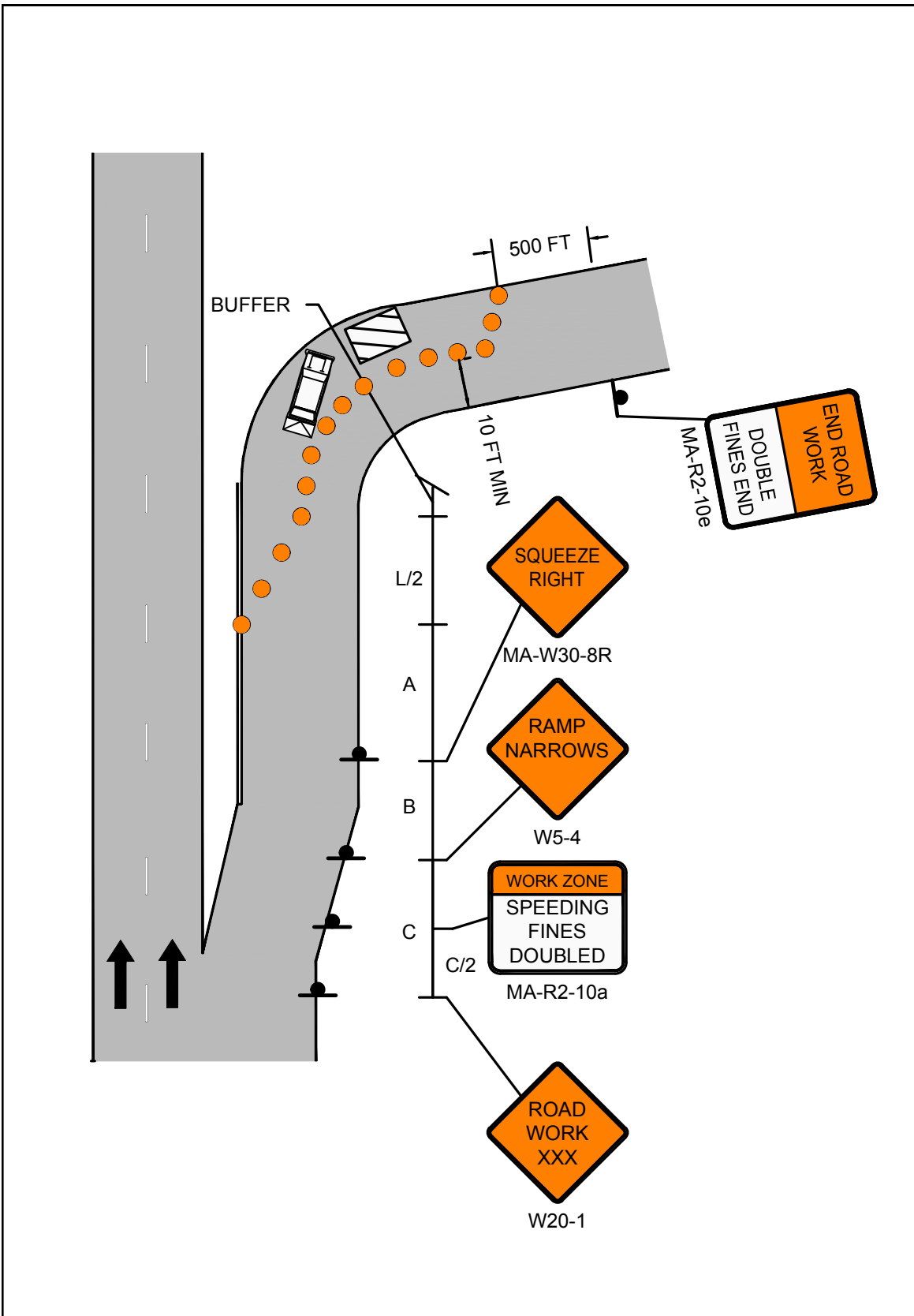
NOTES

1. MA-R2-10a LOCATED AT C/2.

LEGEND

-  WORK ZONE
-  CHANNELIZATION DEVICE
-  FLASHING ARROW BOARD
-  PORTABLE CHANGEABLE MESSAGE SIGN
-  TRUCK MOUNTED ATTENUATOR
-  RADAR SPEED FEEDBACK BOARD
-  POLICE DETAIL OR UNIFORMED FLAGGER
-  TEMPORARY PORTABLE RUMBLE STRIP
-  TYPE III BARRICADE

NOT TO SCALE



	<p>Work Zone Safety Standard Details and Drawings</p>	<p>FIGURE 18 STATIONARY OPERATIONS MULTILANE DIVIDED ROADWAY LEFT SIDE OF OFF RAMP CLOSED PAGE 43</p>
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and Drawings

STATIONARY OPERATIONS  
MULTILANE DIVIDED ROADWAY  
ROADWORK BEYOND ON RAMP

POSTED SPEED LIMIT (MPH)	CHANNELIZATION DEVICES (DRUMS OR CONES)				
	SHOULDER TAPER LENGTH (L/3) (FT)	TRAVEL LANE CLOSURE LENGTH (L) (FT)	BUFFER ZONE LENGTH (FT)	DEVICE SPACING (FT)	MIN # OF DEVICES*
25-40	110	320	305	20	175
45-55	220	660	495	40	135
60-65	260	780	645	40	155










\* NUMBER OF DEVICES BASED ON 400 FT WORK ZONE.

POSTED SPEED LIMIT (MPH)	SPACING FOR ADVANCE WARNING SIGNS (FT) (A,B,C)
25-40	500 / 500 / 500
45-55	500 / 1000 / 1000
60-65	1000 / 1600 / 2600

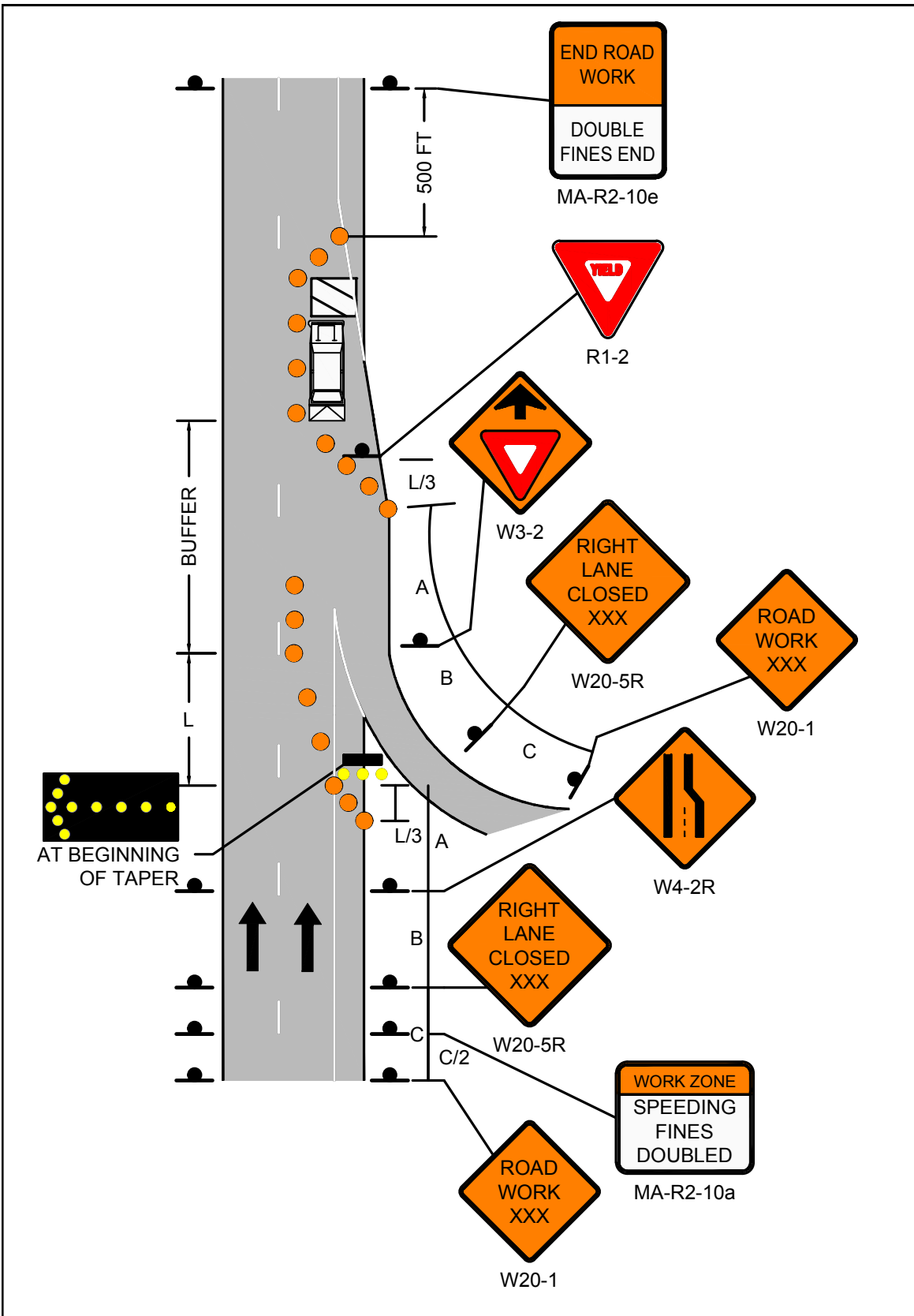
**NOTES**


1. MA-R2-10a LOCATED AT C/2.


**LEGEND**

-  WORK ZONE
-  CHANNELIZATION DEVICE
-  FLASHING ARROW BOARD
-  PORTABLE CHANGEABLE MESSAGE SIGN
-  TRUCK MOUNTED ATTENUATOR
-  RADAR SPEED FEEDBACK BOARD
-  POLICE DETAIL OR UNIFORMED FLAGGER
-  TEMPORARY PORTABLE RUMBLE STRIP
-  TYPE III BARRICADE

NOT TO SCALE



 <p>PAGE 45</p>	<p>Work Zone Safety Standard Details and Drawings</p>	<p>FIGURE 19 STATIONARY OPERATIONS MULTILANE DIVIDED ROADWAY ROADWORK BEYOND ON RAMP</p>
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 <p>Massachusetts Department of Transportation Highway Division</p> <p>PAGE 46</p>	<p>Work Zone Safety Standard Details and Drawings</p>	<p>STATIONARY OPERATIONS MULTILANE DIVIDED ROADWAY ROADWORK BEYOND OFF RAMP</p>
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POSTED SPEED LIMIT (MPH)	CHANNELIZATION DEVICES (DRUMS OR CONES)					
	SHOULDER TAPER LENGTH (L/3) (FT)	TRAVEL LANE CLOSURE LENGTH (L) (FT)	TRAVEL LANE SHIFT LENGTH (L/2) (FT)	BUFFER ZONE LENGTH (FT)	DEVICE SPACING (FT)	MIN # OF DEVICES*
25-40	110	320	160	305	20	70
45-55	220	660	330	495	40	55
60-65	260	780	390	645	40	65










\* NUMBER OF DEVICES BASED ON 400 FT WORK ZONE.

POSTED SPEED LIMIT (MPH)	SPACING FOR ADVANCE WARNING SIGNS (FT) (A,B,C)
25-40	500 / 500 / 500
45-55	500 / 1000 / 1000
60-65	1000 / 1600 / 2600

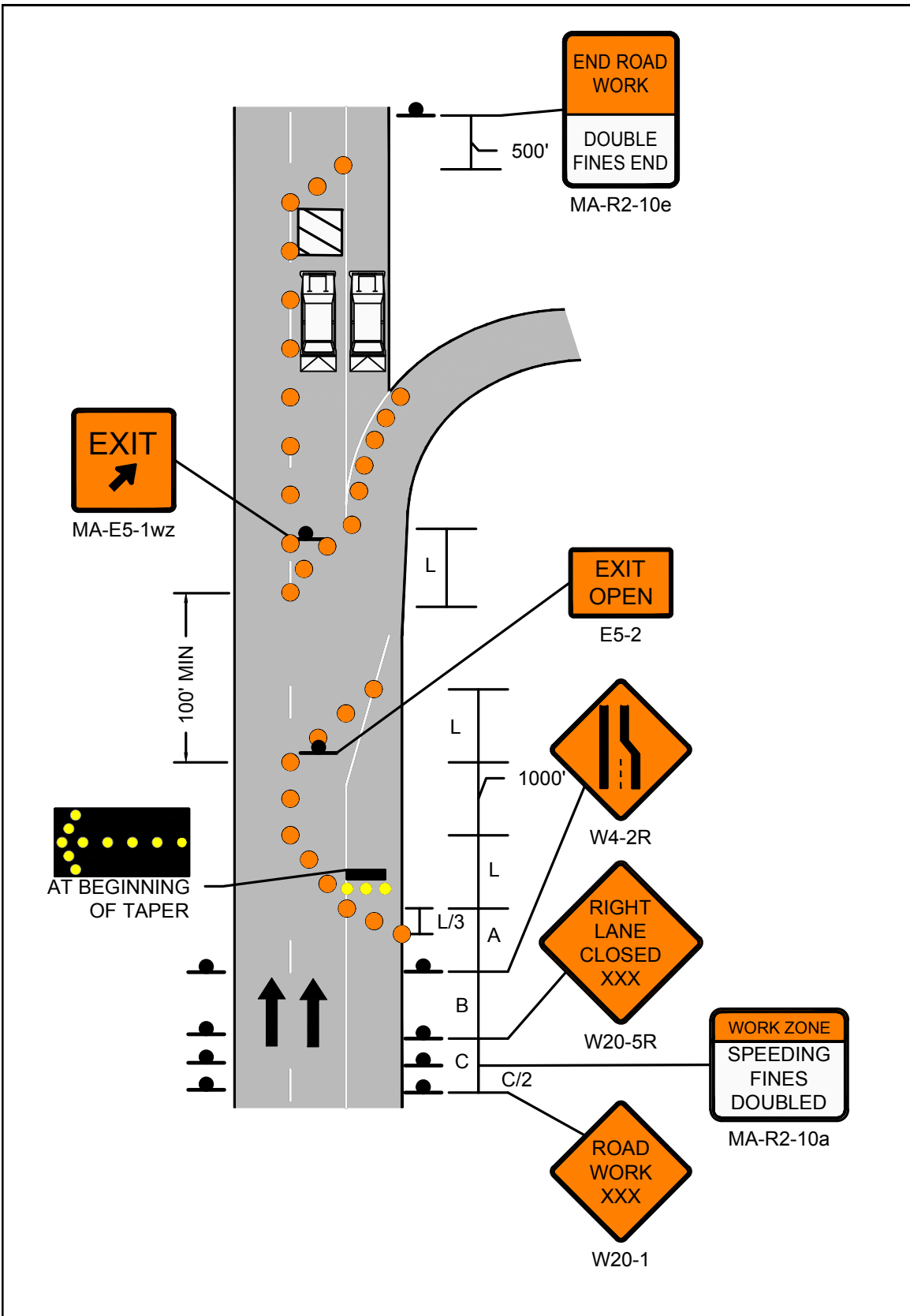
**NOTES**


1. MA-R2-10a LOCATED AT C/2.

**LEGEND**

-  WORK ZONE
-  CHANNELIZATION DEVICE
-  FLASHING ARROW BOARD
-  PORTABLE CHANGEABLE MESSAGE SIGN
-  TRUCK MOUNTED ATTENUATOR
-  RADAR SPEED FEEDBACK BOARD
-  POLICE DETAIL OR UNIFORMED FLAGGER
-  TEMPORARY PORTABLE RUMBLE STRIP
-  TYPE III BARRICADE

NOT TO SCALE



 <p>PAGE 47</p>	<p>Work Zone Safety Standard Details and Drawings</p>	<p>FIGURE 20 STATIONARY OPERATIONS MULTILANE DIVIDED ROADWAY ROADWORK BEYOND OFF RAMP</p>
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Standard Details  
and Drawings










MULTILANE DIVIDED ROADWAY  
TYPICAL RAMP CLOSURE

POSTED SPEED LIMIT (MPH)	SPACING FOR ADVANCE WARNING SIGNS (FT) (A,B,C)	CHANNELIZATION DEVICES (DRUMS OR CONES)			
		SHOULDER TAPER LENGTH (L/3) (FT)	BUFFER ZONE LENGTH (FT)	DEVICE SPACING (FT)	MIN # OF DEVICES
25-40	500 / 500 / 500	110	305	20	45
45-55	500 / 1000 / 1000	220	495	40	30
60-65	1000 / 1600 / 2600	260	645	40	35

NOTES

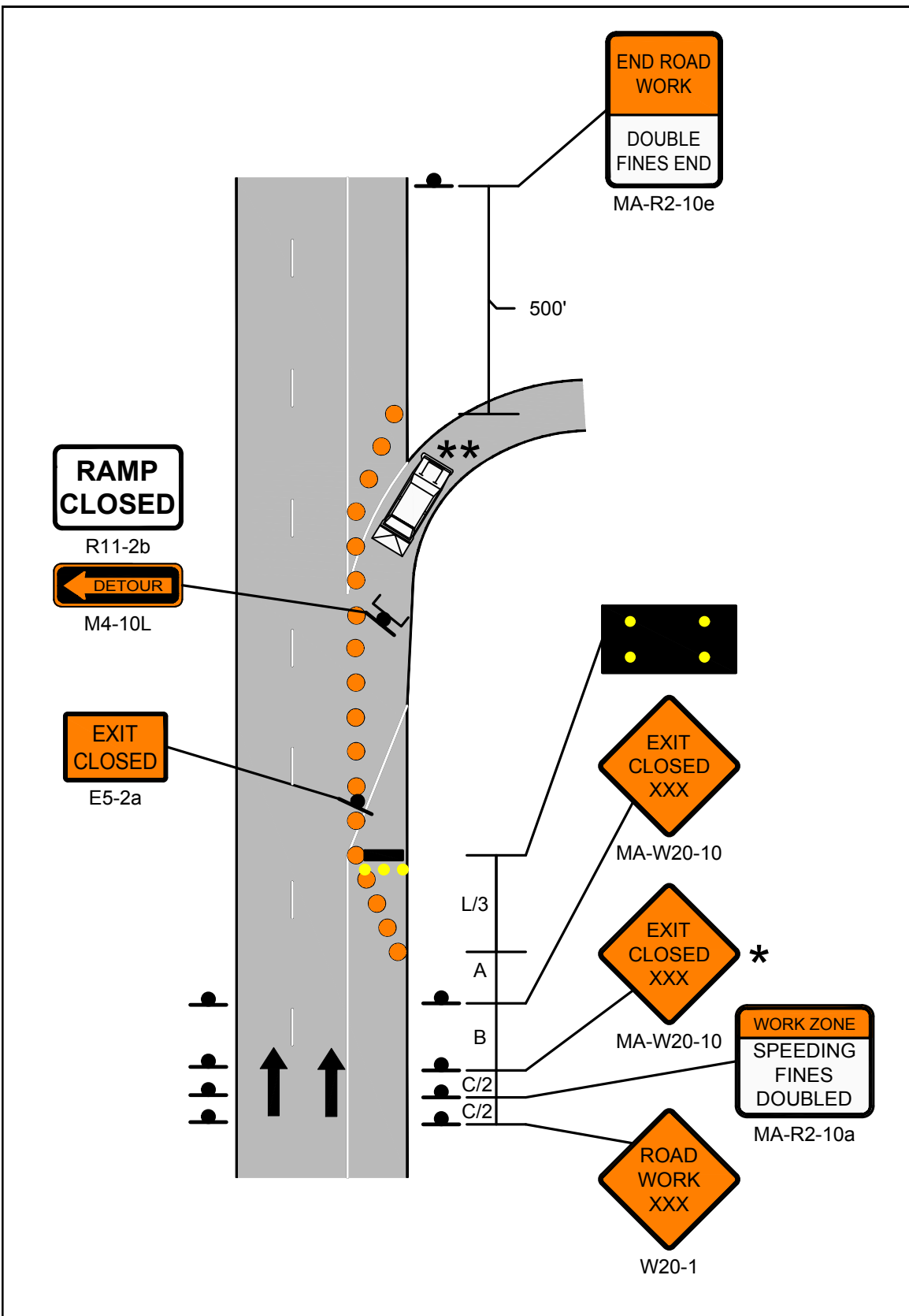
1. MA-R2-10a LOCATED AT C/2.
2. \* NOT REQUIRED IF RIGHT LANE IS CLOSED IN ADVANCE OF EXIT.
3. \*\* OPTIONAL AT ENGINEER'S DISCRETION.

LEGEND

-  WORK ZONE
-  CHANNELIZATION DEVICE
-  FLASHING ARROW BOARD
-  PORTABLE CHANGEABLE MESSAGE SIGN
-  TRUCK MOUNTED ATTENUATOR
-  RADAR SPEED FEEDBACK BOARD
-  POLICE DETAIL OR UNIFORMED FLAGGER
-  TEMPORARY PORTABLE RUMBLE STRIP
-  TYPE III BARRICADE

NOT TO SCALE







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




MULTILANE DIVIDED ROADWAY  
TYPICAL CLOVERLEAF RAMP CLOSURE

POSTED SPEED LIMIT (MPH)	SPACING FOR ADVANCE WARNING SIGNS (FT) (A,B,C)	CHANNELIZATION DEVICES (DRUMS OR CONES)			
		SHOULDER TAPER LENGTH (L/3) (FT)	BUFFER ZONE LENGTH (FT)	DEVICE SPACING (FT)	MIN # OF DEVICES
25-40	500 / 500 / 500	110	305	20	45
45-55	500 / 1000 / 1000	220	495	40	30
60-65	1000 / 1600 / 2600	260	645	40	35

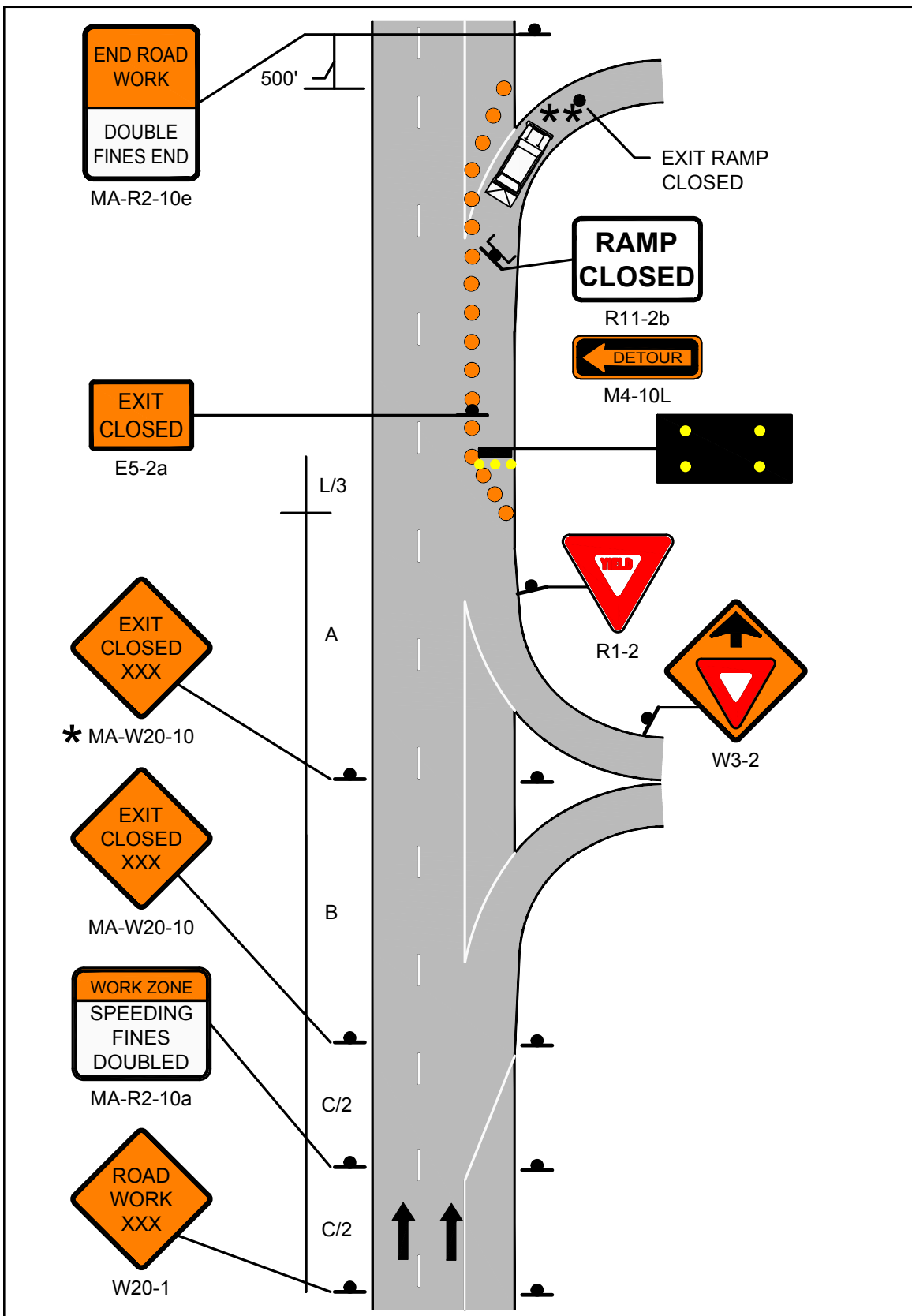
**NOTES**


1. MA-R2-10a LOCATED AT C/2.
2. \* NOT REQUIRED IF RIGHT LANE IS CLOSED IN ADVANCE OF EXIT.
3. \*\* OPTIONAL AT ENGINEER'S DISCRETION.


**LEGEND**

-  WORK ZONE
-  CHANNELIZATION DEVICE
-  FLASHING ARROW BOARD
-  PORTABLE CHANGEABLE MESSAGE SIGN
-  TRUCK MOUNTED ATTENUATOR
-  RADAR SPEED FEEDBACK BOARD
-  POLICE DETAIL OR UNIFORMED FLAGGER
-  TEMPORARY PORTABLE RUMBLE STRIP
-  TYPE III BARRICADE

NOT TO SCALE












 <p>PAGE 51</p>	<p>Work Zone Safety Standard Details and Drawings</p>	<p>FIGURE 22 MULTILANE DIVIDED ROADWAY TYPICAL CLOVERLEAF RAMP CLOSURE</p>
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 <p>Massachusetts Department of Transportation Highway Division</p> <p>PAGE 52</p>	<p>Work Zone Safety Standard Details and Drawings</p>	<p>MULTILANE DIVIDED ROADWAY TYPICAL RAMP CLOSURE ADVANCE SIGNING</p>
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NOTES

1. IF THE CLOSED RAMP IS LOCATED DOWNSTREAM FROM THE PROPOSED DETOUR ROUTE/RAMP, A PCMS SHALL BE POSITIONED AT A SUFFICIENT DISTANCE IN ADVANCE OF THE DETOUR ROUTE/RAMP AND SHOULD STATE WHICH RAMP IS CLOSED AND WHICH SHALL BE USED FOR THE DETOUR.
2. IF THE CLOSED RAMP IS LOCATED UPSTREAM FROM THE PROPOSED DETOUR ROUTE/RAMP, A PCMS SHALL BE POSITIONED PRIOR TO THE CLOSED RAMP AND SHOULD STATE WHICH RAMP IS CLOSED AND WHICH SHALL BE USED FOR THE DETOUR.
3. A SUFFICIENT NUMBER OF DETOUR SIGNS (M4-9 SERIES) SHOULD BE DEPLOYED TO PROPERLY DIRECT DETOURED TRAFFIC. SIGN SPACING SHALL BE AT THE DIRECTION OF THE ENGINEER.

LEGEND

-  WORK ZONE
-  CHANNELIZATION DEVICE
-  FLASHING ARROW BOARD
-  PORTABLE CHANGEABLE MESSAGE SIGN
-  TRUCK MOUNTED ATTENUATOR
-  RADAR SPEED FEEDBACK BOARD
-  POLICE DETAIL OR UNIFORMED FLAGGER
-  TEMPORARY PORTABLE RUMBLE STRIP
-  TYPE III BARRICADE

NOT TO SCALE

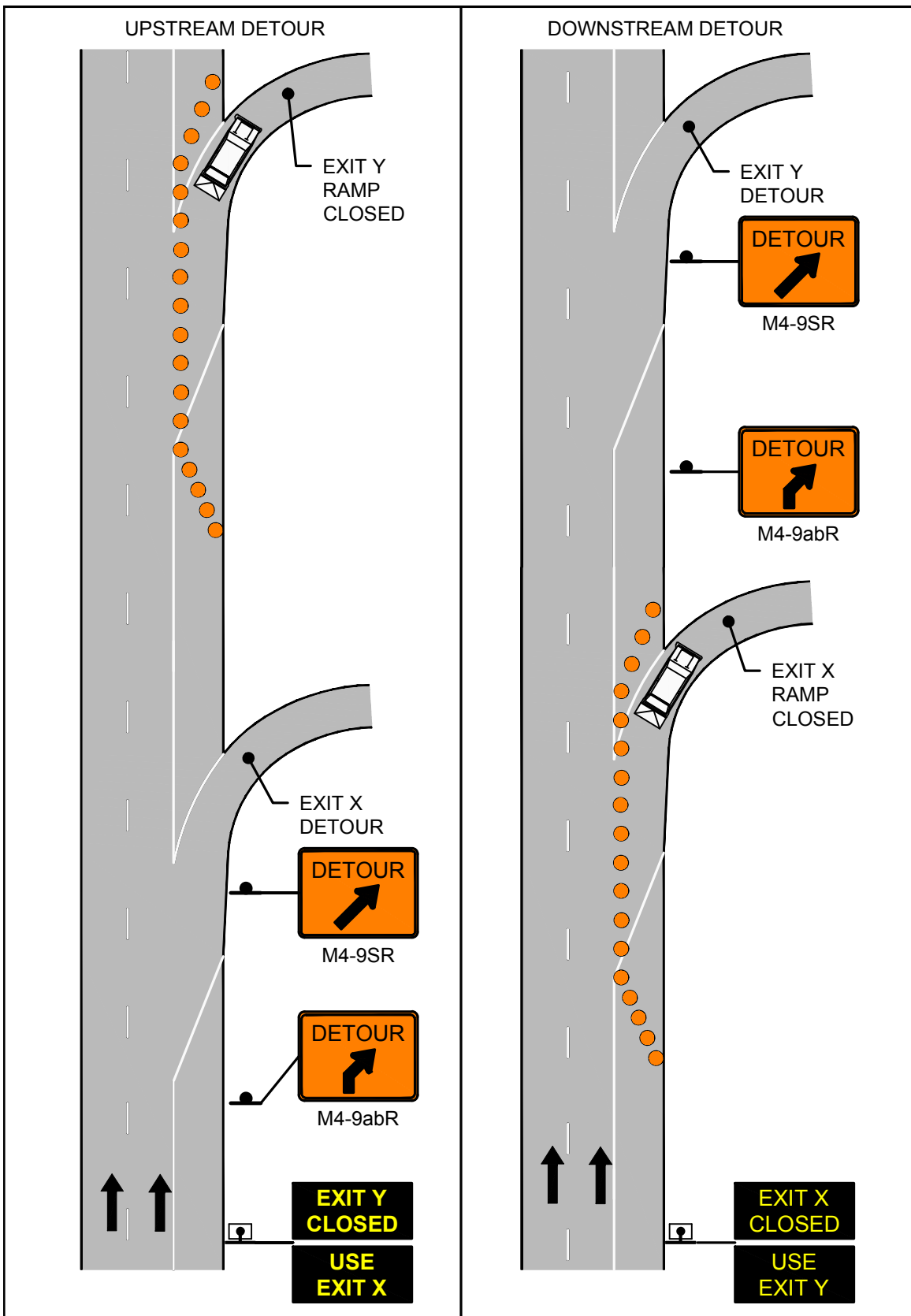


FIGURE 23  
MULTILANE DIVIDED ROADWAY  
TYPICAL RAMP CLOSURE  
ADVANCE SIGNING



FIGURE 24-1  
MULTILANE DIVIDED ROADWAY  
PLACEMENT OF TEMPORARY  
PORTABLE RUMBLE STRIPS  
SHEET 1 OF 2




POSTED REGULATORY OR WORK ZONE SPEED	SEPARATION BETWEEN RUMBLE STRIPS
Above 55-mph	20-feet
36-mph to 55-mph	15-feet
35-mph and under	10-feet

POSTED SPEED LIMIT (MPH)	SPACING FOR ADVANCE WARNING SIGNS (FT) (A,B,C)	TANGENT LENGTH BETWEEN TAPERS (T) (FT)
25-40	500 / 500 / 500	640
45-55	500 / 1000 / 1000	1320
60-65	1000 / 1600 / 2600	1560

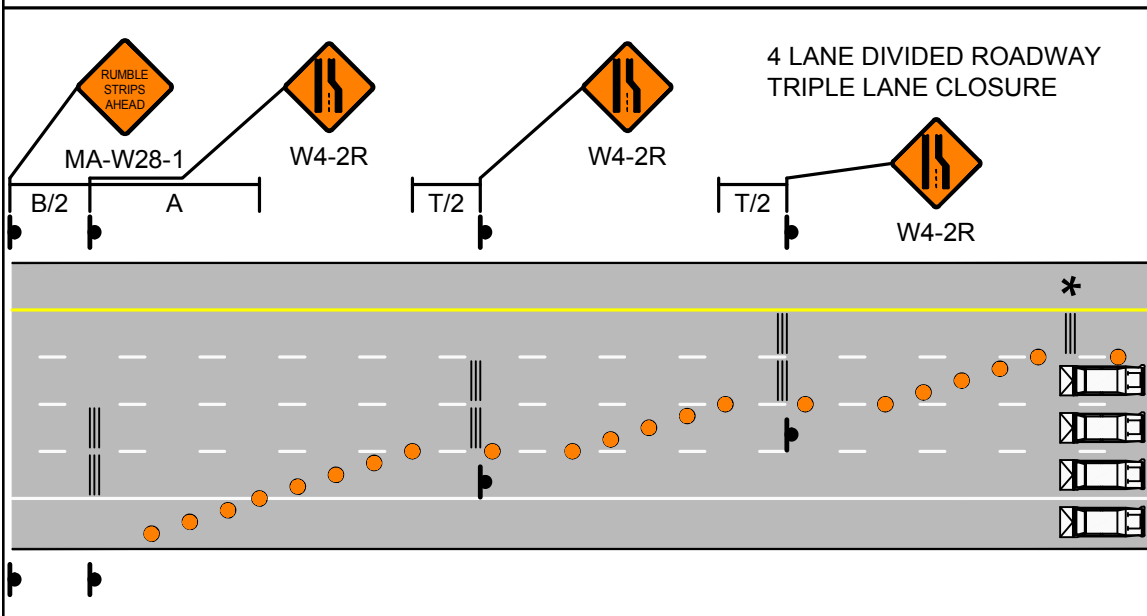
**NOTES**

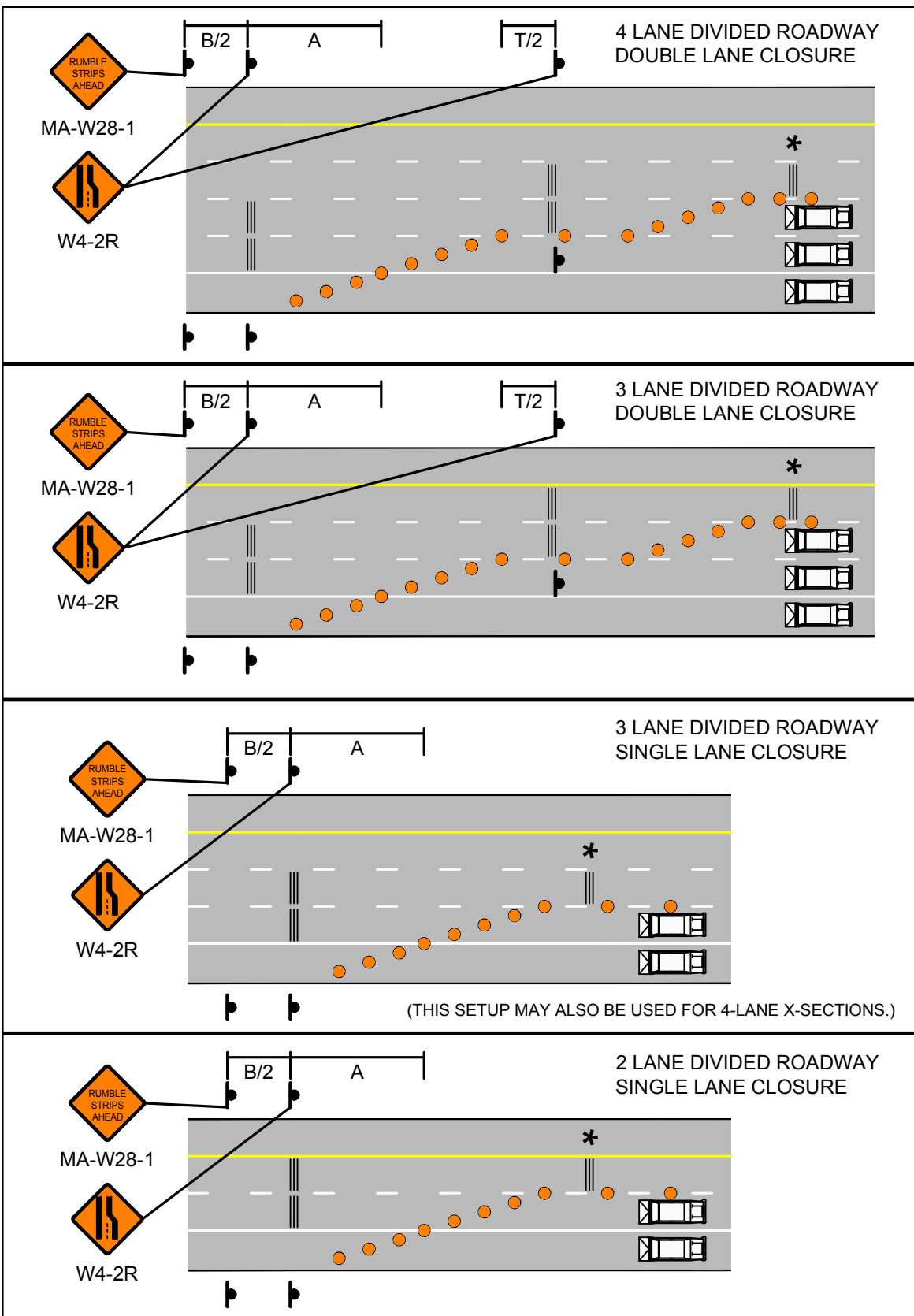
1. THE INTENTION OF THESE DETAILS IS ONLY TO DEPICT THE PLACEMENT OF TEMPORARY PORTABLE RUMBLE STRIPS (TPRS) IN RELATIONSHIP TO THE TAPER AND THE BUFFER OF A SINGLE- OR MULTI-LANE CLOSURE. THE DEPICTION OF THE NUMBER AND SPACING OF ALL OTHER TRAFFIC CONTROL DEVICES IS NOT TO SCALE. REFER TO OTHER DETAILS FOR LANE CLOSURES FOR THE PLACEMENT AND NUMBER OF ALL OTHER TRAFFIC CONTROL DEVICES.
2. THESE DETAILS ONLY DEPICT RIGHT LANE CLOSURES. LEFT LANE CLOSURES SHOULD UTILIZE A MIRROR IMAGE OF THESE SETUPS, STARTING WITH CLOSURE OF THE LEFTMOST LANE.
3. ★ THIS TPRS ARRAY IS OPTIONAL AT THE ENGINEER'S DISCRETION. IF USED, IT SHOULD BE PLACED ADJACENT TO THE BUFFER.
4. DETAILS SHOW THE MINIMUM NUMBER OF TPRS REQUIRED. ADDITIONAL MAY BE USED IF CONDITIONS WARRANT.


**LEGEND**

-  CHANNELIZATION DEVICE
-  TRUCK MOUNTED ATTENUATOR
-  TEMPORARY PORTABLE RUMBLE STRIP

NOT TO SCALE



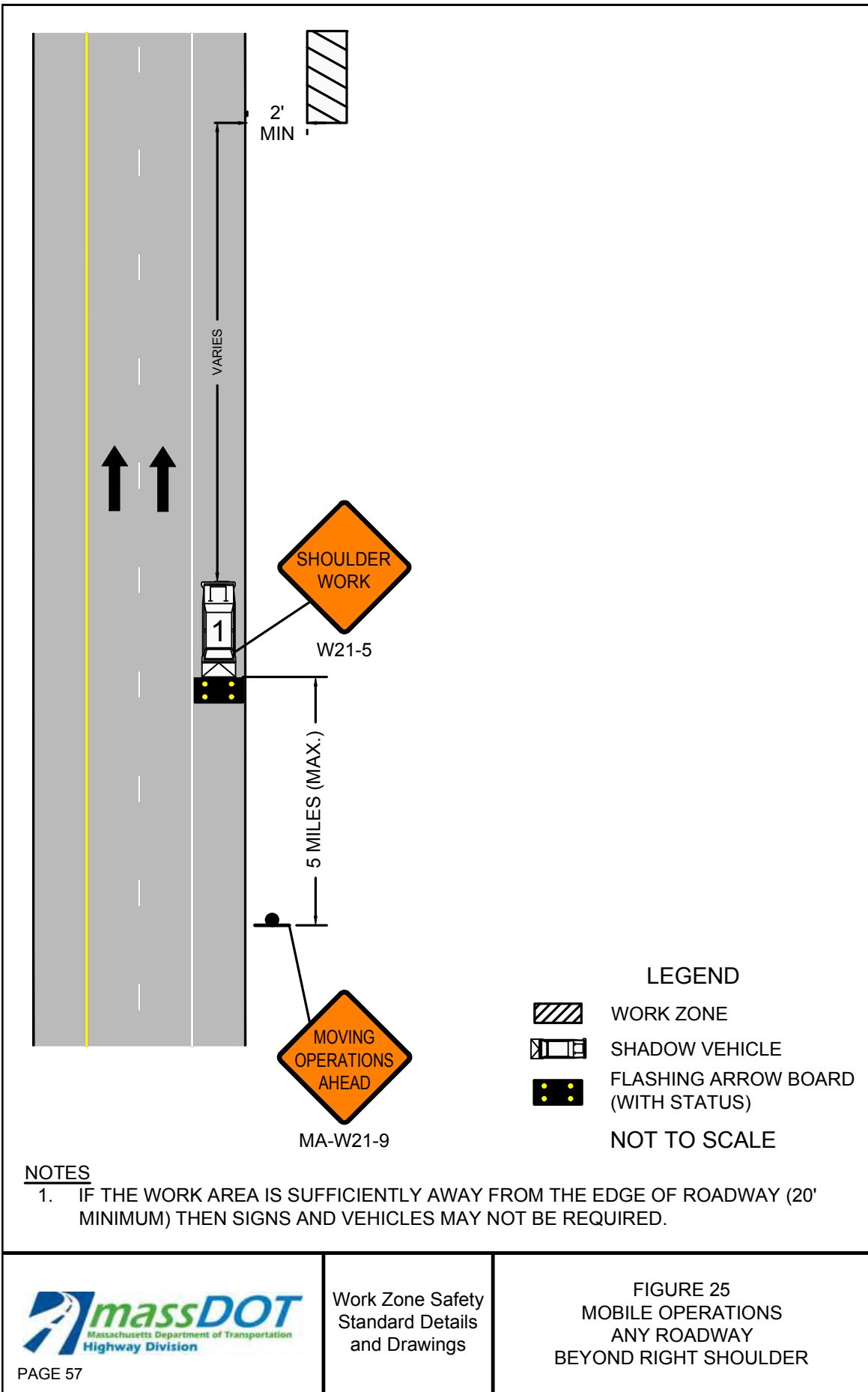


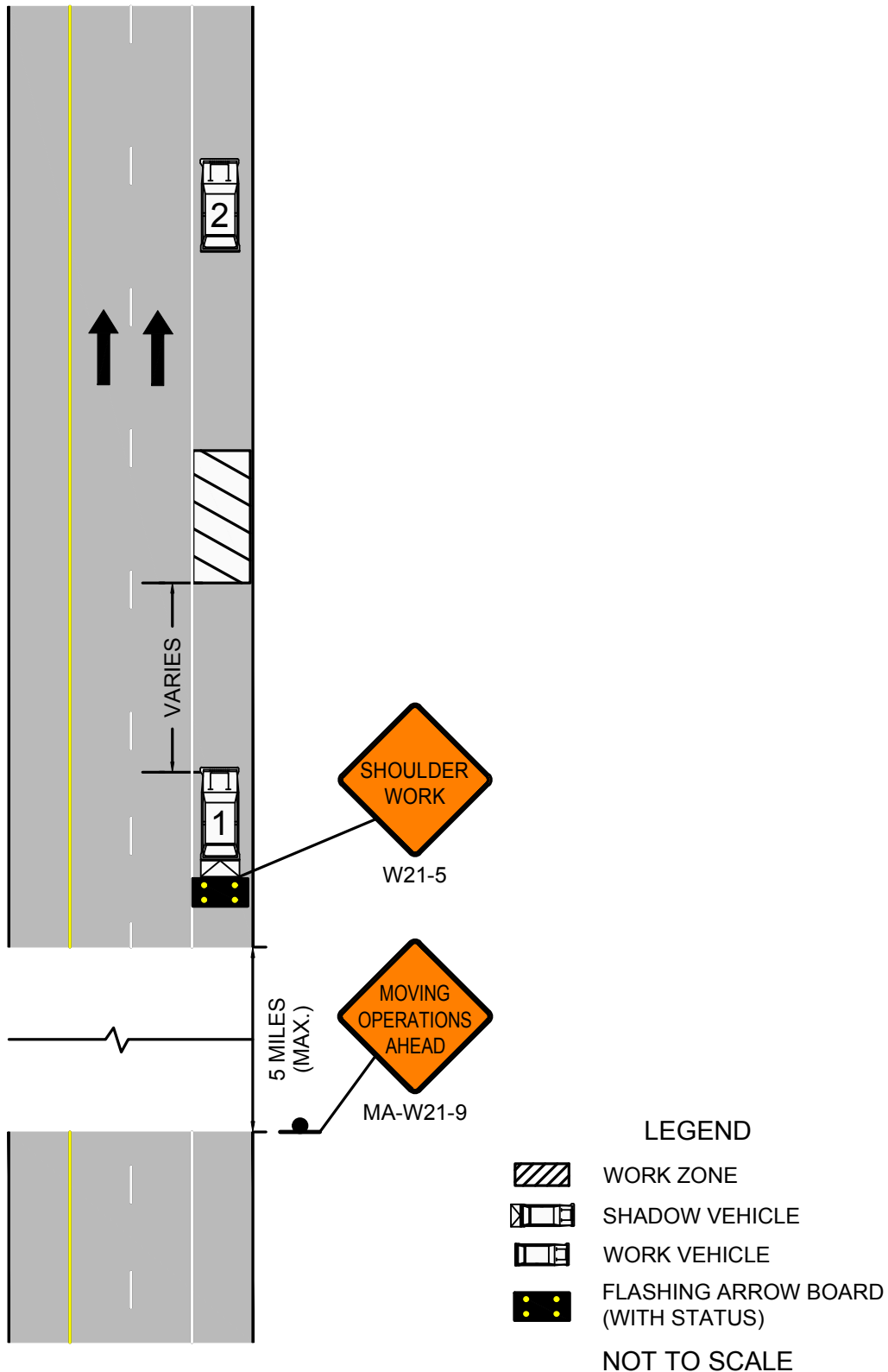
 <p>PAGE 56</p>	<p>Work Zone Safety Standard Details and Drawings</p>	<p>NOTES FOR MOBILE OPERATIONS</p>
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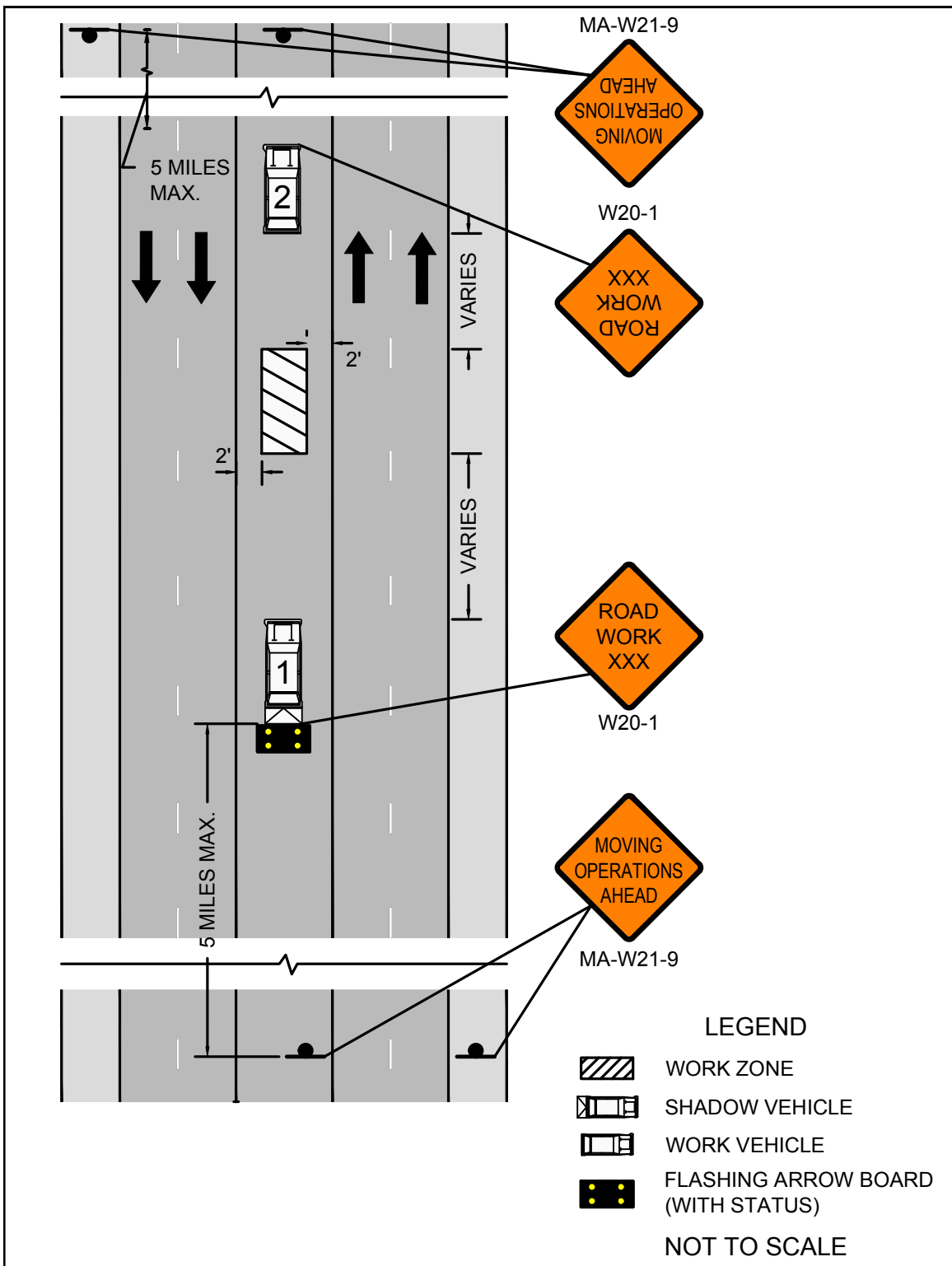
**Notes for Mobile Operations**

- Unless otherwise stated, these notes shall apply to all Mobile Operation setups.
  - Additional, setup-specific notes may be found on individual sheets.
1. The Supervisor shall travel the designated roadway prior to scheduling the work to ensure that sufficient and appropriate traffic control devices will be available. Special consideration shall be exercised to ensure that appropriate traffic controls be placed in areas that will have limited visibility of the work areas or any associated traffic queues.
  2. Vehicles used for these operations shall be made highly visible with appropriate equipment such as flashing lights, rotating beacons, flags, signs, flashing arrow boards, and/or portable changeable message signs. Any signs mounted to these vehicles shall not obscure the visibility of other devices.
  3. All vehicles shown may not be required based upon roadway conditions. However, when needed and practical, additional shadow vehicles and equipment to warn and protect motorists and workers should be used. Based upon roadway conditions, the addition of a police detail with cruiser may be used for additional protection or warning for the traveling public.
  4. The distance between the work and shadow vehicle(s) may vary according to the terrain and other factors. Shadow vehicles are used to warn traffic of the operations ahead. Whenever adequate sight distance exists, the shadow vehicle(s) should maintain the minimum appropriate distance and maintain the same speed to prevent non-work related vehicles from entering the work convoy. If this formation cannot be maintained then additional traffic control devices should be deployed in advance of any vertical or horizontal curves that may restrict the sight distance of an oncoming vehicle to either the work vehicle or associated traffic queue.
  5. All shadow vehicles shall be equipped with a truck or trailer mounted attenuator (TMA) and a flashing arrow board.
  6. Signs should be covered or turned from view when work is not in progress.
  7. Portable changeable message signs may be used in lieu of MA-W21-9 signs and any signs mounted directly to a shadow vehicle.







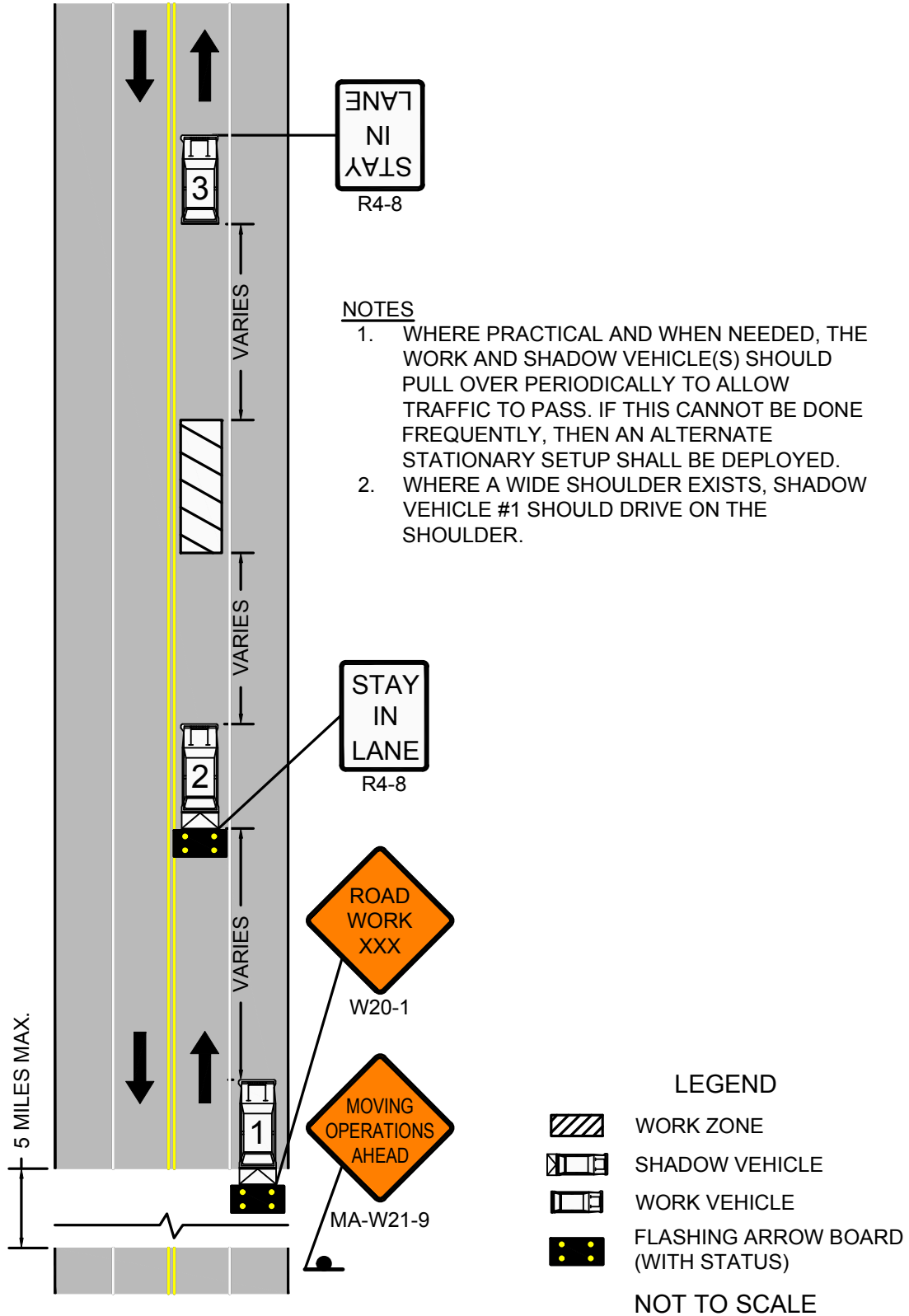


**NOTES**

- IF THE 2' OFFSET CANNOT BE MAINTAINED, A SHORT-TERM STATIONARY SETUP SHOULD BE USED.



FIGURE 28  
MOBILE OPERATIONS  
UNDIVIDED TWO LANE ROADWAY  
HALF OF ROADWAY CLOSED



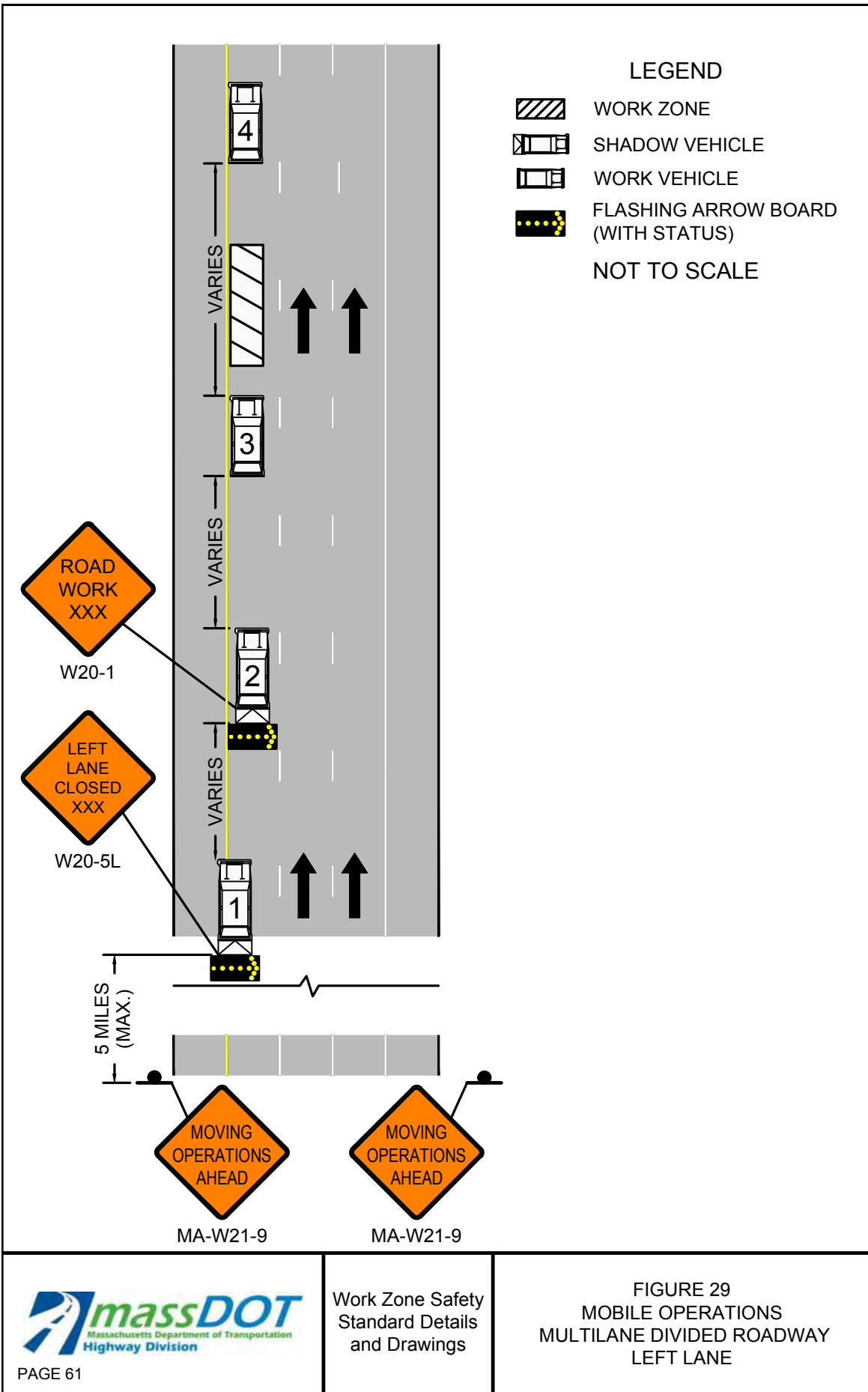
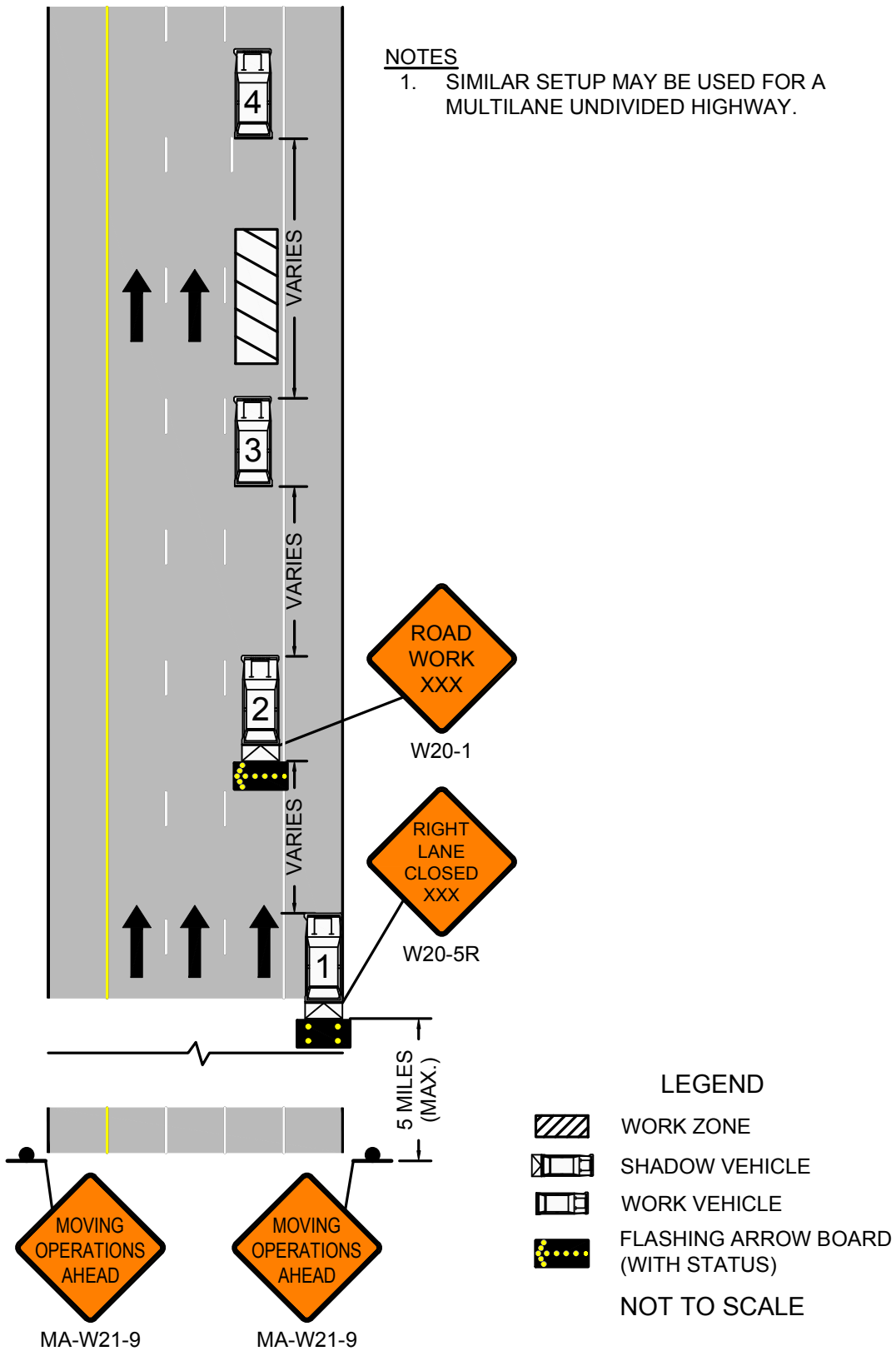
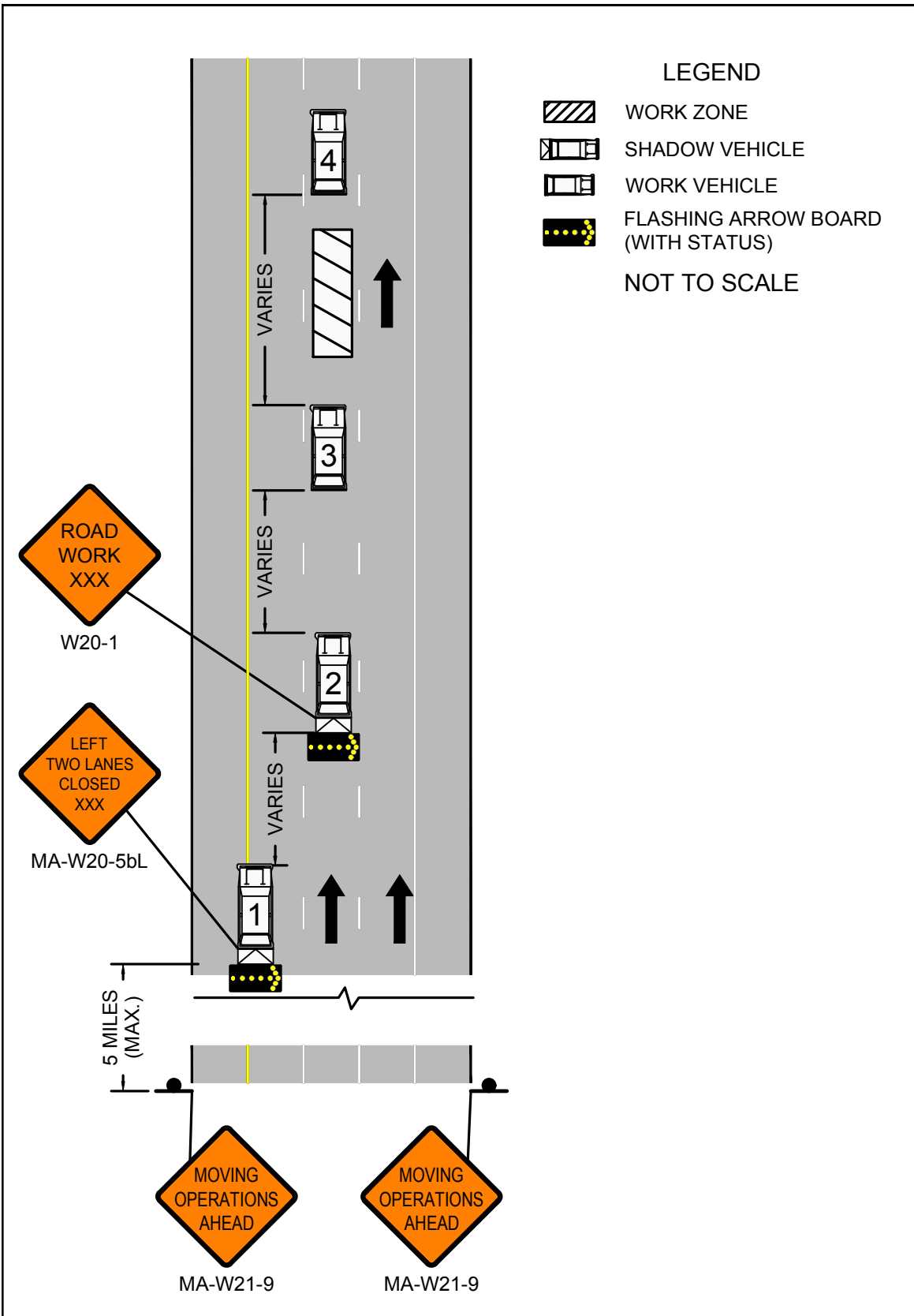



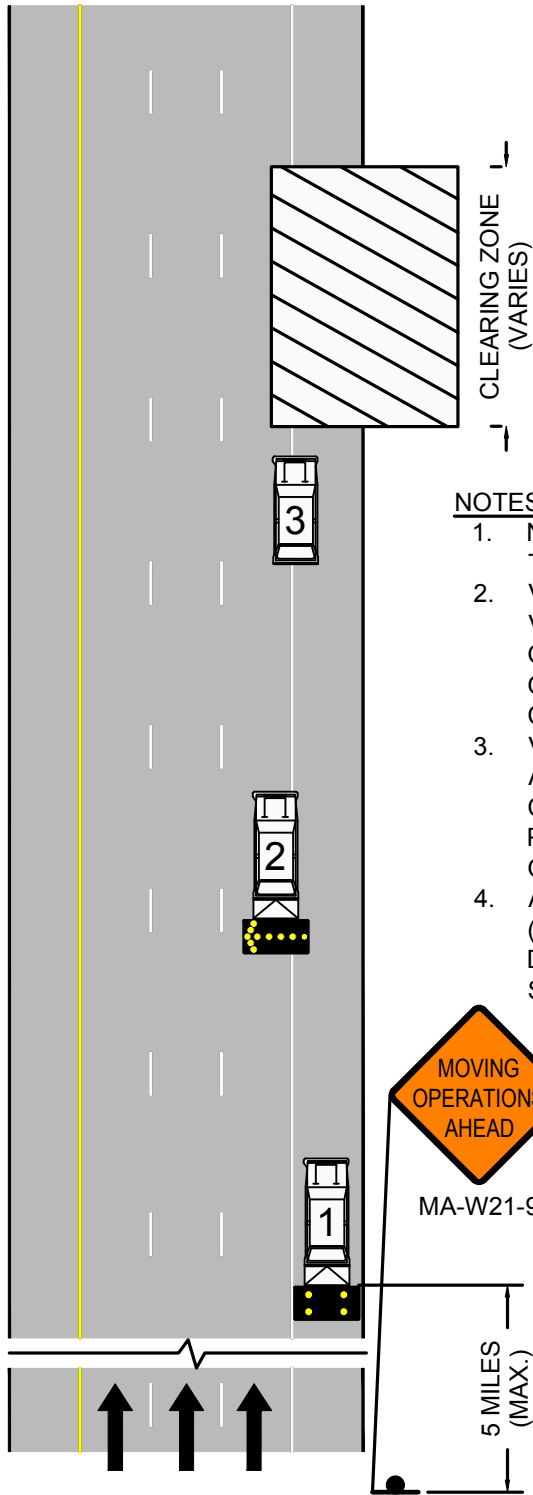


FIGURE 30  
MOBILE OPERATIONS  
MULTILANE DIVIDED ROADWAY  
RIGHT LANE





 Massachusetts Department of Transportation Highway Division PAGE 63	Work Zone Safety Standard Details and Drawings	FIGURE 31 MOBILE OPERATIONS MULTILANE DIVIDED ROADWAY CENTER LANE
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**NOTES**

1. NO OTHER NOTES ARE APPLICABLE TO THIS DETAIL.
2. VEHICLE #3 IS A SNOW/DEBRIS REMOVAL VEHICLE AND SHALL ALWAYS BE AWARE OF THE SURROUNDINGS. MORE THAN ONE VEHICLE MAY BE USED IN THE CLEARING ZONE.
3. VEHICLE #1 SHOULD BE EQUIPPED WITH A PCMS, A TMA, AND STAY IN VISUAL CONTACT WITH VEHICLE #3 WHILE PROVIDING AMPLE WARNING TO ONCOMING TRAFFIC.
4. A POLICE DETAIL WITH BLUE LIGHTS (OPTIONAL) SHALL REMAIN DOWNSTREAM OF VEHICLE #1 IN THE SHOULDER.

**LEGEND**

- WORK ZONE
- SHADOW VEHICLE
- WORK VEHICLE
- FLASHING ARROW BOARD (WITH STATUS)

NOT TO SCALE



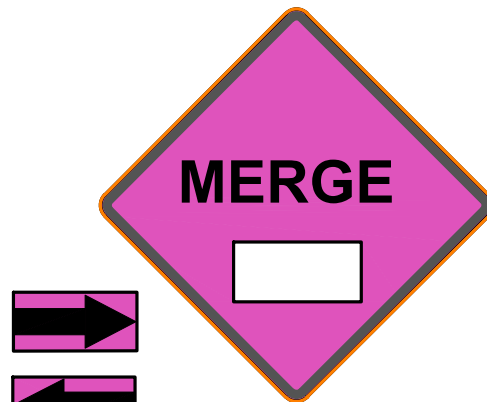
**Notes for Traffic Emergency or Incident Operations**

- The goal is to increase awareness of during traffic emergencies or incidents.
- These signs are to be used to differentiate from the traditional construction work zone and an emergency or incident.
- Upon arrival MassDOT First Responders shall assess the magnitude of the scene to determine if the incident is likely to last an hour or more in duration which would trigger the requirement to use these signs.
- Place the “Emergency Ahead” sign on the same side of the road as the incident, if possible, for up to an hour. Emergency response signs should be put up for all incidents and emergencies as soon as possible.
- Place the emergency sign 500 to 1000 feet before the first channelization devices.
- As an incident evolves this sign would be used as a secondary sign with all other emergency controls put in place.
- Only use “MERGE” signs where applicable (Not on 2 lane roads).
- Use MERGE signs on Multi-lane Roads to move traffic away from the incident and keep them in a safe lane.
- Place the MERGE sign about 500 feet before the closure.
- If additional signs are available, they should be placed accordingly as a sign informing people coming in the other direction or on the opposite side of the roadway.
- Use 12 emergency cones spaced 40 to 80 feet apart to form a taper and protect the scene.
- Sequential flashing lights/flares may be used in lieu of or to supplement cones.
- During a major incident that will last for a long duration, the EMERGENCY AHEAD sign should be moved back before an intersecting road or ramp to alert travelers and give them an option of using an alternate route. (Be sure all other devices are in place before moving this sign).

**Standard Emergency Signs (36"x36" or 48"x48")**



MA-W20-9






MA-W4-2aR/L



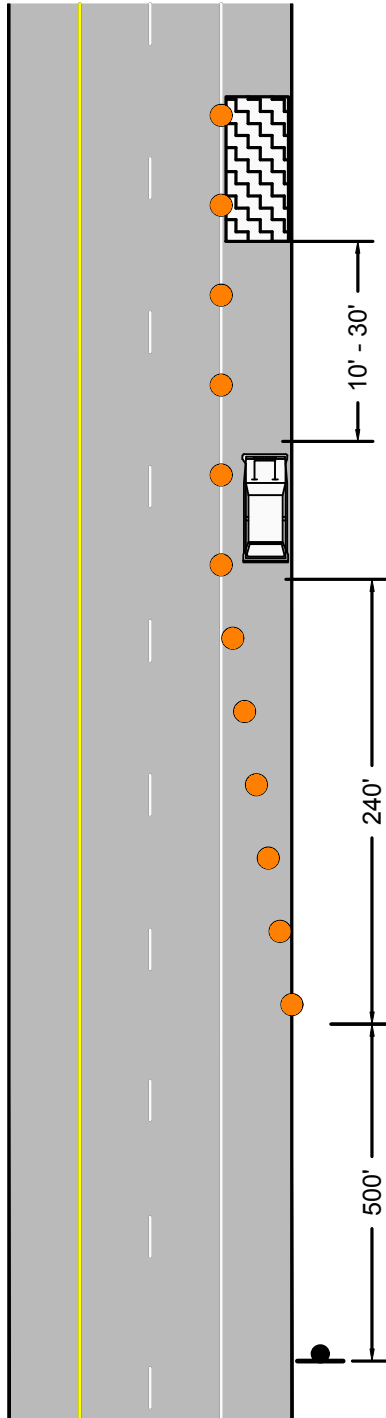


FIGURE 33  
EMERGENCY RESPONSE  
ANY ROADWAY  
SHOULDER ENCROACHMENT

LEGEND

-  EMERGENCY AREA
-  CHANNELIZATION DEVICE
-  EMERGENCY RESPONSE VEHICLE

NOT TO SCALE



ORDER OF RESPONSE ACTIVITIES

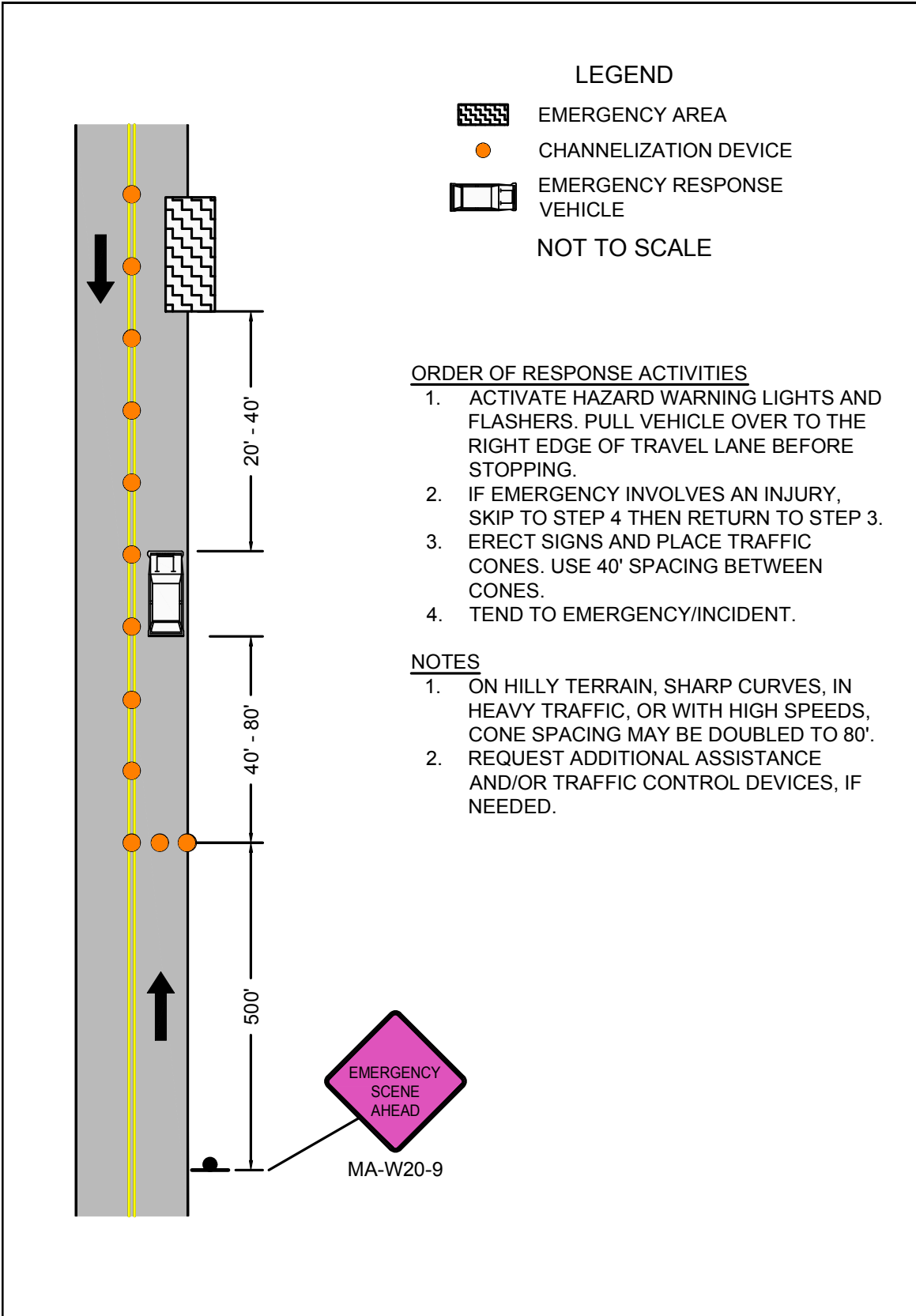
1. ACTIVATE HAZARD WARNING LIGHTS AND FLASHERS. PULL VEHICLE OVER TO THE RIGHT EDGE OF TRAVEL LANE BEFORE STOPPING.
2. IF EMERGENCY INVOLVES AN INJURY, SKIP TO STEP 4 THEN RETURN TO STEP 3.
3. ERECT SIGNS AND PLACE TRAFFIC CONES. USE 40' SPACING BETWEEN CONES.
4. TEND TO EMERGENCY/INCIDENT.

NOTES

1. ON HILLY TERRAIN, SHARP CURVES, IN HEAVY TRAFFIC, OR WITH HIGH SPEEDS, CONE SPACING MAY BE DOUBLED TO 80'.
2. REQUEST ADDITIONAL ASSISTANCE AND/OR TRAFFIC CONTROL DEVICES, IF NEEDED.



MA-W20-9







 Massachusetts Department of Transportation Highway Division PAGE 67	Work Zone Safety Standard Details and Drawings	<b>FIGURE 34</b> EMERGENCY RESPONSE TWO LANE ROADWAY NO SHOULDER TRAVEL LANE ENCROACHMENT
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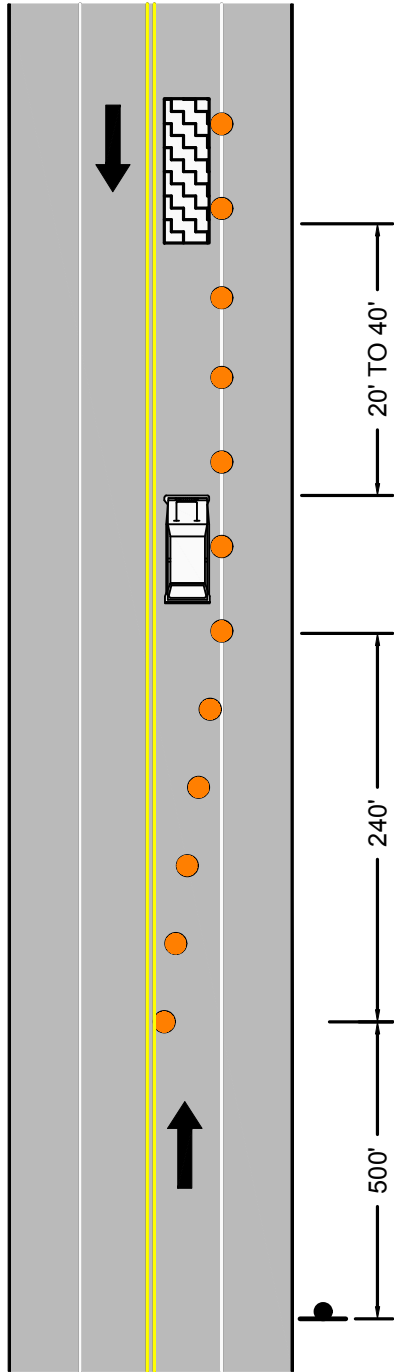


FIGURE 35  
EMERGENCY RESPONSE  
TWO LANE ROADWAY  
TRAVERSABLE SHOULDER  
SINGLE LANE ENCROACHMENT

LEGEND

-  EMERGENCY AREA
-  CHANNELIZATION DEVICE
-  EMERGENCY RESPONSE VEHICLE

NOT TO SCALE

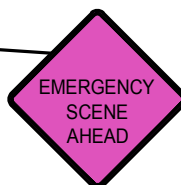


ORDER OF RESPONSE ACTIVITIES

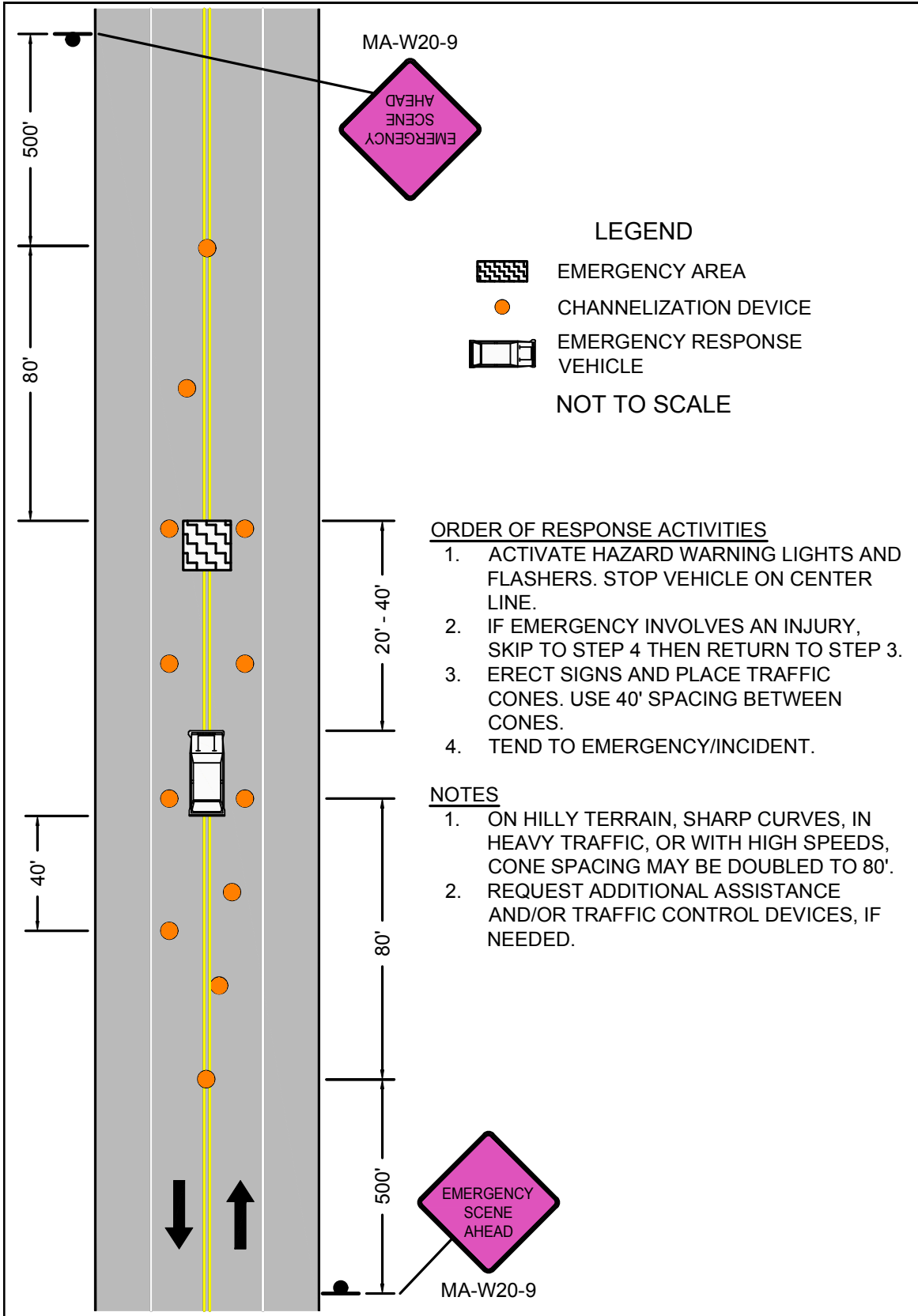
1. ACTIVATE HAZARD WARNING LIGHTS AND FLASHERS. PULL VEHICLE OVER TO THE LEFT EDGE OF TRAVEL LANE BEFORE STOPPING.
2. IF EMERGENCY INVOLVES AN INJURY, SKIP TO STEP 4 THEN RETURN TO STEP 3.
3. ERECT SIGNS AND PLACE TRAFFIC CONES. USE 40' SPACING BETWEEN CONES.
4. TEND TO EMERGENCY/INCIDENT.

NOTES

1. ON HILLY TERRAIN, SHARP CURVES, IN HEAVY TRAFFIC, OR WITH HIGH SPEEDS, CONE SPACING MAY BE DOUBLED TO 80'.
2. REQUEST ADDITIONAL ASSISTANCE AND/OR TRAFFIC CONTROL DEVICES, IF NEEDED.



MA-W20-9




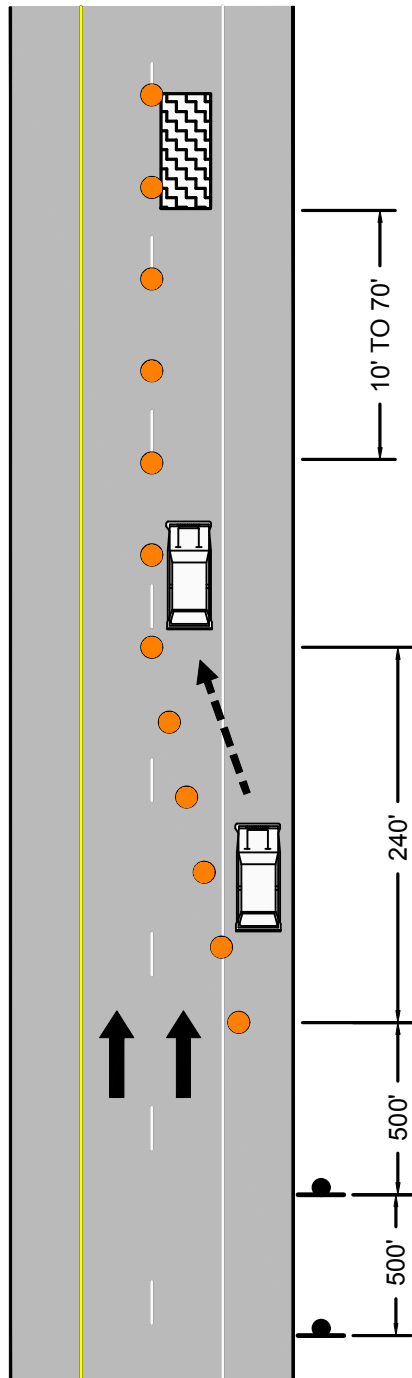




 <p>Massachusetts Department of Transportation Highway Division</p> <p>PAGE 69</p>	<p>Work Zone Safety Standard Details and Drawings</p>	<p>FIGURE 36 EMERGENCY RESPONSE TWO LANE ROADWAY TRAVERSABLE SHOULDER CENTER OF ROADWAY</p>
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FIGURE 37  
EMERGENCY RESPONSE  
MULTILANE DIVIDED ROADWAY  
RIGHT LANE



LEGEND

-  EMERGENCY AREA
-  CHANNELIZATION DEVICE
-  EMERGENCY RESPONSE VEHICLE
-  RESPONSE VEHICLE MOVEMENT

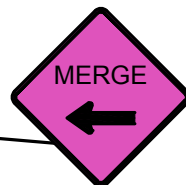
NOT TO SCALE

ORDER OF RESPONSE ACTIVITIES

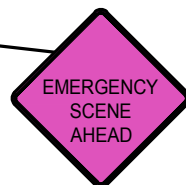
1. ACTIVATE HAZARD WARNING LIGHTS AND FLASHERS. STOP VEHICLE IN BREAKDOWN LANE.
2. IF EMERGENCY INVOLVES AN INJURY, SKIP TO STEP 6 THEN RETURN TO STEP 3.
3. ERECT SIGNS AND PLACE TRAFFIC CONES. USE 40' SPACING BETWEEN CONES.
4. MOVE RESPONSE VEHICLE BEHIND EMERGENCY.
5. PLACE ADDITIONAL CONES.
6. TEND TO EMERGENCY.

NOTES

1. ON HILLY TERRAIN, SHARP CURVES, IN HEAVY TRAFFIC, OR WITH HIGH SPEEDS, CONE SPACING MAY BE DOUBLED TO 80'.
2. REQUEST ADDITIONAL ASSISTANCE AND/OR TRAFFIC CONTROL DEVICES, IF NEEDED.



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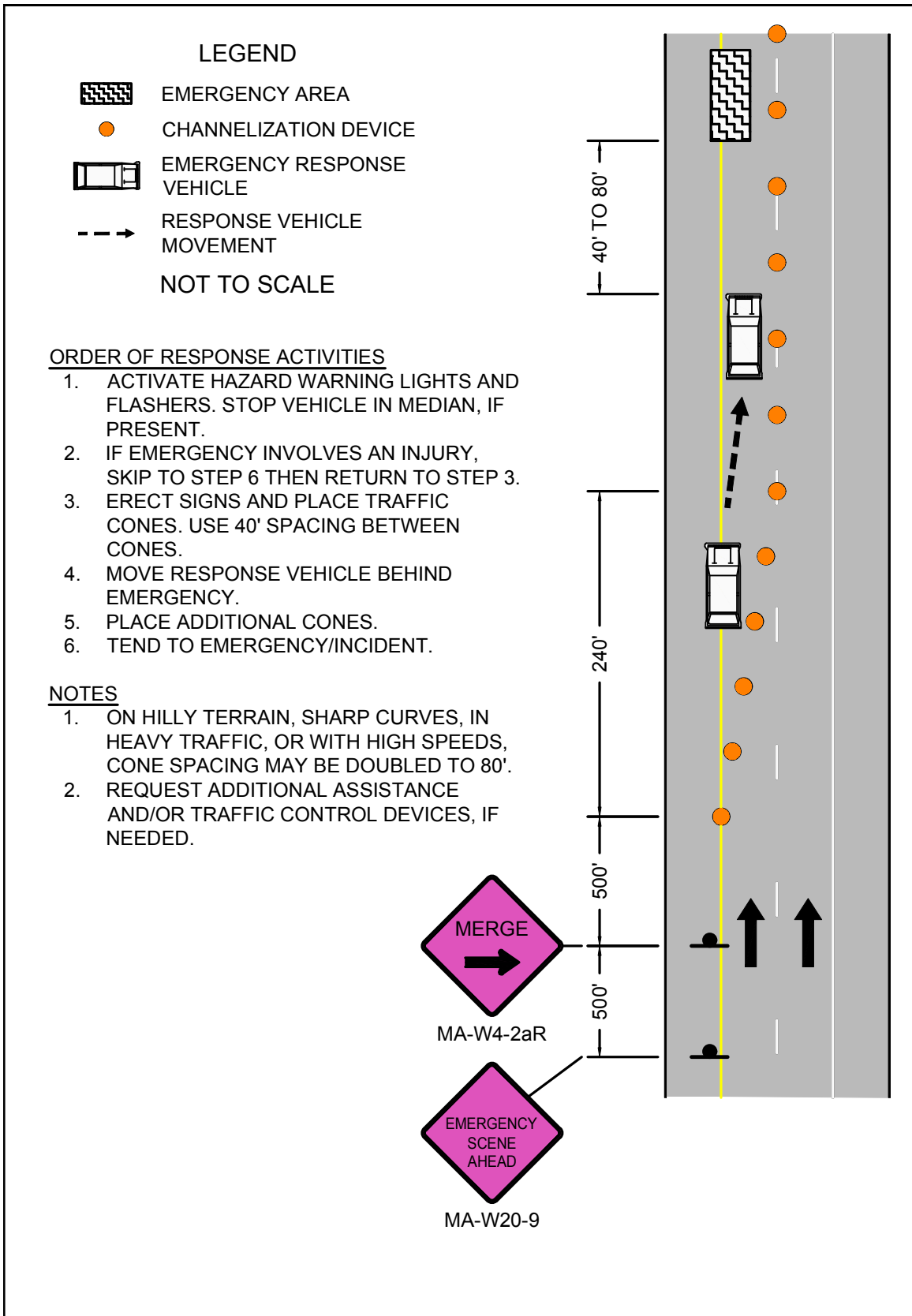
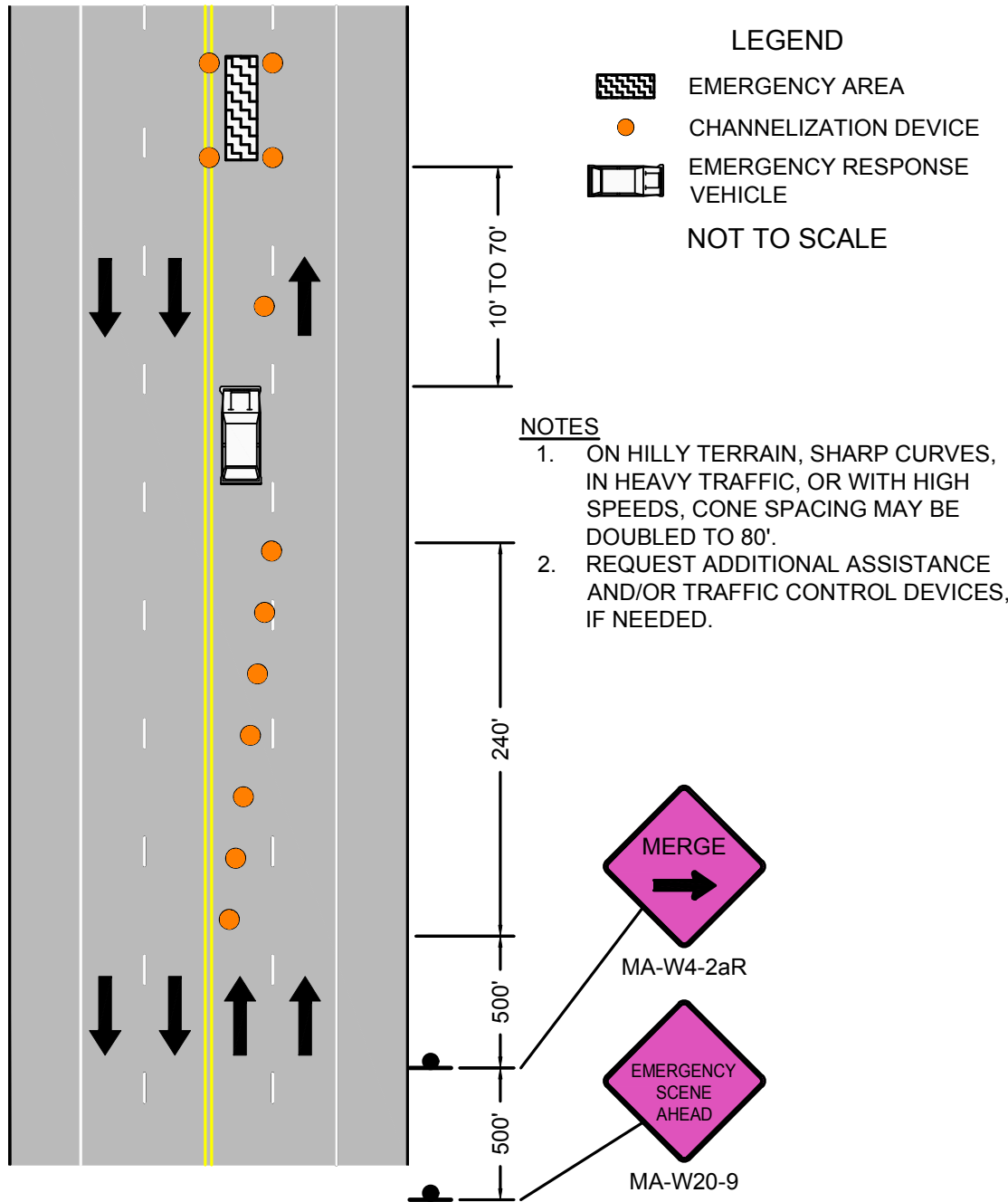




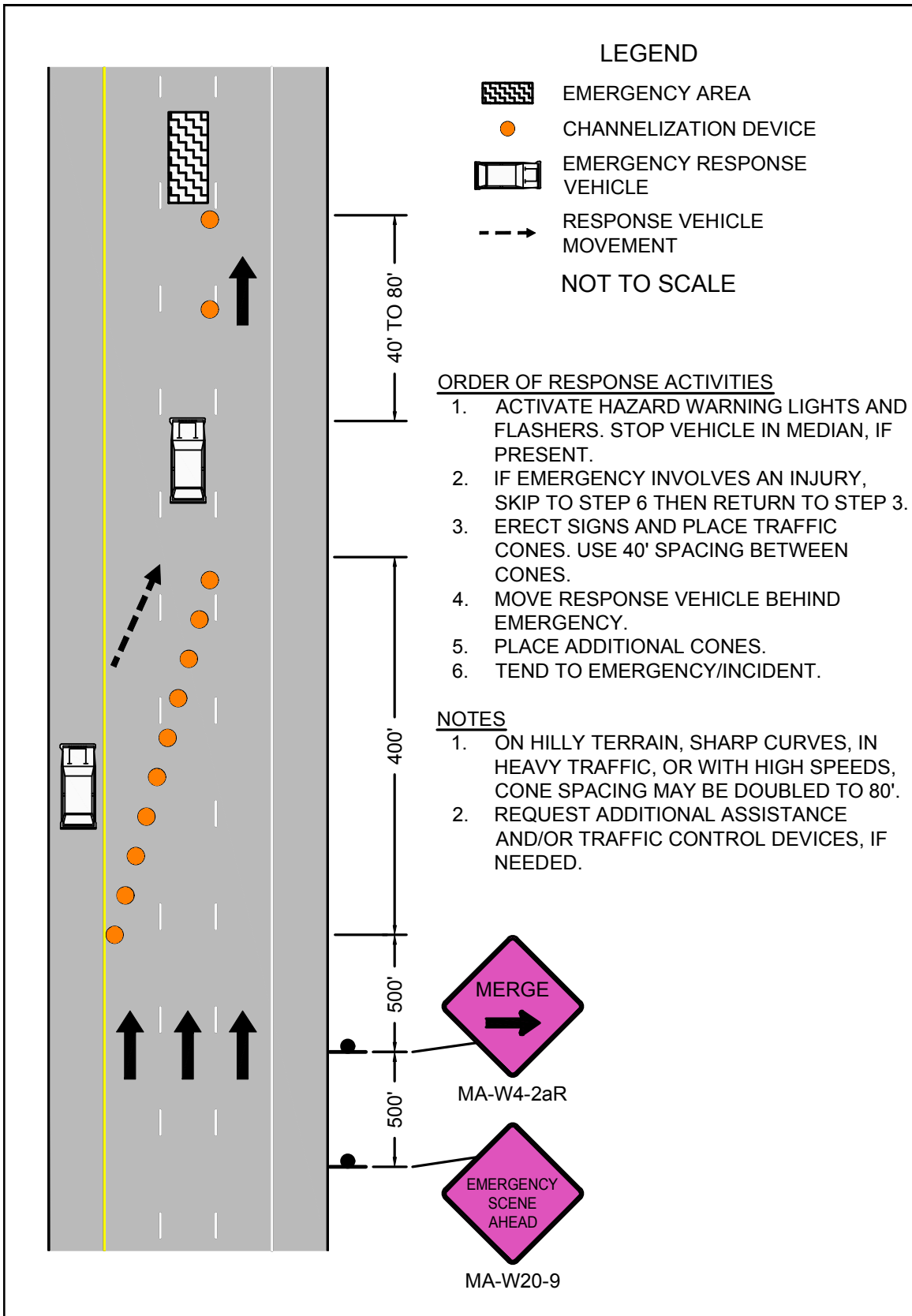
FIGURE 39  
EMERGENCY RESPONSE  
MULTILANE UNDIVIDED  
ROADWAY  
LEFT LANE



**ORDER OF RESPONSE ACTIVITIES**

1. ACTIVATE HAZARD WARNING LIGHTS AND FLASHERS. PULL VEHICLE OVER TO THE RIGHT EDGE OF BREAKDOWN LANE OR SHOULDER OR, IF NOT PRESENT, RIGHT EDGE OF TRAVEL LANE BEFORE STOPPING.
2. IF EMERGENCY INVOLVES AN INJURY, SKIP TO STEP 4 THEN RETURN TO STEP 3.
3. ERECT SIGNS AND PLACE TRAFFIC CONES. USE 40' SPACING BETWEEN CONES.
4. TEND TO EMERGENCY/INCIDENT.






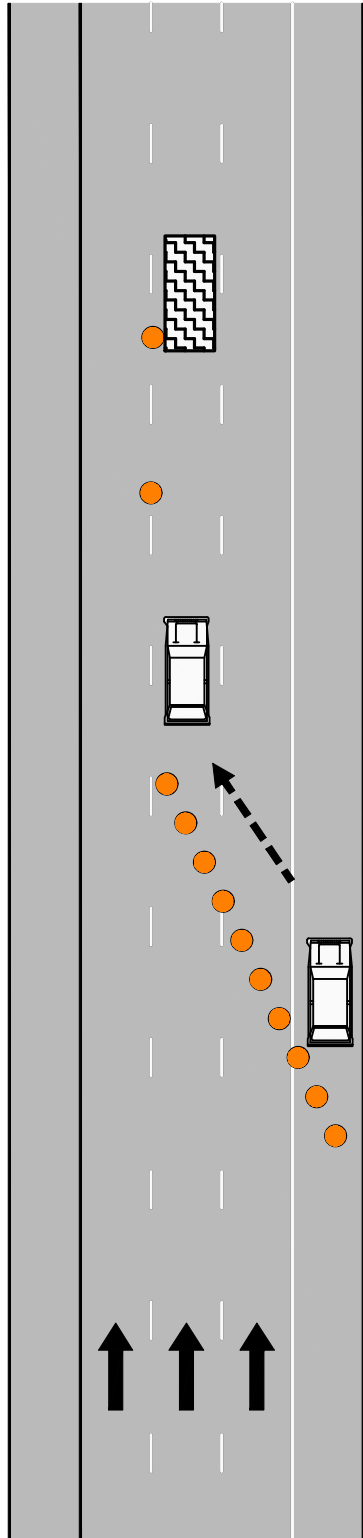




 MASSACHUSETTS DEPARTMENT OF TRANSPORTATION HIGHWAY DIVISION	Work Zone Safety Standard Details and Drawings	<b>FIGURE 40</b> EMERGENCY RESPONSE MULTILANE DIVIDED ROADWAY MIDDLE LANE APPROACH FROM LEFT
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FIGURE 41  
EMERGENCY RESPONSE  
MULTILANE DIVIDED ROADWAY  
MIDDLE LANE  
APPROACH FROM RIGHT



LEGEND

-  EMERGENCY AREA
-  CHANNELIZATION DEVICE
-  EMERGENCY RESPONSE VEHICLE
-  RESPONSE VEHICLE MOVEMENT

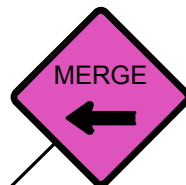
NOT TO SCALE

ORDER OF RESPONSE ACTIVITIES

1. ACTIVATE HAZARD WARNING LIGHTS AND FLASHERS. STOP VEHICLE IN BREAKDOWN LANE.
2. IF EMERGENCY INVOLVES AN INJURY, SKIP TO STEP 6 THEN RETURN TO STEP 3.
3. ERECT SIGNS AND PLACE TRAFFIC CONES. USE 40' SPACING BETWEEN CONES.
4. MOVE RESPONSE VEHICLE BEHIND EMERGENCY.
5. PLACE ADDITIONAL CONES.
6. TEND TO EMERGENCY.

NOTES

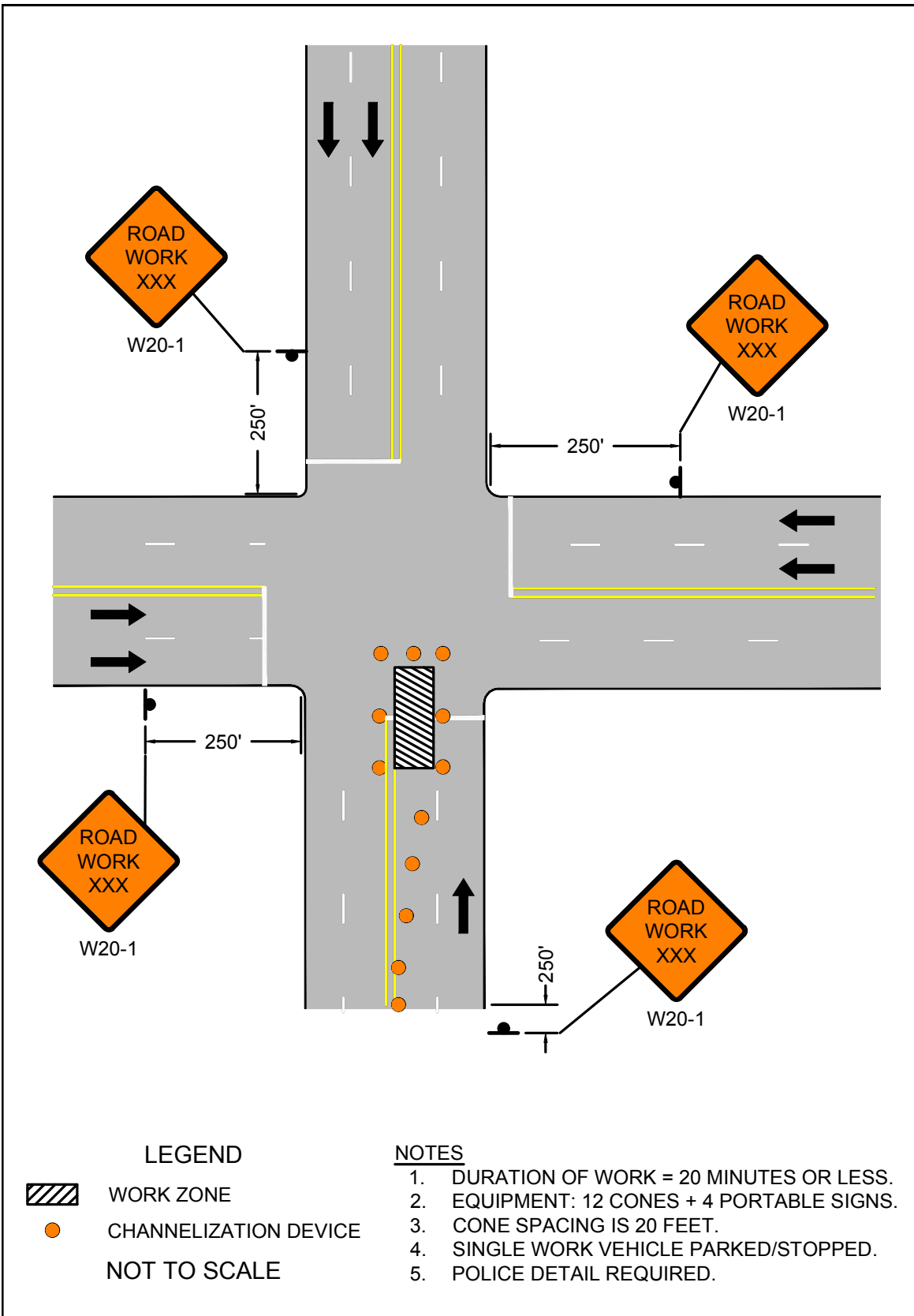
1. ON HILLY TERRAIN, SHARP CURVES, IN HEAVY TRAFFIC, OR WITH HIGH SPEEDS, CONE SPACING MAY BE DOUBLED TO 80'.
2. REQUEST ADDITIONAL ASSISTANCE AND/OR TRAFFIC CONTROL DEVICES, IF NEEDED.





MA-W4-2aL



MA-W20-9



**LEGEND**

-  WORK ZONE
-  CHANNELIZATION DEVICE

NOT TO SCALE

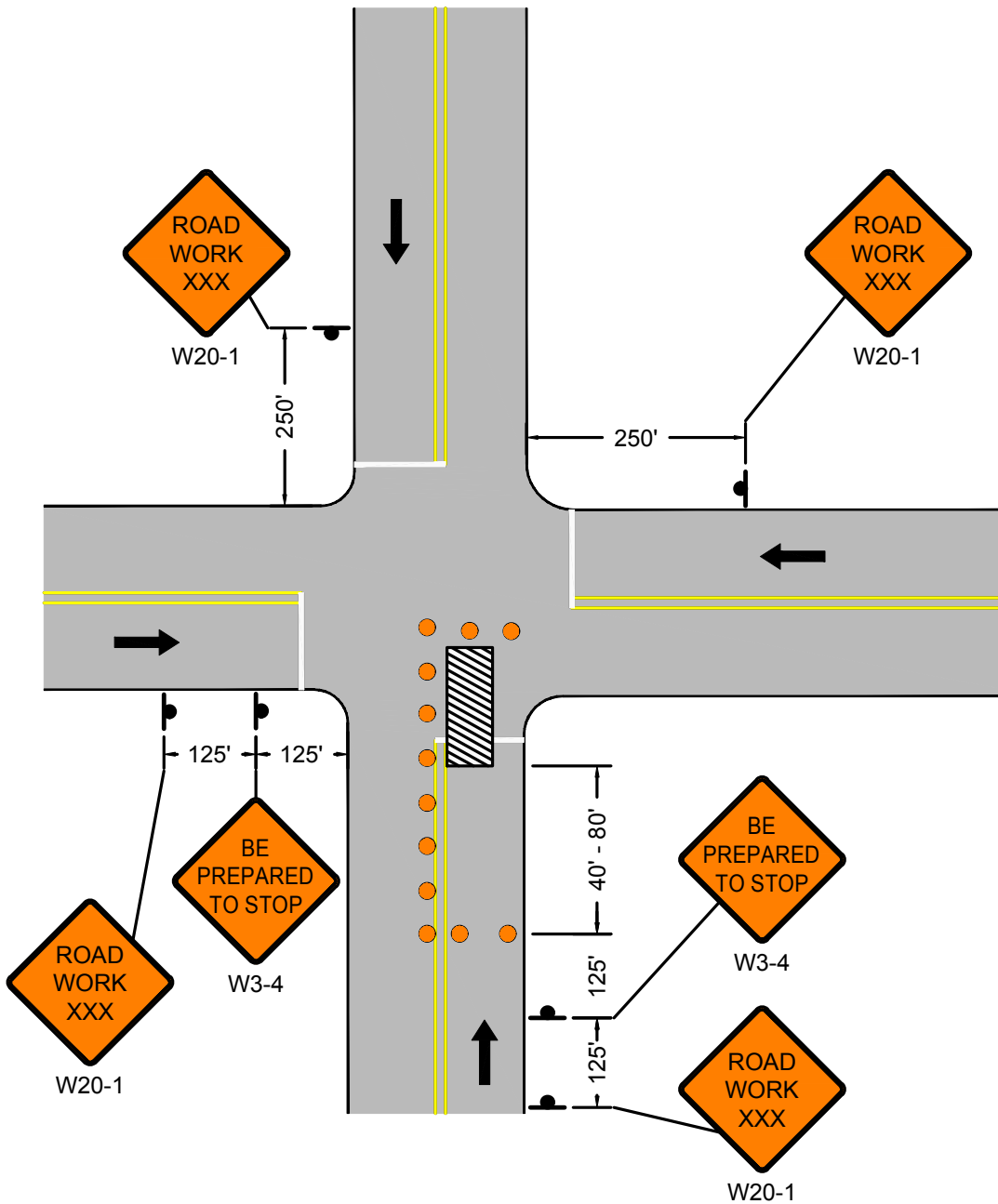
**NOTES**

1. DURATION OF WORK = 20 MINUTES OR LESS.
2. EQUIPMENT: 12 CONES + 4 PORTABLE SIGNS.
3. CONE SPACING IS 20 FEET.
4. SINGLE WORK VEHICLE PARKED/STOPPED.
5. POLICE DETAIL REQUIRED.







FIGURE 43  
TRAFFIC SIGNAL REPAIR WORK  
TWO LANE UNDIVIDED ROADWAY  
ONE LEG OF INTERSECTION

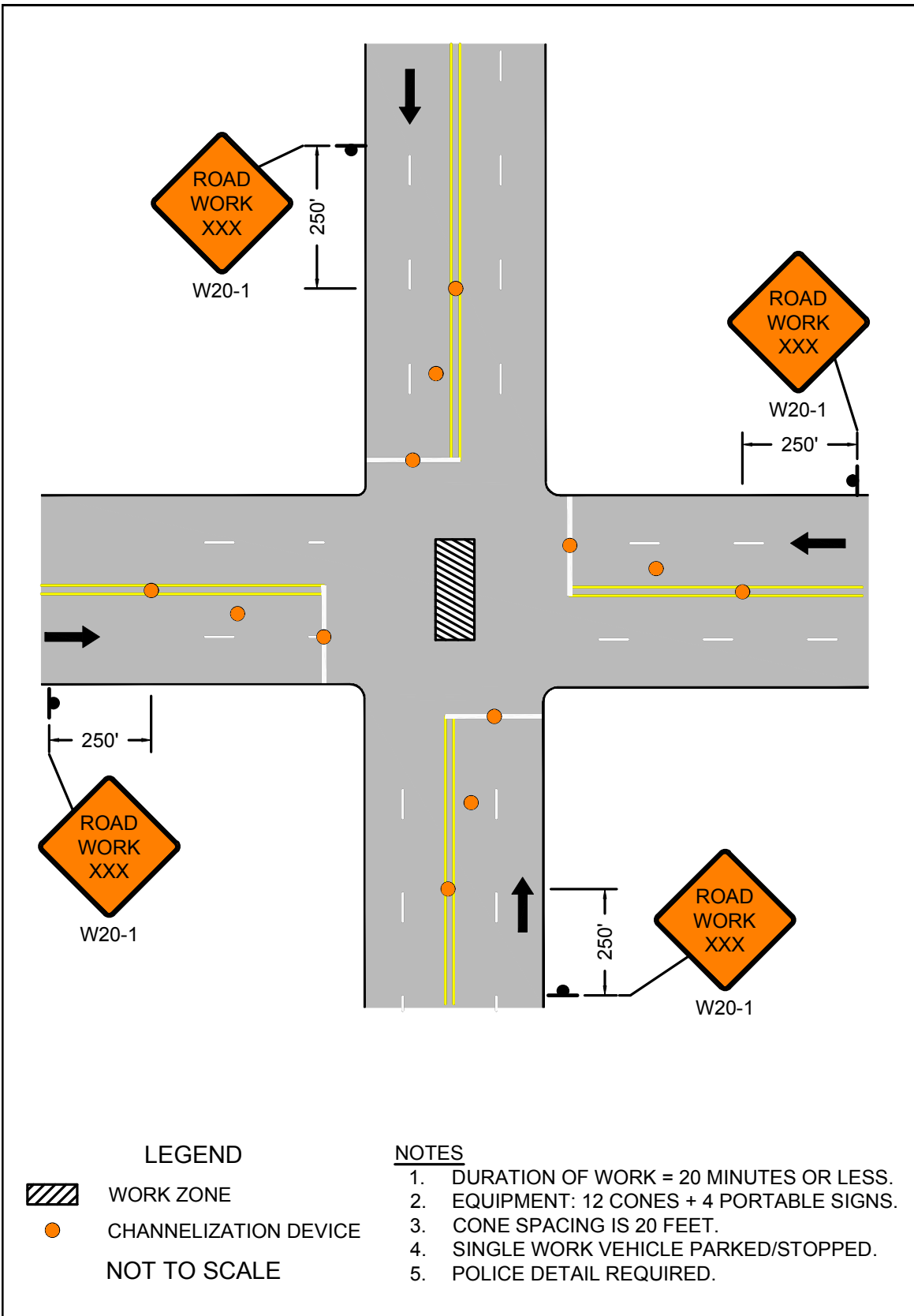



LEGEND

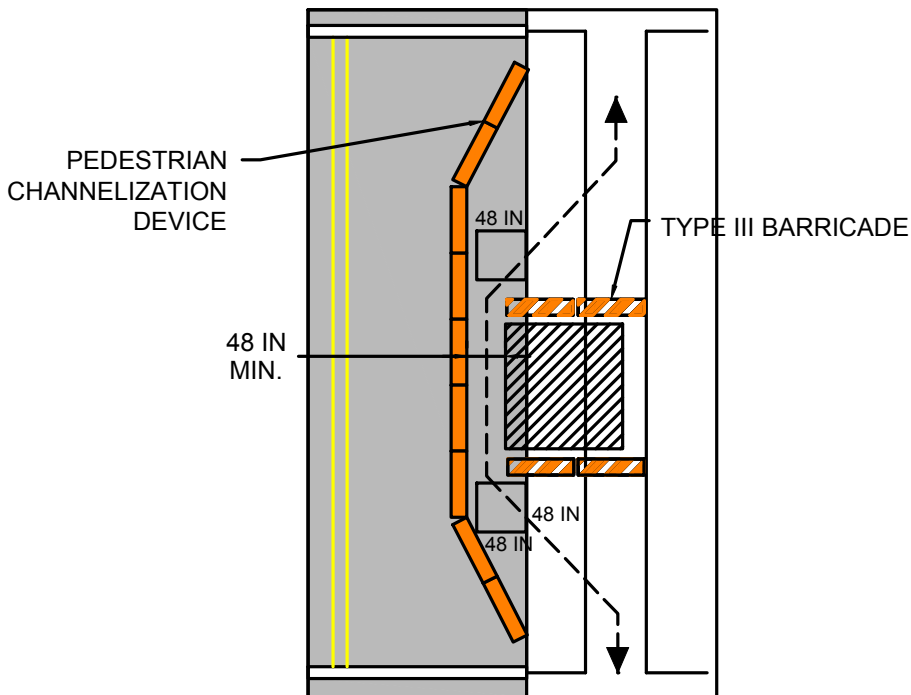
-  WORK ZONE
-  CHANNELIZATION DEVICE
- NOT TO SCALE

NOTES

1. DURATION OF WORK = 20 MINUTES OR LESS.
2. EQUIPMENT: 12 CONES + 6 PORTABLE SIGNS.
3. CONE SPACING IS 20 FEET.
4. SINGLE WORK VEHICLE PARKED/STOPPED.
5. POLICE DETAIL REQUIRED.

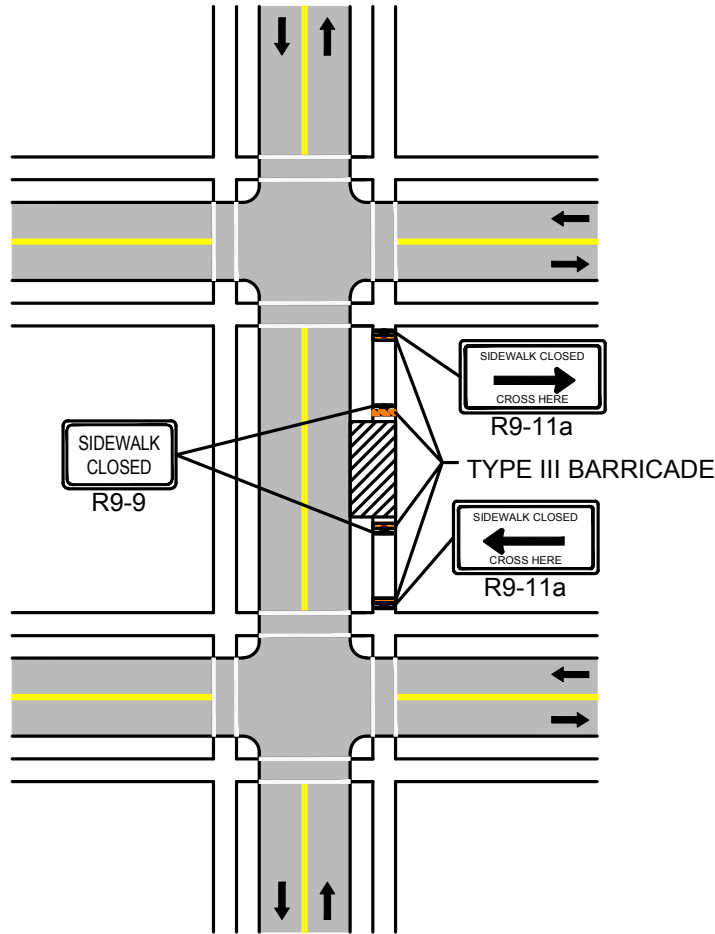


 <p>PAGE 78</p>	<p>Work Zone Safety Standard Details and Drawings</p>	<p>FIGURE 45 PEDESTRIAN BYPASS</p>
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**NOTES:**

1. WHEN EXISTING PEDESTRIAN FACILITIES ARE DISRUPTED, CLOSED, OR RELOCATED IN A TTC ZONE, TEMPORARY FACILITIES SHALL BE PROVIDED AND THEY SHALL BE DETECTABLE AND INCLUDE ACCESSIBILITY FEATURES CONSISTENT WITH THE FEATURES PRESENT IN THE EXISTING PEDESTRIAN FACILITY.
2. A PEDESTRIAN CHANNELIZATION DEVICE THAT IS DETECTABLE BY A PERSON WITH A VISUAL DISABILITY TRAVELING WITH THE AID OF A LONG CANE SHALL BE PLACED ALONG THE FULL LENGTH OF THE TEMPORARY PEDESTRIAN ROUTE.
3. WHEN USED, TEMPORARY RAMPS SHALL COMPLY WITH AMERICANS WITH DISABILITIES ACT.
4. THE ALTERNATE PATHWAY SHOULD HAVE A SMOOTH CONTINUOUS HARD SURFACE FOR THE ENTIRE LENGTH OF THE TEMPORARY PEDESTRIAN FACILITY.
5. THE TEMPORARY SIDEWALK SHOULD BE A MINIMUM OF 4 FEET WIDE. IF THE SIDEWALK EXCEEDS 200 FEET THEN A 5 FOOT BY 5 FOOT PASSING ZONE SHALL BE PROVIDED NEAR THE MID-POINT OF THE CLOSURE.
6. THE PROTECTIVE REQUIREMENTS OF A TTC WORK ZONE MAY HAVE AN IMPACT IN DETERMINING THE NEED FOR TEMPORARY TRAFFIC BARRIERS AND THEIR USE IN PROVIDING PEDESTRIAN DELINEATION SHOULD BE BASED ON ENGINEERING JUDGMENT.
7. ON-DEMAND PEDESTRIAN ASSISTANCE PERSONNEL TO ASSIST WITH NAVIGATION AROUND THE CLOSURE/WORK AREA MAY BE CONSIDERED AS AN OPTION IN PLACE OF PROVIDING ADA/AAB DEVICES FOR WORK FOR CLOSURES LASTING 4 HOURS OR LESS.
8. CONTROLS ONLY FOR PEDESTRIAN TRAFFIC ARE SHOWN; VEHICULAR TRAFFIC SHOULD BE HANDLED AS SHOWN ELSEWHERE. THESE DETAILS ARE USED IN CONJUNCTION WITH THE PROPOSED LANE CLOSURE DETAILS AND DURING CONSTRUCTION STAGING, AS DETERMINED BY THE ENGINEER.



**NOTES:**

1. CLOSURE OF A SIDEWALK FACILITY SHALL CONSTITUTE THE PROVISION FOR MANAGING PEDESTRIAN TRAFFIC AND ACCOMMODATING ALL USERS. IF THE EXISTING PEDESTRIAN ACCESS ROUTE(S) CAN BE TEMPORARILY RELOCATED ALONG THE EXISTING SIDEWALK , AND SAID FACILITY PROVIDES A MINIMUM WIDTH OF 48-INCHES OF SOLID, SMOOTH UNOBSTRUCTED SURFACE, THEN NO DETOURING OF THE ROUTE SHALL BE REQUIRED. DELINEATION OF THE WORK AREA IS STILL REQUIRED.
2. IF IT IS NECESSARY TO DIVERT PEDESTRIAN TRAFFIC TO AN ALTERNATE ROUTE ACROSS THE ROADWAY FROM THE EXISTING FACILITY, THE FIGURE ABOVE SHALL BE FOLLOWED TO PROVIDE ADEQUATE DIRECTION TO PEDESTRIANS. ALTERNATE ROUTE SHALL PROVIDE THE SAME LEVEL OF ACCOMMODATION AS THE FACILITY THAT IS BEING DETOURED AND RETAIN ADA COMPLIANCE IN ITS ENTIRETY.
3. FOR EMERGENCY OR SHORT-DURATION SIDEWALK CLOSURES OF 4-HOURS OR LESS, IT IS OPTIONAL TO HAVE ON-DEMAND PEDESTRIAN ASSISTANCE PERSONNEL AVAILABLE AT ALL TIMES DURING THE CLOSURE TO ASSIST THOSE MOBILITY CHALLENGED PERSONS WHO REQUIRE ADDITIONAL ASSISTANCE TO SAFELY NAVIGATE AROUND THE WORK AREA IN LIEU OF A FULL DETOUR.





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Work Zone Safety  
Standard Details  
and Drawings

STATIONARY OPERATIONS  
BIKE LANE CLOSURE










POSTED SPEED LIMIT (MPH)	SPACING FOR BIKE ADVANCE WARNING SIGNS (FT) (A,B))	CHANNELIZATION DEVICES (DRUMS OR CONES)			
		TRANSITION LENGTH (L/3)	BUFFER ZONE LENGTH (FT)	DEVICE SPACING (FT)	MIN # OF DEVICES*
25-40	150 / 150	100	305	20	45
45-55	150 / 150	220	495	40	35
60-65	150 / 150	260	645	40	40

\* NUMBER OF DEVICES BASED ON 400 FT WORK ZONE.

**NOTES**

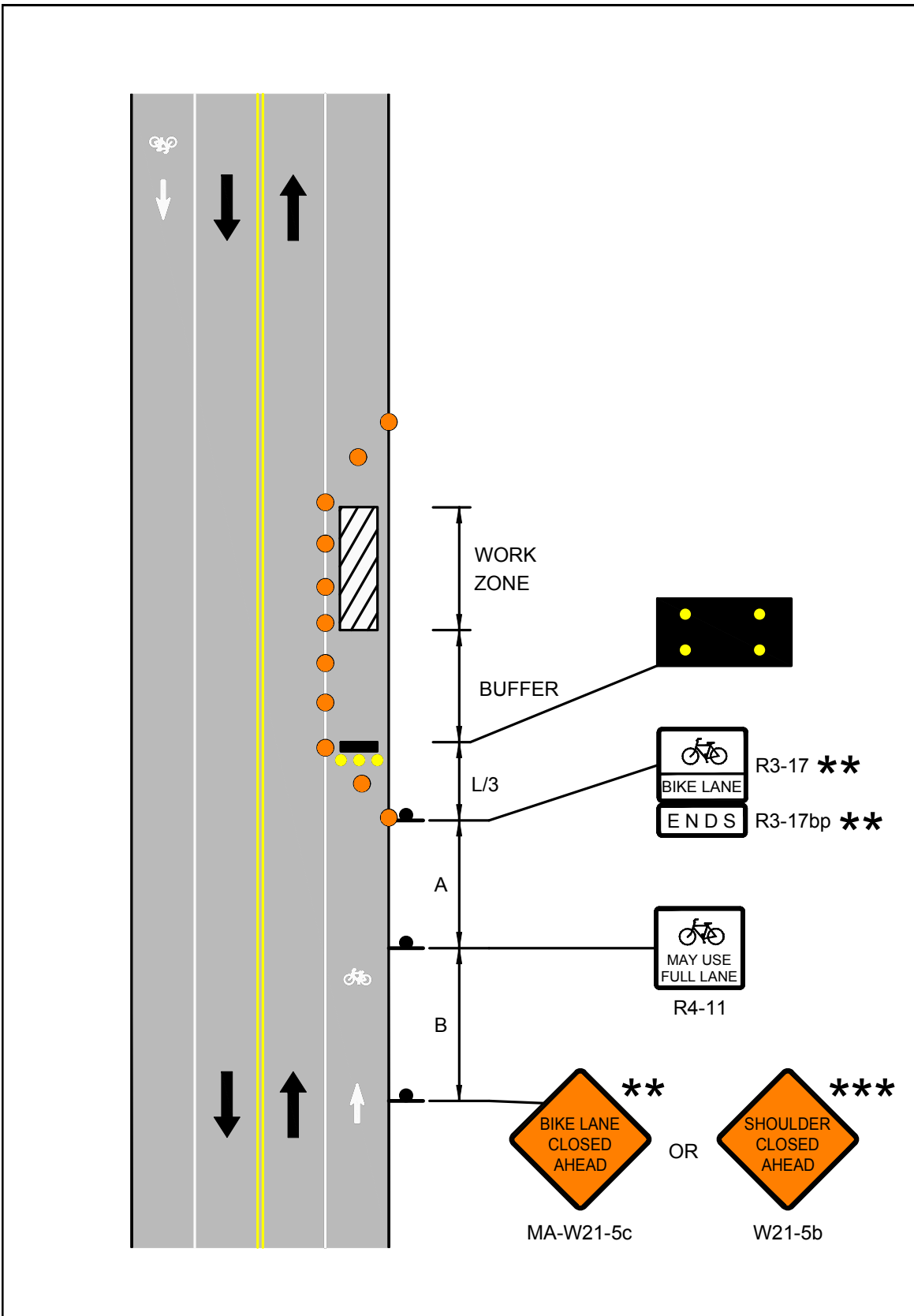
1. DETAIL SHALL BE USED IN CONJUNCTION WITH THE PROPOSED LANE CLOSURE DETAILS. SIGNING SHOWN ONLY FOR BIKE TRAFFIC. FOLLOW ALL OTHER RELEVANT DETAILS FOR TTC DEVICES FOR VEHICULAR TRAFFIC.
2. **\*\*** SIGN SHALL BE USED ONLY IF THERE IS A MARKED BIKE LANE.
3. **\*\*\*** SIGN SHALL BE USED ONLY IF THERE IS NO MARKED BIKE LANE.


**LEGEND**

-  WORK ZONE
-  CHANNELIZATION DEVICE
-  FLASHING ARROW BOARD
-  PORTABLE CHANGEABLE MESSAGE SIGN
-  TRUCK MOUNTED ATTENUATOR
-  RADAR SPEED FEEDBACK BOARD
-  POLICE DETAIL OR UNIFORMED FLAGGER
-  TEMPORARY PORTABLE RUMBLE STRIP
-  TYPE III BARRICADE

NOT TO SCALE





 <p>Massachusetts Department of Transportation Highway Division</p> <p>PAGE 81</p>	<p>Work Zone Safety Standard Details and Drawings</p>	<p>FIGURE 48 STATIONARY OPERATIONS BIKE LANE CLOSURE</p>
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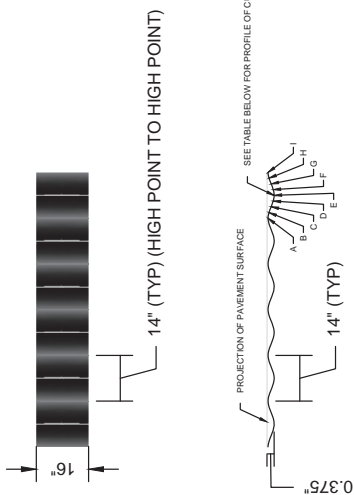
**Safety is everyone's business**

Rev. June, 2017

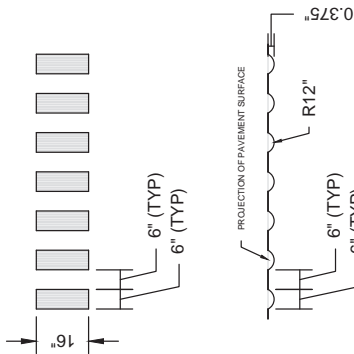
DOCUMENT A00816

# RUMBLE STRIP DETAILS

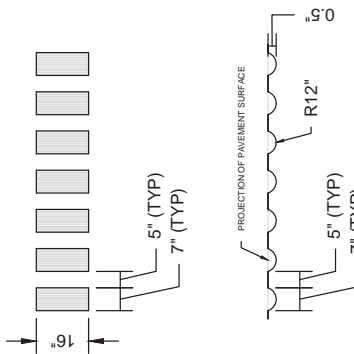
**TYPE C**  
**CONTINUOUS SINUSOIDAL**  
**RUMBLE STRIP**



**TYPE B**  
**CYLINDER RUMBLE STRIP**  
**(BICYCLE TRAVEL PERMITTED)**



**TYPE A**  
**CYLINDER RUMBLE STRIP**  
**(BICYCLE TRAVEL PROHIBITED)**



- NOTES:**
1. NOT TO SCALE. SOME LINE WORK EXAGGERATED FOR CLARITY.
  2. SEE PLANS FOR LOCATION(S) AND START AND END STATIONS FOR ALL RUMBLE STRIP INSTALLATIONS.
  3. HIGH POINT OF SINUSOIDAL RUMBLE STRIP LOCATED  $\frac{1}{16}$ " BELOW PAVEMENT SURFACE.

**DESIGN OF CURVE PROFILE FOR SINUSOIDAL RUMBLE STRIP**

POINT	A	B	C	D	E	F	G	H	I
DEPTH FROM PAVEMENT SURFACE (IN.)	$\frac{1}{16}$	$\frac{1}{8}$	$\frac{7}{32}$	$\frac{11}{32}$	$\frac{3}{8}$	$\frac{11}{32}$	$\frac{7}{32}$	$\frac{1}{8}$	$\frac{1}{16}$
DISTANCE FROM HIGH POINT "A" (IN.)	0	1.75	3.5	5.25	7	8.75	10.5	12.25	14

**massDOT**  
Massachusetts Department of Transportation  
Highway Division

**TRAFFIC & SAFETY STANDARDS**  
SECTION 860

**RUMBLE STRIP DETAILS**

D-T-E OF ISSUE  
2020

DR- ING NUMBER  
**XXX.X.X**

DOCUMENT A00820

**Massachusetts Department of Transportation  
Conditions of Custody**

REQUEST FOR RELEASE OF MASSDOT AUTOCAD FILES FORM

(Only to be used following award of contract)

City/Town: WEBSTER Project File Number: 608433

Contract Number 126697

Project Description: Intersection Improvements at I-395 Ramps (Exit 3) at Route 16 (East Main Street) and Sutton Road

All AutoCAD files are provided solely as a courtesy to facilitate public access to information. MassDOT attempts to provide current and accurate information but cannot guarantee so. MassDOT provides such documents, files or other data "as is" without any warranty of any kind, either expressed or implied, including but not limited to, accuracy, reliability, omissions, completeness and currentness. The Commonwealth of Massachusetts and its Consultants shall not be liable for any claim for damages, including lost profits or other consequential, exemplary, incidental, indirect or special damages, relating in any way to the documents, files or other data accessible from this file, including, but not limited to, claims arising out of or related to electronic access or transmission of data or viruses. Because data stored on electronic media can deteriorate undetected or be modified without our knowledge, MassDOT cannot be held liable for its completeness or correctness. MassDOT makes no representation as to the compatibility of these files beyond the version of the stated CAD software.

By signing this form, I agree that it shall be my responsibility to reconcile this electronic data with the conformed contract documents, and that only the conformed contract documents shall be regarded as legal documents for this Project. I understand that this authorization does not give me the right to distribute the files. I agree to the terms above and wish to receive the AutoCAD files.

This signed form shall be emailed to the Highway Design Engineer at the MassDOT -Highway Division at the following email address:

[DOTHighwayDesign@dot.state.ma.us](mailto:DOTHighwayDesign@dot.state.ma.us)

Attn: AutoCAD Files

Name of person requesting AutoCAD files: \_\_\_\_\_

Affiliation/Company: \_\_\_\_\_

Address: \_\_\_\_\_

Telephone number: \_\_\_\_\_

Email address: \_\_\_\_\_

Signature/Date: \_\_\_\_\_

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