

VOLUME 1 OF 2

COMMONWEALTH OF MASSACHUSETTS



**CONTRACT DOCUMENTS
AND SPECIAL PROVISIONS**

PROPOSAL NO.	608930-128034
P.V. =	\$25,656,000.00
PLANS	YES

FOR

**Federal Aid Project No. CMQ-003S(733)X
Lawrence Manchester Rail Corridor (LMRC) Rail Trail**

in the City of

LAWRENCE

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

This Proposal to be opened and read:

TUESDAY, NOVEMBER 19, 2024 at 2:00 P.M.

THIS PAGE IS INTENTIONALLY LEFT BLANK

DOCUMENT 00010

TABLE OF CONTENTS

VOLUME 1 of 2

DOCUMENT 00010
TABLE OF CONTENTS 00010-1 through 4

DOCUMENT 00104
NOTICE TO CONTRACTORS..... 00104- 1 through 4

DOCUMENT 00210
REQUIREMENTS OF MASSACHUSETTS GENERAL
LAWS CHAPTER 30 SECTION 39R; CHAPTER 30, SECTION 39O 00210-1 through 4

DOCUMENT 00331
LOCUS MAP 00331-1 through 2

DOCUMENT 00439
CONTRACTOR PROJECT EVALUATION FORM 00439-1 through 2

DOCUMENT 00440
SUBCONTRACTOR PROJECT EVALUATION FORM 00440-1 through 2

DOCUMENT 00710
GENERAL CONTRACT PROVISIONS..... 00710-1 through 2

DOCUMENT 00713
SUBSECTION 701
CEMENT CONCRETE SIDEWALKS, PEDESTRIAN CURB RAMPS, AND DRIVEWAYS
AND GUIDE TO THE INTERIM SUBSECTION 701
CEMENT CONCRETE SIDEWALK SPECIFICATION..... 00713-1 through 34

DOCUMENT 00715
SUPPLEMENTAL SPECIFICATIONS 00715-1 through 22

DOCUMENT 00719
SPECIAL PROVISIONS FOR PARTICIPATION BY DISADVANTAGED
BUSINESS ENTERPRISES 00719-1 through 18

DOCUMENT 00760
REQUIRED CONTRACT PROVISIONS FOR FEDERAL-AID
CONSTRUCTION CONTRACTS..... 00760-1 through 14

DOCUMENT 00811
MONTHLY PRICE ADJUSTMENT FOR HOT MIX ASPHALT
(HMA) MIXTURES..... 00811-1 through 2

DOCUMENT 00812
MONTHLY PRICE ADJUSTMENT FOR DIESEL FUEL AND GASOLINE 00812-1 through 2

DOCUMENT 00813
PRICE ADJUSTMENT FOR STRUCTURAL STEEL
AND REINFORCING STEEL 00813-1 through 4

DOCUMENT 00814
PRICE ADJUSTMENT FOR PORTLAND CEMENT CONCRETE MIXES 00814-1 through 2

TABLE OF CONTENTS (Continued)

VOLUME 1 of 2 (Continued)

DOCUMENT 00820
THE COMMONWEALTH OF MASSACHUSETTS
SUPPLEMENTAL EQUAL EMPLOYMENT OPPORTUNITY,
NON-DISCRIMINATION AND AFFIRMATIVE ACTION PROGRAM 00820-1 through 6

DOCUMENT 00821
ELECTRONIC REPORTING REQUIREMENTS
CIVIL RIGHTS PROGRAM AND CERTIFIED PAYROLL 00821-1 through 2

DOCUMENT 00859
CONTRACTOR/SUBCONTRACTOR CERTIFICATION FORM 00859-1 through 2

DOCUMENT 00860
COMMONWEALTH OF MASSACHUSETTS PUBLIC EMPLOYMENT LAWS 00860-1 through 2

DOCUMENT 00861
STATE PREVAILING WAGE RATES 00861-1 through 50

DOCUMENT 00870
STANDARD FEDERAL EQUAL EMPLOYMENT OPPORTUNITY
CONSTRUCTION CONTRACT SPECIFICATIONS 00870-1 through 8

DOCUMENT 00875
TRAINEE SPECIAL PROVISIONS 00875-1 through 2

DOCUMENT 00880
MINIMUM WAGES FOR FEDERAL AND FEDERALLY
ASSISTED CONTRACTS..... 00880-1 through 44

DOCUMENT A00801
SPECIAL PROVISIONS A00801-1 through 456

DOCUMENT A00802
DETAIL SHEETS A00802-1 through 48

DOCUMENT A00803
DRAWINGS AND SKETCHES
EXISTING BRIDGE PLANS A00803-1 through 12

DOCUMENT A00806
RAILROAD SPECIAL PROVISIONS A00806-1 through 160

DOCUMENT A00808
PROJECT UTILITY COORDINATION FORM A00808-1 through 8

DOCUMENT A00810
MASSDOT HERBICIDE USE REPORT A00810-1 through 2

DOCUMENT A00811
WATERING LOG FOR MASSDOT PLANTINGS A00811-1 through 2

DOCUMENT A00813
ALTERNATIVE TRANSPORTATION CORRIDOR LEASE AGREEMENT
BY AND BETWEEN MBTA AND CITY OF LAWRENCE A00813-1 through 40

DOCUMENT A00815
WORK ZONE SAFETY
TEMPORARY TRAFFIC CONTROL A00815-1 through 86

TABLE OF CONTENTS (Continued)

VOLUME 2 of 2

DOCUMENT A00817
LANDSCAPE MAINTENANCE AGREEMENT A00817-1 through 20

DOCUMENT A00818
CONDITIONS FOR PROPOSED ACTIVITIES
WITHIN TRANSMISSION LINE RIGHTS-OF-WAY A00818-1 through 12

DOCUMENT A00819
BIKE WAYFINDING DESIGN GUIDE A00819-1 through 46

DOCUMENT A00820
REQUEST FOR RELEASE OF MASSDOT AUTOCAD FILES FORM..... A00820-1 through 2

DOCUMENT A00830
SELF-VERIFICATION (SV) APPLICATION..... A00830-1 through 104

DOCUMENT A00831
ARMY CORPS OF ENGINEERS
GENERAL PERMITS FOR THE COMMONWEALTH OF MASSACHUSETTS A00831-1 through 94

DOCUMENT A00832
ARMY CORPS OF ENGINEERS
SELF-VERIFICATION (SV) APPROVAL..... A00832-1 through 6

DOCUMENT A00860
MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION
NOTICE OF INTENT A00860-1 through 506

DOCUMENT A00861
MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION
ORDER OF CONDITIONS A00861-1 through 18

DOCUMENT A00865
CHAPTER 91
MINOR MODIFICATION APPLICATION A00865-1 through 20

DOCUMENT A00866
CHAPTER 91
MINOR MODIFICATION APPROVAL..... A00866-1 through 4

DOCUMENT A00869
NOAA FISHERIES – SECTION 7
NO-EFFECT DETERMINATION..... A00869-1 through 250

DOCUMENT A00870
MASSACHUSETTS DIVISION OF FISHERIES AND WILDLIFE
NATURAL HERITAGE AND ENDANGERED SPECIES PROGRAM
NHESP NO TAKE LETTER A00870-1 through 4

DOCUMENT A00871
NMFS NO ADVERSE EFFECT DETERMINATION..... A00871-1 through 4

TABLE OF CONTENTS (Continued)

VOLUME 2 of 2 (Continued)

DOCUMENT A00872
 UNITED STATES DEPARTMENT OF THE INTERIOR
 FISH AND WILDLIFE SERVICE (USFWS NLAA)
 CONCURRENCE VERIFICATION LETTER..... A00872-1 through 16

DOCUMENT A00873
 UNITED STATES COAST GUARD
 SURFACE TRANSPORTATION AND UNIFORM RELOCATION ASSISTANCE ACT (STURRA)
 STURAA EXEMPTION A00873-1 through 30

DOCUMENT A00875
 POLICY DIRECTIVE P-22-001 AND POLICY DIRECTIVE P-22-002 A00875-1 through 8

DOCUMENT A00876
 SECTION 106 CLEARANCE AND USACOE..... A00876-1 through 30

DOCUMENT A00880
 GEOTECHNICAL REPORTS..... A00880-1 through 296

DOCUMENT B00420
 PROPOSAL.....B00420-1 through 30

DOCUMENT B00853
 SCHEDULE OF PARTICIPATION BY DISADVANTAGED
 BUSINESS ENTERPRISES (DBEs)B00853-1 through 2

DOCUMENT B00854
 DISADVANTAGED BUSINESS ENTERPRISES (DBE) PARTICIPATION
 LETTER OF INTENT.....B00854-1 through 2

DOCUMENT B00855
 DBE JOINT CHECK ARRANGEMENT APPROVAL FORM.....B00855-1 through 2

DOCUMENT B00856
 JOINT VENTURE AFFIDAVITB00856-1 through 4

*** END OF DOCUMENT ***

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 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, NOVEMBER 19, 2024 at 2:00 P.M. **

LAWRENCE

Federal Aid Project No. CMQ-003S(733)X

Lawrence Manchester Rail Corridor (LMRC) Rail Trail

****Date Subject to Change**

PROJECT VALUE = \$25,656,000.00

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.

Proposal documents for official bidders are posted on 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 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.

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 ARLINGTON.

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 \$575.00 per ton, Portland cement \$425.53 per ton, diesel fuel \$2.713 per gallon, and gasoline \$2.666 per gallon, and Steel Base Price Index 409.2. 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.

BY: Monica G. Tibbits-Nutt, Secretary and CEO, MassDOT
Jonathan L. Gulliver, Administrator, MassDOT Highway Division
SATURDAY, SEPTEMBER 7, 2024

THIS PAGE IS LEFT BLANK INTENTIONALLY

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.

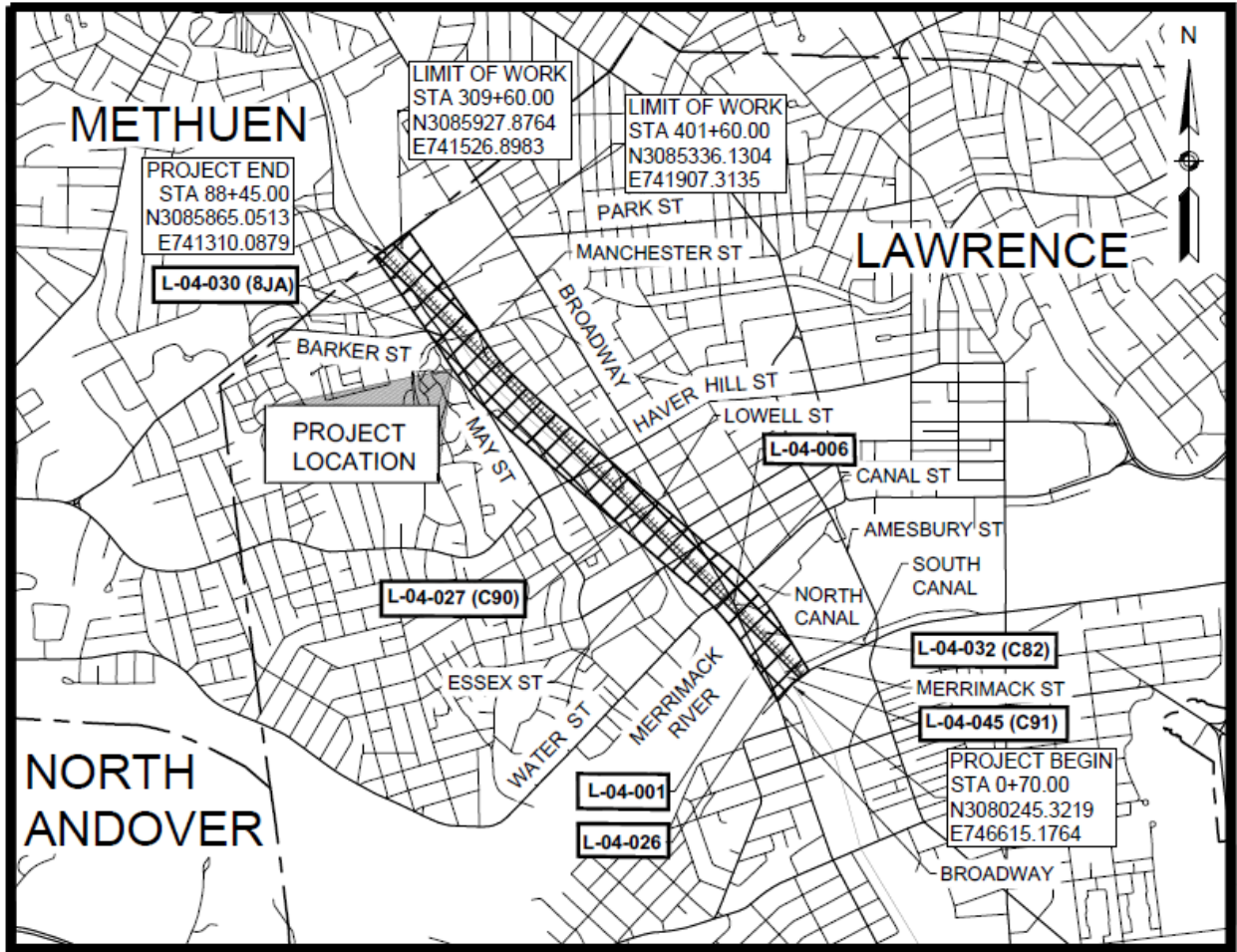
THIS PAGE INTENTIONALLY LEFT BLANK

DOCUMENT 00331

LOCUS MAP

LAWRENCE

**Federal Aid Project No. CMQ-003S(733)X
Lawrence Manchester Rail Corridor (LMRC) Rail Trail**



NOT TO SCALE

THIS PAGE IS INTENTIONALLY LEFT BLANK

DOCUMENT 00439



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
1. Workmanship								x 2=
2. Safety								x 2=
3. Schedule								x 1.5=
4. Home Office Support								x 1=
5. Subcontractors Performance								x 1=
6. Field Supervision/ Superintendent								x 1=
7. Contract Compliance								x 0.5=
8. Equipment								x 0.5=
9. Payment of Accounts								x 0.5=
(use back for additional comments)								Overall Rating:

(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): _____

CONTRACTOR PROJECT EVALUATION FORM (Continued)

Date: _____ Contract Number: _____

INFORMATION FOR DISTRICT HIGHWAY DIRECTORS RELATING TO PREQUALIFICATION

A deduction shall be recommended for unsatisfactory performance if computed overall rating is under 80%.

A deduction may be recommended for this project being completed late due to the Contractor's fault.

RECOMMENDATIONS FOR DEDUCTIONS FROM CONTRACTORS' ASSIGNED FACTOR

(Write Yes or No in space provided)

I recommend a deduction for Contractor's unsatisfactory performance: _____

I recommend a deduction for project completed late: _____

Signed: _____

District Highway Director

EXPLANATION OF RATINGS 1 – 9: _____

WORK NOT COMPLETED WITHIN SPECIFIED TIME: _____



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
1. Workmanship								x 2=
2. Safety								x 2=
3. Schedule								x 1.5=
4. Home Office Support								x 1.5=
5. Field Supervision/ Superintendent								x 1=
6. Contract Compliance								x 1=
7. Equipment								x 0.5=
8. Payment of Accounts								x 0.5=
(use back for additional comments)								Overall Rating:

(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: _____



SUBCONTRACTOR PROJECT EVALUATION FORM (Continued)

Date: _____ Contract Number: _____

INFORMATION FOR DISTRICT HIGHWAY DIRECTORS RELATING TO PREQUALIFICATION

A deduction shall be recommended for unsatisfactory performance if computed overall rating is under 80%.
A deduction may be recommended for this project being completed late due to the Contractor's fault.

RECOMMENDATIONS FOR DEDUCTIONS FROM CONTRACTORS' ASSIGNED FACTOR

(Write Yes or No in space provided)

I recommend a deduction for Contractor's unsatisfactory performance: _____

I recommend a deduction for project completed late: _____

Signed: _____
District Highway Director

EXPLANATION OF RATINGS 1 – 8: _____

WORK NOT COMPLETED WITHIN SPECIFIED TIME: _____

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.

*** END OF DOCUMENT ***

THIS PAGE IS INTENTIONALLY LEFT BLANK

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)

THIS PAGE INTENTIONALLY LEFT BLANK

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 ^[1]

^[1] 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		–

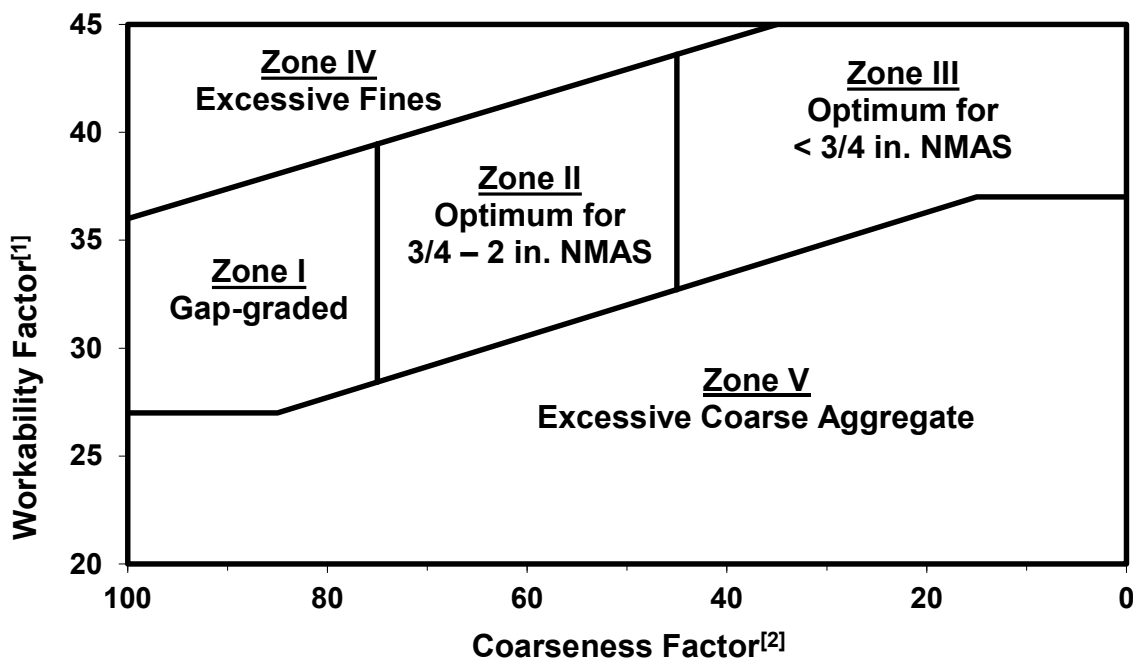
2. Shilstone Workability-Coarseness Chart.

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



^[1] 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.

^[2] 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^{[1][2]}

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 ^[3]	–
			Fly Ash (Class F)	15 – 30
			Slag (Grade 100 or 120)	25 – 50
			Silica Fume	5 – 10
			Total SCM	≤ 50
			Total Fly Ash and Silica Fume	≤ 35

^[1] 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.

^[2] 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.

^[3] 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 ^[1]	–
	Optically Strained, Microfractured or Microcrystalline Quartz (%)	≤ 5.0
	Chert or Chalcedony (%)	≤ 3.0
	Trydimite or Cristobalite (%)	≤ 1.0
	Opal (%)	≤ 0.5
	Natural Volcanic Glass (%)	≤ 3.0
T 380	Alkali Silica Reaction Resistance: Expansion of Miniature Concrete Prisms at 56 days (%)	≤ 0.03 ^[2]

^[1] 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.

^[2] 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 ^[1]	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

^[1] 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) ^[1]	27
Paste Content (%) ^[2]	≤ 28 ^[3]
Paste Content to Aggregate Void Content Ratio ^[4]	1.25 – 1.75
Excess Volume of Paste for Workability (%) ^[5]	–

^[1] 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).

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

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

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

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

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

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

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

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

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

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

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

^[4] 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.

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

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

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

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

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

^[5] 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 ft²/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 ft²/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

Type	Description
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

Type	Description
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/ft²/hr), T_c = concrete temperature of the evaporating surface (°F), r = relative humidity of air surrounding the evaporating surface (%), T_a = 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 ½ 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 ft². The depth of the scoring shall be at least ½ in. deep and no more than ½ 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 ^[1]
50°F ≤ °F ≤ 90°F	≥ Seven (7) days	≥ 70% f _c

^[1] 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

Operation	Operators^[1]	Activity
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		

^[1] Recommended number of operators.

Table 701.62-2: Minimum Operator Activities (Continued)

Operation	Operators ^[1]	Activity
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
	One (1)	701.30.E.3.b: Liquid Membrane-Forming Compounds for Curing and Sealing
701.46: Protective Sealing	One (1)	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

^[1] 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.) ^[1]	100 cy	1 per Sublot	Point of Discharge	Target \pm 1.5
Workability	T 119	Segregation Resistance ^[2]	100 cy	1 per Sublot	Point of Discharge	Pass
Thermal	T 309	Concrete Temperature (°F)	100 cy	1 per Sublot	Point of Discharge	50 – 90
Strength	T 22	Compressive Strength at 7 Days for Curing Termination (psi) ^[3]	100 cy	1 per Sublot	Point of Discharge	\geq 70% f'_c
		Compressive Strength at 28 Days (psi) ^[3]	100 cy	1 per Sublot	Point of Discharge	\geq 100% f'_c
		Compressive Strength at 56 Days (psi) ^{[3][4]}	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

^[1] 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.

^[2] 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.

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

^[4] 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	
701.30.A	Combined Aggregate System	
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
701.30.B	Paste System	
701.30.B.1	The mix design's Water-Cementitious Ratio should be ≤ 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 ≤ 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

701.73 Acceptance Sampling and Testing		
T 119	The Slump shall meet Table 701.71-1: Minimum Acceptance Sampling and Testing Requirements (± 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

Section	Activity	
701.40	Pre-Placement	
	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
701.41	Placement (Concrete Discharging)	
	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
701.41	Placement	
	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
701.42	Initial Curing (When Applicable)	
	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
701.43	Finishing	
	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
701.44	Intermediate Curing (When Applicable, Apply One of the Methods)	
	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
701.45	Final Curing (Apply One of the Methods)	
	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
701.46	Protective Sealing (If Required)	
	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 NOT REQUIRED IF 701.30.E.3.b: Liquid Membrane-Forming Compounds for Curing and Sealing was applied.	Required if 701.30.E.3.b Curing and Sealing Compound was Not Applied
701.47	Cold Weather Concreting (When Applicable)	
	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
701.48	Hot Weather Concreting (When Applicable)	
	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
701.61	Contractor Quality Control Plan	
	The Contractor shall prepare and submit a Quality Control Plan (QC Plan) to the Department for review.	Requirement
701.62	Production Personnel	
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"> • NRMCA Concrete Exterior Finisher Certification • ACI Concrete Flatwork Technician and Flatwork Finisher 	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	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 Sections 701.40 to 701.48.	Requirement
701.63	Quality Control Inspection	
	<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"> • NRMCA Concrete Exterior Finisher Certification • ACI Concrete Flatwork Technician and Flatwork Finisher <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

JUNE 30, 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.

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 Subsections 230.40, 485.40, 501.40, 685.40, 940.40A and 983.40.

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

SUBSECTION 150: EMBANKMENT

Subsection 150.62: Embankment Construction with Materials Other Than Rock

Replace the fourth paragraph with the following.

The embankment materials shall be compacted to not less than 95% of the maximum dry density of the embankment material as determined by AASHTO T 99, Method C. If required, a correction for oversized particles shall be in accordance with Annex A of AASHTO T 99. If the material retained on the ¾-in. sieve is 30% or more of the total sample, this test shall not apply and the material shall be compacted to the target density. The target density shall be established by determining the number of passes of a roller required to produce a constant and uniform density, after conducting a series of tests using either AASHTO T 310, *In-Place Density and Moisture Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)*, AASHTO T 191, *Density of Soil In-Place by the Sand-Cone Method*, or *ASTM D 8167 Standard Test Method for In-Place Bulk Density of Soil and Soil-Aggregate by a Low-Activity Nuclear Method (Shallow Depth)*. The Contractor shall, without additional compensation, employ whatever measures may be necessary to adjust the natural water content of the suitable embankment material to permit the placement and compaction as hereinbefore specified.

SUBSECTION 160: CONTROLLED LOW-STRENGTH MATERIAL

Subsection 160: Controlled Low-Strength Material

Add this new subsection.

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 (≤ 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

SUBSECTION 201: BASINS, MANHOLES AND INLETS

Subsection 201.40: General

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

SECTION 400: SUB-BASE, BASE COURSES, SHOULDERS, PAVEMENTS AND BERMS

SUBSECTION 401: GRAVEL SUB-BASE

Subsection 401.60: Gravel Sub-base

Replace the last sentence of the first paragraph with the following.

The specific density of the Gravel Sub-base shall be maintained by determining the number of passes of a roller required to produce a constant and uniform density, after conducting a series of tests using a nuclear device or the sand/volume method in accordance with AASHTO T310, AASHTO T 191, or ASTM D 8167.

SUBSECTION 402: DENSE GRADED CRUSHED STONE FOR SUB-BASE

Subsection 402.61: Spreading and Compacting

Replace the last sentence of the first paragraph with the following.

The specified density of the Dense Graded Crushed Stone shall be maintained by determining the number of passes of a roller are required to produce a constant and uniform density, after conducting a series of tests using a nuclear device or the sand/volume method in accordance with AASHTO T310, AASHTO T 191, or ASTM D 8167.

SUBSECTION 403: RECLAIMED PAVEMENT FOR BASE COURSE AND/OR SUB-BASE

Subsection 403.64: Compaction and Dust Control

Replace the second paragraph with the following.

The reclaimed base course shall be tested for compaction and smoothness and accuracy of grade in accordance with the applicable provisions of 401.60: Gravel Sub-base. The required density shall be measured by using a nuclear device or the sand/volume method in accordance with AASHTO T310, AASHTO T 191, or ASTM D 8167. If any portions are found to be unacceptable by the Engineer, such portions shall be reprocessed, regraded, and recompacted until the required smoothness and accuracy are obtained.

SUBSECTION 404: RECLAIMED PAVEMENT BORROW MATERIAL

Subsection 404.60: General

Replace the second sentence with the following.

The specified density of the Reclaimed Pavement Borrow Material shall be maintained by determining the number of passes of a roller that are required to produce a constant and uniform density, after conducting a series of tests using a nuclear device or the sand/volume method in accordance with AASHTO T310, AASHTO T 191, or ASTM D 8167

SUBSECTION 450: HOT MIX ASPHALT PAVEMENT

Subsection 450.40: General

Add the following paragraph to the end of this subsection.

Prior to placing hot mix asphalt the contractor shall provide notice to the Engineer at least 48 hours in advance of the work. The notice shall include the anticipated schedule, HMA tonnage, the type of mix, the mix provider and plant location.

SUBSECTION 460: HOT MIX ASPHALT PAVEMENT FOR LOCAL ROADS

Subsection 460.40: General

Add the following paragraph to the end of this subsection.

Prior to placing hot mix asphalt the contractor shall provide notice to the Engineer at least 48 hours in advance of the work. The notice shall include the anticipated schedule, HMA tonnage, the type of mix, the mix provider and plant location.

SUBSECTION 466: STRESS ABSORBING MEMBRANE & STRESS ABSORBING MEMBRANE INTERLAYER

Subsection 466.40: General

Replace this subsection with the following.

Prior to placing stress absorbing membrane the contractor shall provide notice to the Engineer at least 48 hours in advance of the work. The notice shall include the anticipated schedule, tonnage, the type of mix, the mix provider and plant location. Stress absorbing membrane and stress absorbing membrane interlayer shall be constructed as specified herein.

SUBSECTION 470: HOT MIX ASPHALT PAVEMENT BERM

Subsection 470.40: General

Replace this subsection with the following.

Prior to placing hot mix asphalt the contractor shall provide notice to the Engineer at least 48 hours in advance of the work. The notice shall include the anticipated schedule, HMA tonnage, the type of mix, the mix provider and plant location. The Contractor shall obtain HMA berm material of the type specified.

SUBSECTION 472: TEMPORARY ASPHALT PATCHING

Subsection 472.40: General

Add the following paragraph to the beginning of this subsection.

Prior to placing hot mix asphalt the contractor shall provide notice to the Engineer at least 48 hours in advance of the work. The notice shall include the anticipated schedule, HMA tonnage, the type of mix, the mix provider and plant location.

SUBSECTION 486: ULTRATHIN BONDED OVERLAY

Subsection 486.40: General

Add the following paragraph to the end of this subsection.

Prior to placing ultrathin bonded overlay the contractor shall provide notice to the Engineer at least 48 hours in advance of the work. The notice shall include the anticipated schedule, tonnage, the type of mix, the mix provider and plant location.

SECTION 600: HIGHWAY GUARD, FENCES AND WALLS

SUBSECTION 690: WALLS REMOVED AND RESET

Subsection 403.64: General

Replace the last sentence with the following.

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

SECTION 700: INCIDENTAL WORK

SUBSECTION 702: HOT MIX ASPHALT SIDEWALKS AND DRIVEWAYS

Subsection 702.40: General

Add the following paragraph to the end of this subsection.

Prior to placing hot mix asphalt the contractor shall provide notice to the Engineer at least 48 hours in advance of the work. The notice shall include the anticipated schedule, HMA tonnage, the type of mix, the mix provider and plant location.

SECTION 800: TRAFFIC CONTROL DEVICES

SUBSECTION 825: RECTANGULAR RAPID FLASHING BEACONS

Subsection 825: Rectangular Rapid Flashing Beacons

Add this new subsection.

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

Subsection 922: Elastomeric Bearing Pads

Add this new subsection.

SUBSECTION 922: ELASTOMERIC BEARING PADS

DESCRIPTION

922.20: General

This specification consists of the construction requirements for elastomeric bearing pads. Elastomeric bearing pads shall consist of plain or laminated bearings consisting of layers of elastomers restrained at their interfaces by bonded steel laminates.

MATERIALS

922.40: General

Elastomeric bearing pads shall meet the following requirements:

Elastomeric Bearing Pads	M9.14.5
Anchor bolts	M8.01.5

CONSTRUCTION METHODS

922.50: Submittals

The Contractor shall submit the following to the Engineer for approval:

1. Prior to fabrication:
 - a. Written notification 30 days prior to the start of bearing production. The notification shall include the contract number, quantity, type, and size of bearing being produced, manufacturer’s name, and the name of the independent testing lab.
 - b. Shop drawings for approval in accordance with Subsection 5.02, 14 days prior to the start of bearing production.
2. At the time of bearing pad delivery:
 - a. A certificate of compliance (COC) certifying that the elastomeric bearing pads meet the requirements of the contract specifications. The COC shall be accompanied by:
 - A mill certificate for steel laminates used in bearings, where applicable.
 - Fabricator QC test reports.
 - b. Independent test results as required under Subsection 922.62.

922.51: Fabricators

Fabricators shall be in accordance with Subsection M9.14.5D.

922.52: Fabrication

Fabrication shall be in accordance with Subsection M9.14.5E.

In addition to the number of bearing pads required for the contract the Contractor shall order additional bearing pads as defined in Subsection M9.14.5G, in order to allow the Engineer to randomly select a bearing pad for testing in accordance with 922.72.

922.53: Packaging, Handling, & Storage

The bearing pads shall be packaged, handled, and stored in accordance with Subsection M9.14.5F.

All bearing devices and components shall be stored on the project in an area that provides protection from environmental and physical damage. When installed, bearings shall be clean and free of all foreign substances.

922.54 Installation

Bearing pads shall be installed only on concrete bridge seat bearing areas that have been prepared in accordance with Subsection 901.65A(3).

Bearing pads shall be installed by qualified personnel to the positions, elevations, and slopes shown on the plans and to the dimensions and offsets prescribed by the manufacturer. The bearing pads shall be adjusted, as necessary, to take into account the ambient temperature at installation and future movements of the bridge due to temperature changes, release of falsework, and shortening due to post-tensioning.

Elastomeric bearings shall be placed directly on the concrete surface provided that it is flat within the bearing area to within a tolerance of 0.005 times the smallest nominal dimension of the bearing as measured by a

straight edge from peak to valley. Bearings shall be placed on surfaces that do not deviate from the specified bridge seat slope in any direction by more than 0.01 rad.

Any bearing areas that exceed these tolerances shall be brought into compliance by grouting or use of shims as directed by the Engineer before the weight of the structure acts on the bearing.

Bearings that have an internal tapered load plates shall be marked with an arrow that points up-station in order to properly align the slope of the internal tapered load plate with the centerline of the bridge.

Sole plates that sit on the bearing shall not be welded to the beam flange in the field unless at least 1.5 in. of the steel exists between the weld and the elastomer. In no case shall the elastomer or the bond be subjected to temperatures higher than 400°F.

No beams shall be erected until the bearings have been accepted by the Engineer.

CONTRACTOR QUALITY CONTROL

922.60: General

The Contractor shall provide a Quality Control System (QC System) to ensure that all materials and workmanship meet the required specifications.

922.61: Quality Control Inspection

The Contractor shall perform QC inspection of all work items addressed under this specification. Inspection activities during placement may be performed by qualified production personnel. The Contractor's QC personnel shall have overall responsibility for the QC inspection. The Contractor shall not rely on the results of the Engineer's Acceptance inspection for QC purposes. The Engineer shall be provided with the opportunity to monitor and witness all QC inspections.

QC inspection activities must address the following three primary components:

- a. Materials
- b. Environmental Conditions
- c. Workmanship

The minimum frequency of QC inspection activity shall be in accordance with the requirements below.

Table 922.61-1 - Minimum QC Inspection of Elastomeric Bearing Pads

Inspection Component	Inspection Attribute	Minimum Inspection Frequency	Point of Inspection	Inspection Method
Materials	Bearing Pad	Each Delivery	Bearing Pad	Check COC
	Geometry and Surface	Each Bearing Pad	Bearing Pad Surface	Visual Check & Check Measurement
Environmental Conditions	Temperature of Air	1 per Day	At Project Site	Check Measurement
Workmanship	Bridge Seat	Each Bearing Location	Bearing Pad Location	Visual Check
	Elevation	Each Bearing Pad	Bearing Pad Location	Check Measurement
	Orientation	Each Bearing Pad	Bearing Pad Location	Check Measurement

922.62: Quality Control Sampling and Testing Requirements

The Contractor shall have each Lot of bearing pads sampled and tested in accordance with Subsection M9.14.5G. This shall include both QC and compliant independent laboratory test results.

DEPARTMENT ACCEPTANCE

922.70: General

The Department shall sample and test bearing pads as part of its Acceptance activities. Independent testing shall also be used to supplement its testing.

922.71: Acceptance Inspection

The Engineer will perform Acceptance inspection to ensure that materials and completed work are in conformance with the contract requirements. Acceptance inspection is intended to visually assess the quality of each Lot produced and placed and will address only the inspection components of materials and workmanship in support of the Department’s final Acceptance determination. All Acceptance inspection activities by the Department will be performed independent of the Contractor’s QC inspection.

Table 922.71-1 – Department Acceptance Inspection of Elastomeric Bearing Pads

Inspection Component	Inspection Attribute	Minimum Inspection Frequency	Point of Inspection	Inspection Method
Materials	Bearing Pad	1 Per Bearing Pad	Bearing Pad Surface	Check COC
	Geometry and Surface	1 Per Bearing Pad	Bearing Pad Surface	Visual Check & Check Measurement
Workmanship	Elevation	1 per Bearing Pad	Bearing Pad Location	Check Measurement
	Orientation	1 per Bearing Pad	Bearing Pad Location	Check Measurement

922.72: Acceptance Sampling and Testing Requirements

For Acceptance samples taken by the Engineer at the project, the sampling rate shall be in accordance with Subsection M9.14.5G. Bearing pads shall be tested by the Department in accordance with Table M9.14.5-1.

922.73: Lot Acceptance Determination Based on Inspection Results

The Engineer's Acceptance inspection results will be used in the final Acceptance determination for all Lots. Prior to final Acceptance of each Lot produced and placed, the Engineer will evaluate all Acceptance inspection information for the Lot. The materials and product workmanship for the completed work will be evaluated for conformance with the plans and the requirements specified in Subsections 922.60, 922.61, and 922.62.

When the Acceptance information identifies deficiencies in either material quality or product workmanship, the location will be isolated and further evaluated by the Engineer through additional Acceptance inspection. Depending upon the findings of the additional Acceptance inspection activity, the Engineer will determine the disposition of the nonconforming work in accordance with Division I, Subsection 5.03, Conformity with Plans and Specifications.

922.74: Lot Acceptance Determination Based on Testing Data

Prior to final Acceptance of each Lot, the Engineer will evaluate all available QC, independent, and Acceptance testing data for the Lot to determine conformance with the minimum requirements in Subsection M9.14.5G and Table M9.14.5-1.

If a test result does not meet the minimum requirement, the Contractor and Engineer will further assess the quality to determine whether the material can remain in place.

If the Engineer's assessment determines that the material quality is not sufficient to permit the bearing pad to remain in place, the pad shall be removed and replaced. When a nonconforming bearing pad is corrected or replaced, the Engineer will perform Acceptance testing of the replacement bearing pad and evaluate the test results for conformance with the minimum requirements.

922.75: Final Lot Acceptance Determination

For each Lot produced and placed, the Engineer will evaluate all Acceptance inspection and testing data for the Lot. The final review and visual inspection shall be conducted jointly by the Contractor and Engineer. Any items that do not meet the requirements of the specifications and plans shall be addressed at this time, at no additional cost to the Department.

After each Lot is complete, including any corrective action, the Engineer will perform a final evaluation of all Acceptance data for the Lot. The Engineer will accept the Lot if the evaluation of all inspection and testing data for the Lot is in conformance with this specification and the contract documents.

When the above requirements have been met, the Engineer will accept all completed bearing pads.

COMPENSATION

922.80: Method of Measurement

Laminated Elastomeric Bearing Pads will be measured by each pad installed. Plain Elastomeric Bearing Pads will be measured by the square foot installed. The measured quantities do not include the additional bearings required for conformance and destructive testing.

922.81: Basis of Payment

Payment under this item shall be at the contract unit price. This price will include all materials, equipment, tools and labor, additional bearing pads for testing and all required testing necessary to complete the work.

922.82: Payment Items

921.	Laminated Elastomeric Bearing Pad with Anchor Bolts	Each
922.	Laminated Elastomeric Bearing Pad without Anchor Bolts	Each
923.	Laminated Sliding Elastomeric Bearing Pad with Anchor Bolts	Each
933.	Plain Elastomeric Bearing Pad	Square Foot

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.

SUBSECTION 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

Subsection M4.02.00 Cement Concrete

Add the following to the end of this subsection.

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 ⁽¹⁾ 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 ² is less than 0.95.
ASTM C295: Petrographic Examination of Aggregates for Concrete	Optically strained, microfractured, or microcrystalline quartz	5.0% maximum ⁽²⁾
	Chert or chalcedony	3.0% maximum ⁽²⁾
	Tridymite or cristobolite	1.0% maximum ⁽²⁾
	Opal	0.5% maximum ⁽²⁾
	Natural volcanic glass	3.0% maximum ⁽²⁾
⁽¹⁾ Use a second order polynomial of %Exp = A ⁰ + A ¹ SQRT(t) + A ² t. See publication SD92-04-F.		
⁽²⁾ Based on the total aggregate sample.		

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

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

⁽¹⁾ Measure this minimum content of cementitious material as percent by weight of cement plus pozzolan.
⁽²⁾ This single criterion is not effective in all cases in remediating ASR. Low alkali cement (0.60% maximum ⁽³⁾) must be used in combination with other pozzolanic materials in Table B.
⁽³⁾ $\text{Na}_2\text{O equivalent} = \% \text{Na}_2\text{O} + 0.658 (\% \text{K}_2\text{O})$
⁽⁴⁾ 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.
⁽⁵⁾ Silica fume shall only be used in silica fume cement concrete.
⁽⁶⁾ 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.

Subsection M4.02.15 Cement Mortar

Delete this subsection.

Subsection M4.04.0: Grout, Mortar and Concrete Products

Replace this subsection 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

Type	Description	Application
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 ^[1]	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 CONDUITSubsection 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 MATERIALSSubsection 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 M9: MISCELLANEOUS MATERIALSSubsection M9.14.5: Elastomeric Bridge Bearing Pads

Replace this subsection with the following:

M9.14.5: Elastomeric Bearing Pads**A. General Requirements**

Elastomeric bearing pads shall be plain or laminated. They shall meet the applicable requirements of AASHTO M 251, the MassDOT Bridge Manual, and the AASHTO LRFD Bridge Design and Construction Specifications. The type of bearing will be specified on the plans.

Laminated elastomeric bearing pads consist of layers of elastomers restrained at their interfaces by bonded metal laminates.

B. Material Requirements

Plain elastomeric bearing pads shall consist of elastomer.

Laminated elastomeric bearing pad shall consist of:

- Elastomer
- Internal Steel Laminates
- Tapered Internal Load Plates (if used)

The components of the elastomeric bearing pad shall conform to AASHTO M 251 and the following:

- The elastomer compound shall be 100% virgin neoprene and classified as being of low-temperature grade 3.
- The steel laminates shall meet the requirements of ASTM A 1011 Grade 36 or higher

C. Material Qualification

Elastomeric bearing pads shall be approved on a project basis. The Contractor shall furnish to the Research and Materials Section certified independent test reports demonstrating conformance. All testing shall be performed by the same independent lab in accordance with Subsection M9.14.5G.

D. Fabricators

Bearing shall be fabricated by a fabricator listed on the MassDOT Qualified Construction Materials List (QCML).

E. Fabrication

Fabrication shall not begin until the shop drawings have been approved and the Department has an inspector at the fabricator's facility.

The shop drawings shall specify bearing dimensions as shown on the plans and, where applicable, shall include:

- Elastomer thickness and edge cover,
- Number and thickness of steel reinforcing laminates,
- Dimensions of load plates (if any),
- Design shear modulus of the elastomer shall be as shown on the Plans.

Plain elastomeric bearing pads shall be fabricated and tested in accordance with the "Method A" design outlined in the AASHTO LRFD Bridge Design Specifications.

Laminated elastomeric bearing pads shall be fabricated and tested in accordance with the "Method B" design outlined in the AASHTO LRFD Bridge Design Specifications.

The manufacturer shall designate the bearings in each Lot, as described in Subsection M9.14.5G, and certify that each bearing in the Lot was manufactured in a reasonably continuous manner from the same batch of elastomer and cured under the same conditions. In addition, the manufacturer shall certify that each bearing in the Lot satisfies the requirements of this specification, AASHTO M 251, the AASHTO LRFD Bridge Construction Specifications, and the contract plans and documents.

The tolerances on the overall dimensions for the bearings shall be according to Table 2 of AASHTO M 251, except that the tolerance on the overall vertical dimension shall be limited to 0, +1/8" regardless of the design thickness.

All steel included in the final bearing product must conform to Buy America Requirements.

F. Packaging, Handling, & Storage

The bearing pads shall be packaged, handled, and stored as specified below:

Prior to shipment from the point of manufacture, bearings shall be packaged in such a manner to ensure that during shipment and storage the bearings will be protected against damage from handling, weather, or any normal hazard. Each completed bearing shall have its components clearly identified, be securely bolted, strapped, or otherwise fastened to prevent any relative movement, and be marked on its top as to location and orientation in each structure in the project in conformity with the contract documents.

Each elastomeric bearing shall be marked in indelible ink or flexible paint. The marking shall consist of the order number, lot number, bearing identification number, and elastomer type and grade per AASHTO M 251. For bearing pads fabricated with a tapered internal load plate, a 1/32" deep direction arrow shall be inscribed into the bearing which will allow the bearing to be aligned with the up-station direction. All marks shall be permanent and be visible after the bearing is installed.

G. Testing Requirements

Quality Control System

Fabricators shall perform Quality Control (QC) testing in accordance with their quality system. QC test reports shall accompany the bearing pads when delivered to the project.

Acceptance System

MassDOT will evaluate the fabricator's quality system and QC test reports. It will also perform its own testing and verify the independent laboratory's test reports, if applicable.

Lot Sizes

Sampling of bearing pads for testing shall be random and performed on a Lot basis. A Lot of bearings shall be a group of 100 or fewer bearings that are:

- For a single contract,
- Cured under the same conditions,
- The same size and configuration,
- Manufactured in a reasonably continuous manner from the same batch of elastomer.

Testing of Plain Bearings

Testing Laboratory

Plain elastomeric bearing pads shall be tested by both an independent laboratory and MassDOT:

- Independent testing shall be performed by a nationally recognized third-party laboratory approved by the Research & Materials Section.
- Acceptance testing shall be performed by the Research and Materials.

Sampling Frequency

Each Lot of plain bearings shall be randomly sampled for testing. The Contractor shall ensure that the fabricator produces the additional bearings required for testing.

Samples for independent testing shall be selected by the fabricator. The sampling rate for the independent

testing shall be as follows:

- Lot sizes less than 10 bearings – One full-size bearing per Lot.
- Lot sizes greater than or equal to 10 bearings – Two full-size bearings per lot.

Samples for Acceptance testing shall be selected by the Engineer. The sampling rate for Acceptance testing shall be one bearing pad per lot.

Testing Requirements

The laboratory shall test the bearings in accordance with Sections 8 and 9 of AASHTO M 251 as specified below:

1. Dimensions per Section 8.4.
2. Elastomer per Section 8.6.
 - The hardness, tensile strength, and ultimate elongation shall be in accordance with Table 1 of AASHTO M 251.
3. Test procedures per Section 8.9.
 - Heat resistance per Section 8.9.3.

Testing of Laminated Bearings

Testing Laboratory

Laminated elastomeric bearing pads shall be tested by both an independent laboratory and MassDOT:

- Independent testing shall be performed by a nationally recognized third-party laboratory approved by the Research & Materials Section.
- Acceptance testing shall be performed by the Research and Materials.

Sampling Frequency

Each Lot of laminated bearings shall be randomly sampled for testing. The Contractor shall ensure that the fabricator produces the additional bearings required for testing.

Samples for independent testing shall be selected by the fabricator. The sampling rate for the independent testing shall be as follows:

- Lot sizes less than 10 bearings – One full-size bearing per Lot.
- Lots sizes greater than or equal to 10 bearings:
 - One full-size bearing per every twenty per lot, or a minimum of two bearings.
 - The number of laminated bearings to sample shall be determined by taking the Lot size divided by 20. If the integer part of this calculation is 0 or 1, then two bearings shall be sampled. For example, if the lot size is 58 laminated bearings, two bearings shall be sampled; if the lot size is 65, three bearings shall be sampled; and if the lot size is 22, two bearings shall be sampled.

Samples for Acceptance testing shall be selected by the Engineer. The sampling rate for Acceptance testing shall be one bearing pad per lot.

Testing Requirements

Testing of the bearings shall be in accordance with Sections 8 and 9 of AASHTO M 251 as specified below:

1. Dimensions per Section 8.4.
2. Elastomer per Section 8.6.
 - The hardness, tensile strength, and ultimate elongation shall be in accordance with Table 1 of AASHTO M 251.
3. Compressive strain at the maximum design dead plus live service compressive load per Section 8.8.1.1.

- The compressive deflection, as determined per Section 9.1., between the two loadings for each bearing tested shall not exceed 10%.
- 4. Bond via Compressive Load per Section 8.8.2.2.
- 5. Shear Modulus of the elastomer per Section 8.8.3.
 - Shear modulus shall meet the requirements on the plans.
- 6. Test procedures per Section 8.9.
 - a. Additional Low Temperature Shear Modulus testing per Section 8.9.1.
 - b. Heat resistance per Section 8.9.3.
 - c. Compression set per Section 8.9.4.
 - d. Creep per Section 8.9.5.
 - The percent creep shall be less than 35%.
 - e. Long Term Compression per Section 8.9.6.

Table M9.14.5-1: Department Acceptance Testing of Elastomeric Bearing Pads

Quality Characteristic	Test Method	Requirement
Hardness	ASTM D2240	From Independent Test Results ± 5 Pts
Tensile Strength	ASTM D412	≥ 2250 psi
Ultimate Elongation	ASTM D412	Minimum Elongation Based on Durometer according to AASHTO M 251 Table 1
Shear Modulus (see Note 1)	ASTM D4014	Specified Value ± 15%
After Heat Aging for 70 Hours at 100°C (Maximum Change from Unaged Testing)		
Hardness	ASTM D573	Hardness + 15 Pts
Tensile Strength	ASTM D573	Tensile Strength - 15%
Ultimate Elongation	ASTM D573	Ultimate Elongation - 40%
Note 1: Test is only required for laminated elastomeric bearing pads.		

SECTION M10: TRAFFIC CONTROL DEVICES

Subsection M10.05.0: Traffic Signal Structures (General)

Add this new subsection.

M10.05.0: Traffic Signal Structures (General)

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

Subsection M10.05.1: Signal Posts and Bases

Add this new subsection.

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.

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)**

Section: Page 00719-

POLICY 2

1. DEFINITIONS..... 3

2. DBE PARTICIPATION 5

 a. Goal 5

 b. Bidders List..... 5

3. CONTRACTOR ASSURANCES 6

4. REQUIRED SUBCONTRACT PROVISIONS 6

5. ELIGIBILITY OF DBES 6

 a. Massachusetts DBE Directory 6

 b. DBE Certification 6

 c. Joint Venture Approval 7

6. COUNTING DBE PARTICIPATION TOWARDS DBE PARTICIPATION GOALS..... 7

 a. Commercially Useful Function 7

 b. Counting Participation Toward The Contract Participation Goal..... 7

 c. Joint Check Policy..... 9

 d. Joint Check Procedure(s) 10

7. AWARD DOCUMENTATION AND PROCEDURES 11

8. COMPLIANCE 13

9. SANCTIONS..... 16

10. FURTHER INFORMATION; ENFORCEMENT, COOPERATION AND
 CONFIDENTIALITY 16

11. LIST OF ADDITIONAL DOCUMENTS 18

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	https://www.mass.gov/disadvantaged-business-enterprise-goals-2019-2022	MassDOT– Highway Div’n Page
For copies of the Code of Federal Regulations	http://www.gpo.gov/fdsys/browse/collectionCfr.action?collectionCode=CFR	FDsys – US Gov’t Printing Office
For information about the U.S.DOT DBE Program	https://www.transportation.gov/civil-rights/disadvantaged-business-enterprise	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 15 %
(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.

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 (3rd) 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. 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, 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.

***** END OF DOCUMENT *****

THIS PAGE INTENTIONALLY LEFT BLANK

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

*** END OF DOCUMENT ***

THIS PAGE INTENTIONALLY LEFT BLANK

DOCUMENT 00813

SPECIAL PROVISIONS

PRICE ADJUSTMENTS FOR STRUCTURAL STEEL AND REINFORCING STEEL

September 18, 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	\$0.63
2	ASTM A27 (AASHTO M103) Steel Castings, H-Pile Points & Pipe Pile Shoes (See Note (8) below.)	\$0.87
3	ASTM A668 / A668M (AASHTO M102) Steel Forgings	\$0.87
4	ASTM A108 (AASHTO M169) Steel Forgings for Shear Studs	\$0.90
5	ASTM A709/A709M Grade 36 / AASHTO M270M/M270 Grade 36 or 250 Structural Steel Plate	\$0.96
6	ASTM A709/A709M Grade 36 / AASHTO M270M/M270 Grade 36 or 250 Structural Steel Shapes	\$0.89
7	ASTM A709/A709M Grade 50 / AASHTO M270M/M270 Grade 50 or 345 Structural Steel Plate	\$0.96
8	ASTM A709/A709M Grade 50 / AASHTO M270M/M270 Grade 50 or 345 Structural Steel Shapes	\$0.89
9	ASTM A709/A709M Grade 50WT / AASHTO M270M/M270 Grade 50WT or 345WT Structural Steel Plate	\$1.00
10	ASTM A709/A709M Grade 50WT / AASHTO M270M/M270 Grade 50WT or 345WT Structural Steel Shapes	\$0.90
11	ASTM A709/A709M Grade 50W / AASHTO M270M/M270 Grade 50W 345W Structural Steel Plate	\$1.00
12	ASTM A709/A709M Grade 50W / AASHTO M270M/M270 Grade 50W or 345W Structural Steel Shapes	\$0.90
13	ASTM A709/A709M Grade HPS 50W / AASHTO M270M/M270 Grade HPS 50W or 345W Structural Steel Plate	\$1.04
14	ASTM A709/A709M Grade HPS 70W / AASHTO M270M/M270 Grade HPS 70W or 485W Structural Steel Plate	\$1.11
15	ASTM A514/A514M-05 Grade HPS 100W / AASHTO M270M/M270 Grade HPS 100W or 690W Structural Steel Plate	\$1.71
16	ASTM A992/A992M Grade 50S / AASHTO M270M/M270 Grade 50S or 345S Structural Steel Plate	\$1.00
17	ASTM A992/A992M Grade 50S / AASHTO M270M/M270 Grade 50S or 345S Structural Steel Shapes	\$0.90
18	ASTM A276 Type 316 Stainless Steel	\$5.10
19	ASTM A240 Type 316 Stainless Steel	\$5.10
20	ASTM A148 Grade 80/50 Steel Castings (See Note (8) below.)	\$1.76
21	ASTM A53 Grade B Structural Steel Pipe	\$1.11
22	ASTM A500 Grades A, B, 36 & 50 Structural Steel Pipe	\$1.11
23	ASTM A252, Grades 240 (36 KSI) & 414 (60 KSI) Pipe Pile	\$0.88
24	ASTM 252, Grade 2 Permanent Steel Casing	\$0.88
25	ASTM A36 (AASHTO M183) for H-piles, steel supports and sign supports	\$0.94
26	ASTM A328 / A328M, Grade 50 (AASHTO M202) Steel Sheetpiling	\$1.68
27	ASTM A572 / A572M, Grade 50 Sheetpiling	\$1.68
28	ASTM A36/36M, Grade 50	\$0.96
29	ASTM A570, Grade 50	\$0.94
30	ASTM A572 (AASHTO M223), Grade 50 H-Piles	\$0.96
31	ASTM A1085 Grade A (50 KSI) Steel Hollow Structural Sections (HSS), heat-treated per ASTM A1085 Supplement S1	\$1.11
32	AREA 140 LB Rail and Track Accessories	\$0.58

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.

END OF DOCUMENT

THIS PAGE IS INTENTIONALLY LEFT BLANK

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.

*** END OF DOCUMENT ***

THIS PAGE INTENTIONALLY LEFT BLANK

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

*** END OF DOCUMENT ***

THIS PAGE INTENTIONALLY LEFT BLANK

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. 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.

*** END OF DOCUMENT ***

THIS PAGE INTENTIONALLY LEFT BLANK

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: 128034 Project No. 608930 Federal Aid No.: CMQ-003S(733)X

Location: LAWRENCE

Project Description: Lawrence Manchester Rail Corridor (LMRC) Rail Trail

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.

*** END OF DOCUMENT ***

DOCUMENT 00861

STATE PREVAILING WAGE RATES

MBTA RAILROAD OPERATIONS DIRECTORATE.....	A00806 - 3 through 134
MBTA CONSTRUCTION SAFETY.....	A00806 - 135 through 146
MBTA SPECIAL INSTRUCTIONS.....	A00806 - 147 through 160

THIS PAGE INTENTIONALLY LEFT BLANK



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: 128034 **City/Town:** LAWRENCE
Description of Work: LAWRENCE – FAP No. CMQ-003S(733)X Lawrence Manchester Rail Corridor (LMRC) Rail Trail

Job Location: Lawrence Manchester Rail Corridor (LMRC) Rail Trail

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 updated wage schedule must be provided to all contractors, including general and sub-contractors, working on the construction project.
- This annual update requirement is generally not applicable to 27F “rental of equipment” contracts. For such contracts, the prevailing wage rates issued by DLS shall remain in effect for the duration of the contract term. However, if the prevailing wage rate sheet issued does not contain wage rates for each year covered by the contract term, the Awarding Authority must request updated rate sheets from DLS and provide them to the contractor to ensure the correct rates are being paid throughout the duration of the contract. Additionally, if an Awarding Authority exercises an option to renew or extend the contract term, they must request updated rate sheets from DLS and provide them to the contractor.
- 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.

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
Construction						
(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 1)</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>	06/01/2024	\$39.28	\$9.65	\$18.40	\$0.00	\$67.33
	12/01/2024	\$40.61	\$9.65	\$18.40	\$0.00	\$68.66
	06/01/2025	\$42.00	\$9.65	\$18.40	\$0.00	\$70.05
	12/01/2025	\$43.38	\$9.65	\$18.40	\$0.00	\$71.43
	06/01/2026	\$44.82	\$9.65	\$18.40	\$0.00	\$72.87
	12/01/2026	\$46.26	\$9.65	\$18.40	\$0.00	\$74.31
	06/01/2027	\$47.71	\$9.65	\$18.40	\$0.00	\$75.76
	12/01/2027	\$49.16	\$9.65	\$18.40	\$0.00	\$77.21
	06/01/2028	\$50.66	\$9.65	\$18.40	\$0.00	\$78.71
12/01/2028	\$52.16	\$9.65	\$18.40	\$0.00	\$80.21	
For apprentice rates see "Apprentice- LABORER"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
AIR TRACK OPERATOR (HEAVY & HIGHWAY) <i>LABORERS - ZONE 2 (HEAVY & 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 REMOVER - PIPE / MECH. EQUIPT. <i>HEAT & FROST INSULATORS LOCAL 6 (BOSTON)</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
ASPHALT RAKER <i>LABORERS - ZONE 2</i>	06/01/2024	\$38.78	\$9.65	\$18.40	\$0.00	\$66.83
	12/01/2024	\$40.11	\$9.65	\$18.40	\$0.00	\$68.16
	06/01/2025	\$41.50	\$9.65	\$18.40	\$0.00	\$69.55
	12/01/2025	\$42.88	\$9.65	\$18.40	\$0.00	\$70.93
	06/01/2026	\$44.32	\$9.65	\$18.40	\$0.00	\$72.37
	12/01/2026	\$45.76	\$9.65	\$18.40	\$0.00	\$73.81
	06/01/2027	\$47.21	\$9.65	\$18.40	\$0.00	\$75.26
	12/01/2027	\$48.66	\$9.65	\$18.40	\$0.00	\$76.71
	06/01/2028	\$50.16	\$9.65	\$18.40	\$0.00	\$78.21
	12/01/2028	\$51.66	\$9.65	\$18.40	\$0.00	\$79.71
For apprentice rates see "Apprentice- LABORER"						
ASPHALT RAKER (HEAVY & HIGHWAY) <i>LABORERS - ZONE 2 (HEAVY & 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"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
BARCO-TYPE JUMPING TAMPER <i>LABORERS - ZONE 2</i>	06/01/2024	\$38.78	\$9.65	\$18.40	\$0.00	\$66.83
	12/01/2024	\$40.11	\$9.65	\$18.40	\$0.00	\$68.16
	06/01/2025	\$41.50	\$9.65	\$18.40	\$0.00	\$69.55
	12/01/2025	\$42.88	\$9.65	\$18.40	\$0.00	\$70.93
	06/01/2026	\$44.32	\$9.65	\$18.40	\$0.00	\$72.37
	12/01/2026	\$45.76	\$9.65	\$18.40	\$0.00	\$73.81
	06/01/2027	\$47.21	\$9.65	\$18.40	\$0.00	\$75.26
	12/01/2027	\$48.66	\$9.65	\$18.40	\$0.00	\$76.71
	06/01/2028	\$50.16	\$9.65	\$18.40	\$0.00	\$78.21
	12/01/2028	\$51.66	\$9.65	\$18.40	\$0.00	\$79.71
For apprentice rates see "Apprentice- LABORER"						
BLOCK PAVER, RAMMER / CURB SETTER <i>LABORERS - ZONE 2</i>	06/01/2024	\$39.28	\$9.65	\$18.40	\$0.00	\$67.33
	12/01/2024	\$40.61	\$9.65	\$18.40	\$0.00	\$68.66
	06/01/2025	\$42.00	\$9.65	\$18.40	\$0.00	\$70.05
	12/01/2025	\$43.38	\$9.65	\$18.40	\$0.00	\$71.43
	06/01/2026	\$44.82	\$9.65	\$18.40	\$0.00	\$72.87
	12/01/2026	\$46.26	\$9.65	\$18.40	\$0.00	\$74.31
	06/01/2027	\$47.71	\$9.65	\$18.40	\$0.00	\$75.76
	12/01/2027	\$49.16	\$9.65	\$18.40	\$0.00	\$77.21
	06/01/2028	\$50.66	\$9.65	\$18.40	\$0.00	\$78.71
	12/01/2028	\$52.16	\$9.65	\$18.40	\$0.00	\$80.21
For apprentice rates see "Apprentice- LABORER"						
BLOCK PAVER, RAMMER / CURB SETTER (HEAVY & HIGHWAY) <i>LABORERS - ZONE 2 (HEAVY & 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)	08/01/2024	\$64.50	\$11.49	\$23.59	\$0.00	\$99.58
BRICKLAYERS LOCAL 3 (LYNN)	02/01/2025	\$65.80	\$11.49	\$23.59	\$0.00	\$100.88
	08/01/2025	\$67.95	\$11.49	\$23.59	\$0.00	\$103.03
	02/01/2026	\$69.30	\$11.49	\$23.59	\$0.00	\$104.38
	08/01/2026	\$71.50	\$11.49	\$23.59	\$0.00	\$106.58
	02/01/2027	\$72.90	\$11.49	\$23.59	\$0.00	\$107.98

Apprentice - BRICK/PLASTER/CEMENT MASON - Local 3 Lynn

Effective Date - 08/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$32.25	\$11.49	\$23.59	\$0.00	\$67.33
2	60	\$38.70	\$11.49	\$23.59	\$0.00	\$73.78
3	70	\$45.15	\$11.49	\$23.59	\$0.00	\$80.23
4	80	\$51.60	\$11.49	\$23.59	\$0.00	\$86.68
5	90	\$58.05	\$11.49	\$23.59	\$0.00	\$93.13

Effective Date - 02/01/2025

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$32.90	\$11.49	\$23.59	\$0.00	\$67.98
2	60	\$39.48	\$11.49	\$23.59	\$0.00	\$74.56
3	70	\$46.06	\$11.49	\$23.59	\$0.00	\$81.14
4	80	\$52.64	\$11.49	\$23.59	\$0.00	\$87.72
5	90	\$59.22	\$11.49	\$23.59	\$0.00	\$94.30

Notes:

Apprentice to Journeyworker Ratio:1:5

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
BULLDOZER/GRADER/SCRAPER <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"						
CAISSON & UNDERPINNING BOTTOM MAN <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"						
CAISSON & UNDERPINNING 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"						
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>	06/01/2024	\$38.78	\$9.65	\$18.40	\$0.00	\$66.83
	12/01/2024	\$40.11	\$9.65	\$18.40	\$0.00	\$68.16
	06/01/2025	\$41.50	\$9.65	\$18.40	\$0.00	\$69.55
	12/01/2025	\$42.88	\$9.65	\$18.40	\$0.00	\$70.93
	06/01/2026	\$44.32	\$9.65	\$18.40	\$0.00	\$72.37
	12/01/2026	\$45.76	\$9.65	\$18.40	\$0.00	\$73.81
	06/01/2027	\$47.21	\$9.65	\$18.40	\$0.00	\$75.26
	12/01/2027	\$48.66	\$9.65	\$18.40	\$0.00	\$76.71
	06/01/2028	\$50.16	\$9.65	\$18.40	\$0.00	\$78.21
	12/01/2028	\$51.66	\$9.65	\$18.40	\$0.00	\$79.71
For apprentice rates see "Apprentice- LABORER"						
CARPENTER <i>CARPENTERS -ZONE 2 (Eastern Massachusetts)</i>	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

Classification

Effective Date Base Wage Health Pension Supplemental Unemployment Total Rate

Apprentice - CARPENTER - Zone 2 Eastern MA

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

Effective Date - 03/01/2025

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	45	\$22.33	\$9.83	\$1.73	\$0.00	\$33.89
2	45	\$22.33	\$9.83	\$1.73	\$0.00	\$33.89
3	55	\$27.29	\$9.83	\$3.40	\$0.00	\$40.52
4	55	\$27.29	\$9.83	\$3.40	\$0.00	\$40.52
5	70	\$34.73	\$9.83	\$16.51	\$0.00	\$61.07
6	70	\$34.73	\$9.83	\$16.51	\$0.00	\$61.07
7	80	\$39.70	\$9.83	\$18.24	\$0.00	\$67.77
8	80	\$39.70	\$9.83	\$18.24	\$0.00	\$67.77

Notes:

Apprentice to Journeyworker Ratio:1:5

CARPENTER WOOD FRAME	10/01/2023	\$25.55	\$7.02	\$4.80	\$0.00	\$37.37
CARPENTERS-ZONE 3 (Wood Frame)	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

Classification

Effective Date Base Wage Health Pension Supplemental Unemployment Total Rate

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 BRICKLAYERS LOCAL 3 (LYNN)	01/01/2024	\$49.33	\$13.00	\$23.57	\$1.30	\$87.20
---	------------	---------	---------	---------	--------	---------

Apprentice - CEMENT MASONRY/PLASTERING - Eastern Mass (Lynn)

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

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
CHAIN SAW OPERATOR <i>LABORERS - ZONE 2</i>	06/01/2024	\$38.78	\$9.65	\$18.40	\$0.00	\$66.83
	12/01/2024	\$40.11	\$9.65	\$18.40	\$0.00	\$68.16
	06/01/2025	\$41.50	\$9.65	\$18.40	\$0.00	\$69.55
	12/01/2025	\$42.88	\$9.65	\$18.40	\$0.00	\$70.93
	06/01/2026	\$44.32	\$9.65	\$18.40	\$0.00	\$72.37
	12/01/2026	\$45.76	\$9.65	\$18.40	\$0.00	\$73.81
	06/01/2027	\$47.21	\$9.65	\$18.40	\$0.00	\$75.26
	12/01/2027	\$48.66	\$9.65	\$18.40	\$0.00	\$76.71
	06/01/2028	\$50.16	\$9.65	\$18.40	\$0.00	\$78.21
	12/01/2028	\$51.66	\$9.65	\$18.40	\$0.00	\$79.71
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

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

DEMO: ADZEMAN	06/10/2024	\$45.53	\$9.65	\$18.40	\$0.00	\$73.58
LABORERS - ZONE 2	12/02/2024	\$47.00	\$9.65	\$18.40	\$0.00	\$75.05
	06/02/2025	\$48.50	\$9.65	\$18.40	\$0.00	\$76.55
	12/01/2025	\$50.00	\$9.65	\$18.40	\$0.00	\$78.05
	06/01/2026	\$51.55	\$9.65	\$18.40	\$0.00	\$79.60
	12/07/2026	\$53.05	\$9.65	\$18.40	\$0.00	\$81.10
	06/07/2027	\$54.65	\$9.65	\$18.40	\$0.00	\$82.70
	12/06/2027	\$56.25	\$9.65	\$18.40	\$0.00	\$84.30
	06/05/2028	\$57.93	\$9.65	\$18.40	\$0.00	\$85.98
	12/04/2028	\$59.60	\$9.65	\$18.40	\$0.00	\$87.65

For apprentice rates see "Apprentice- LABORER"

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
DEMO: BACKHOE/LOADER/HAMMER OPERATOR <i>LABORERS - ZONE 2</i>	06/10/2024	\$46.53	\$9.65	\$18.40	\$0.00	\$74.58
	12/02/2024	\$48.00	\$9.65	\$18.40	\$0.00	\$76.05
	06/02/2025	\$49.50	\$9.65	\$18.40	\$0.00	\$77.55
	12/01/2025	\$51.00	\$9.65	\$18.40	\$0.00	\$79.05
	06/01/2026	\$52.55	\$9.65	\$18.40	\$0.00	\$80.60
	12/07/2026	\$54.05	\$9.65	\$18.40	\$0.00	\$82.10
	06/07/2027	\$55.65	\$9.65	\$18.40	\$0.00	\$83.70
	12/06/2027	\$57.25	\$9.65	\$18.40	\$0.00	\$85.30
	06/05/2028	\$58.93	\$9.65	\$18.40	\$0.00	\$86.98
	12/04/2028	\$60.60	\$9.65	\$18.40	\$0.00	\$88.65
For apprentice rates see "Apprentice- LABORER"						
DEMO: BURNERS <i>LABORERS - ZONE 2</i>	06/10/2024	\$46.28	\$9.65	\$18.40	\$0.00	\$74.33
	12/02/2024	\$47.75	\$9.65	\$18.40	\$0.00	\$75.80
	06/02/2025	\$49.25	\$9.65	\$18.40	\$0.00	\$77.30
	12/01/2025	\$50.75	\$9.65	\$18.40	\$0.00	\$78.80
	06/01/2026	\$52.30	\$9.65	\$18.40	\$0.00	\$80.35
	12/07/2026	\$53.80	\$9.65	\$18.40	\$0.00	\$81.85
	06/07/2027	\$55.40	\$9.65	\$18.40	\$0.00	\$83.45
	12/06/2027	\$57.00	\$9.65	\$18.40	\$0.00	\$85.05
	06/05/2028	\$58.68	\$9.65	\$18.40	\$0.00	\$86.73
	12/04/2028	\$60.35	\$9.65	\$18.40	\$0.00	\$88.40
For apprentice rates see "Apprentice- LABORER"						
DEMO: CONCRETE CUTTER/SAWYER <i>LABORERS - ZONE 2</i>	06/10/2024	\$46.53	\$9.65	\$18.40	\$0.00	\$74.58
	12/02/2024	\$48.00	\$9.65	\$18.40	\$0.00	\$76.05
	06/02/2025	\$49.50	\$9.65	\$18.40	\$0.00	\$77.55
	12/01/2025	\$51.00	\$9.65	\$18.40	\$0.00	\$79.05
	06/01/2026	\$52.55	\$9.65	\$18.40	\$0.00	\$80.60
	12/07/2026	\$54.05	\$9.65	\$18.40	\$0.00	\$82.10
	06/07/2027	\$55.65	\$9.65	\$18.40	\$0.00	\$83.70
	12/06/2027	\$57.25	\$9.65	\$18.40	\$0.00	\$85.30
	06/05/2028	\$58.93	\$9.65	\$18.40	\$0.00	\$86.98
	12/04/2028	\$60.60	\$9.65	\$18.40	\$0.00	\$88.65
For apprentice rates see "Apprentice- LABORER"						
DEMO: JACKHAMMER OPERATOR <i>LABORERS - ZONE 2</i>	06/10/2024	\$46.28	\$9.65	\$18.40	\$0.00	\$74.33
	12/02/2024	\$47.75	\$9.65	\$18.40	\$0.00	\$75.80
	06/02/2025	\$49.25	\$9.65	\$18.40	\$0.00	\$77.30
	12/01/2025	\$50.75	\$9.65	\$18.40	\$0.00	\$78.80
	06/01/2026	\$52.30	\$9.65	\$18.40	\$0.00	\$80.35
	12/07/2026	\$53.80	\$9.65	\$18.40	\$0.00	\$81.85
	06/07/2027	\$55.40	\$9.65	\$18.40	\$0.00	\$83.45
	12/06/2027	\$57.00	\$9.65	\$18.40	\$0.00	\$85.05
	06/05/2028	\$58.68	\$9.65	\$18.40	\$0.00	\$86.73
	12/04/2028	\$60.35	\$9.65	\$18.40	\$0.00	\$88.40
For apprentice rates see "Apprentice- LABORER"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
DEMO: WRECKING LABORER <i>LABORERS - ZONE 2</i>	06/10/2024	\$45.53	\$9.65	\$18.40	\$0.00	\$73.58
	12/02/2024	\$47.00	\$9.65	\$18.40	\$0.00	\$75.05
	06/02/2025	\$48.50	\$9.65	\$18.40	\$0.00	\$76.55
	12/01/2025	\$50.00	\$9.65	\$18.40	\$0.00	\$78.05
	06/01/2026	\$51.55	\$9.65	\$18.40	\$0.00	\$79.60
	12/07/2026	\$53.05	\$9.65	\$18.40	\$0.00	\$81.10
	06/07/2027	\$54.65	\$9.65	\$18.40	\$0.00	\$82.70
	12/06/2027	\$56.25	\$9.65	\$18.40	\$0.00	\$84.30
	06/05/2028	\$57.93	\$9.65	\$18.40	\$0.00	\$85.98
	12/04/2028	\$59.60	\$9.65	\$18.40	\$0.00	\$87.65
For apprentice rates see "Apprentice- LABORER"						
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 1)</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 1)</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 1)</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 1)</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 103</i>	09/01/2024	\$63.78	\$13.00	\$22.26	\$0.00	\$99.04
	03/01/2025	\$64.98	\$13.00	\$22.30	\$0.00	\$100.28
	09/01/2025	\$66.89	\$13.00	\$22.36	\$0.00	\$102.25
	03/01/2026	\$68.09	\$13.00	\$22.39	\$0.00	\$103.48
	09/01/2026	\$70.00	\$13.00	\$22.45	\$0.00	\$105.45
	03/01/2027	\$71.19	\$13.00	\$22.49	\$0.00	\$106.68
	09/01/2027	\$73.11	\$13.00	\$22.54	\$0.00	\$108.65
	03/01/2028	\$74.31	\$13.00	\$22.58	\$0.00	\$109.89

Classification

Effective Date Base Wage Health Pension Supplemental Unemployment Total Rate

Apprentice - ELECTRICIAN - Local 103

Effective Date - 09/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	\$25.51	\$13.00	\$0.77	\$0.00	\$39.28
2	40	\$25.51	\$13.00	\$0.77	\$0.00	\$39.28
3	45	\$28.70	\$13.00	\$16.69	\$0.00	\$58.39
4	45	\$28.70	\$13.00	\$16.69	\$0.00	\$58.39
5	50	\$31.89	\$13.00	\$17.20	\$0.00	\$62.09
6	55	\$35.08	\$13.00	\$17.70	\$0.00	\$65.78
7	60	\$38.27	\$13.00	\$18.21	\$0.00	\$69.48
8	65	\$41.46	\$13.00	\$18.71	\$0.00	\$73.17
9	70	\$44.65	\$13.00	\$19.22	\$0.00	\$76.87
10	75	\$47.84	\$13.00	\$19.74	\$0.00	\$80.58

Effective Date - 03/01/2025

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	\$25.99	\$13.00	\$0.78	\$0.00	\$39.77
2	40	\$25.99	\$13.00	\$0.78	\$0.00	\$39.77
3	45	\$29.24	\$13.00	\$16.71	\$0.00	\$58.95
4	45	\$29.24	\$13.00	\$16.71	\$0.00	\$58.95
5	50	\$32.49	\$13.00	\$17.21	\$0.00	\$62.70
6	55	\$35.74	\$13.00	\$17.72	\$0.00	\$66.46
7	60	\$38.99	\$13.00	\$18.23	\$0.00	\$70.22
8	65	\$42.24	\$13.00	\$18.74	\$0.00	\$73.98
9	70	\$45.49	\$13.00	\$19.24	\$0.00	\$77.73
10	75	\$48.74	\$13.00	\$19.76	\$0.00	\$81.50

Notes :
 App Prior 1/1/03; 30/35/40/45/50/55/65/70/75/80

Apprentice to Journeyworker Ratio:2:3***

ELEVATOR CONSTRUCTOR	01/01/2022	\$65.62	\$16.03	\$20.21	\$0.00	\$101.86
ELEVATOR CONSTRUCTORS LOCAL 4						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
Apprentice - ELEVATOR CONSTRUCTOR - Local 4						
Effective Date - 01/01/2022						
Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$32.81	\$16.03	\$0.00	\$0.00	\$48.84
2	55	\$36.09	\$16.03	\$20.21	\$0.00	\$72.33
3	65	\$42.65	\$16.03	\$20.21	\$0.00	\$78.89
4	70	\$45.93	\$16.03	\$20.21	\$0.00	\$82.17
5	80	\$52.50	\$16.03	\$20.21	\$0.00	\$88.74

Notes:
Steps 1-2 are 6 mos.; Steps 3-5 are 1 year

Apprentice to Journeyworker Ratio:1:1

ELEVATOR CONSTRUCTOR HELPER <i>ELEVATOR CONSTRUCTORS LOCAL 4</i>	01/01/2022	\$45.93	\$16.03	\$20.21	\$0.00	\$82.17
For apprentice rates see "Apprentice - ELEVATOR CONSTRUCTOR"						
FENCE & GUARD RAIL ERECTOR (HEAVY & HIGHWAY) <i>LABORERS - ZONE 2 (HEAVY & 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)"						
FIELD ENG.INST.PERSON-BLDG,SITE,HVY/HWY <i>OPERATING ENGINEERS LOCAL 4</i>	05/01/2024	\$50.79	\$15.00	\$16.40	\$0.00	\$82.19
	11/01/2024	\$52.08	\$15.00	\$16.40	\$0.00	\$83.48
	05/01/2025	\$53.52	\$15.00	\$16.40	\$0.00	\$84.92
	11/01/2025	\$54.81	\$15.00	\$16.40	\$0.00	\$86.21
	05/01/2026	\$56.25	\$15.00	\$16.40	\$0.00	\$87.65
	11/01/2026	\$57.54	\$15.00	\$16.40	\$0.00	\$88.94
	05/01/2027	\$58.97	\$15.00	\$16.40	\$0.00	\$90.37
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
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"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
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 103</i>	09/01/2024	\$63.78	\$13.00	\$22.26	\$0.00	\$99.04
	03/01/2025	\$64.98	\$13.00	\$22.30	\$0.00	\$100.28
	09/01/2025	\$66.89	\$13.00	\$22.36	\$0.00	\$102.25
	03/01/2026	\$68.09	\$13.00	\$22.39	\$0.00	\$103.48
	09/01/2026	\$70.00	\$13.00	\$22.45	\$0.00	\$105.45
	03/01/2027	\$71.19	\$13.00	\$22.49	\$0.00	\$106.68
	09/01/2027	\$73.11	\$13.00	\$22.54	\$0.00	\$108.65
03/01/2028	\$74.31	\$13.00	\$22.58	\$0.00	\$109.89	
For apprentice rates see "Apprentice- ELECTRICIAN"						
FIRE ALARM REPAIR / MAINTENANCE <i>LOCAL 103</i> / COMMISSIONING <i>ELECTRICIANS</i>	09/01/2024	\$51.02	\$13.00	\$20.24	\$0.00	\$84.26
	03/01/2025	\$51.98	\$13.00	\$20.27	\$0.00	\$85.25
	09/01/2025	\$53.51	\$13.00	\$20.32	\$0.00	\$86.83
	03/01/2026	\$54.47	\$13.00	\$20.34	\$0.00	\$87.81
	09/01/2026	\$56.00	\$13.00	\$20.39	\$0.00	\$89.39
	03/01/2027	\$56.95	\$13.00	\$20.42	\$0.00	\$90.37
	09/01/2027	\$58.49	\$13.00	\$20.46	\$0.00	\$91.95
03/01/2028	\$59.45	\$13.00	\$20.49	\$0.00	\$92.94	
For apprentice rates see "Apprentice- TELECOMMUNICATIONS TECHNICIAN"						
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 & 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 1</i>	09/01/2024	\$56.23	\$8.83	\$20.27	\$0.00	\$85.33
	03/01/2025	\$57.73	\$8.83	\$20.27	\$0.00	\$86.83
	09/01/2025	\$59.23	\$8.83	\$20.27	\$0.00	\$88.33
	03/01/2026	\$60.73	\$8.83	\$20.27	\$0.00	\$89.83
	09/01/2026	\$62.23	\$8.83	\$20.27	\$0.00	\$91.33
	03/01/2027	\$63.73	\$8.83	\$20.27	\$0.00	\$92.83

Classification

Effective Date Base Wage Health Pension Supplemental Unemployment Total Rate

Apprentice - FLOORCOVERER - Local 2168 Zone I

Effective Date - 09/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	45	\$25.30	\$8.83	\$1.76	\$0.00	\$35.89
2	45	\$25.30	\$8.83	\$1.76	\$0.00	\$35.89
3	55	\$30.93	\$8.83	\$3.52	\$0.00	\$43.28
4	55	\$30.93	\$8.83	\$3.52	\$0.00	\$43.28
5	70	\$39.36	\$8.83	\$16.75	\$0.00	\$64.94
6	70	\$39.36	\$8.83	\$16.75	\$0.00	\$64.94
7	80	\$44.98	\$8.83	\$18.51	\$0.00	\$72.32
8	80	\$44.98	\$8.83	\$18.51	\$0.00	\$72.32

Effective Date - 03/01/2025

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	45	\$25.98	\$8.83	\$1.76	\$0.00	\$36.57
2	45	\$25.98	\$8.83	\$1.76	\$0.00	\$36.57
3	55	\$31.75	\$8.83	\$3.52	\$0.00	\$44.10
4	55	\$31.75	\$8.83	\$3.52	\$0.00	\$44.10
5	70	\$40.41	\$8.83	\$16.75	\$0.00	\$65.99
6	70	\$40.41	\$8.83	\$16.75	\$0.00	\$65.99
7	80	\$46.18	\$8.83	\$18.51	\$0.00	\$73.52
8	80	\$46.18	\$8.83	\$18.51	\$0.00	\$73.52

Notes: Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

FORK LIFT/CHERRY PICKER OPERATING ENGINEERS LOCAL 4	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"

GENERATOR/LIGHTING PLANT/HEATERS OPERATING ENGINEERS LOCAL 4	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"

GLAZIER (GLASS PLANK/AIR BARRIER/INTERIOR SYSTEMS) GLAZIERS LOCAL 35 (ZONE 2)	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:

Apprentice to Journeyworker Ratio:1:6

HVAC (DUCTWORK) SHEETMETAL WORKERS LOCAL 17 - A	08/01/2024	\$58.97	\$14.59	\$27.50	\$2.98	\$104.04
	02/01/2025	\$60.72	\$14.59	\$27.50	\$2.98	\$105.79
	08/01/2025	\$62.57	\$14.59	\$27.50	\$2.98	\$107.64
	02/01/2026	\$64.52	\$14.59	\$27.50	\$2.98	\$109.59

For apprentice rates see "Apprentice- SHEET METAL WORKER"

HVAC (ELECTRICAL CONTROLS) ELECTRICIANS LOCAL 103	09/01/2024	\$63.78	\$13.00	\$22.26	\$0.00	\$99.04
	03/01/2025	\$64.98	\$13.00	\$22.30	\$0.00	\$100.28
	09/01/2025	\$66.89	\$13.00	\$22.36	\$0.00	\$102.25
	03/01/2026	\$68.09	\$13.00	\$22.39	\$0.00	\$103.48
	09/01/2026	\$70.00	\$13.00	\$22.45	\$0.00	\$105.45
	03/01/2027	\$71.19	\$13.00	\$22.49	\$0.00	\$106.68
	09/01/2027	\$73.11	\$13.00	\$22.54	\$0.00	\$108.65
	03/01/2028	\$74.31	\$13.00	\$22.58	\$0.00	\$109.89

For apprentice rates see "Apprentice- ELECTRICIAN"

HVAC (TESTING AND BALANCING - AIR) SHEETMETAL WORKERS LOCAL 17 - A	08/01/2024	\$58.97	\$14.59	\$27.50	\$2.98	\$104.04
	02/01/2025	\$60.72	\$14.59	\$27.50	\$2.98	\$105.79
	08/01/2025	\$62.57	\$14.59	\$27.50	\$2.98	\$107.64
	02/01/2026	\$64.52	\$14.59	\$27.50	\$2.98	\$109.59

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
For apprentice rates see "Apprentice- SHEET METAL WORKER"						
HVAC (TESTING AND BALANCING -WATER) <i>PIPEFITTERS LOCAL 537 (Local 138)</i>	09/01/2024	\$67.08	\$12.70	\$21.80	\$0.00	\$101.58
	03/01/2025	\$68.88	\$12.70	\$21.80	\$0.00	\$103.38
For apprentice rates see "Apprentice- PIPEFITTER" or "PLUMBER/PIPEFITTER"						
HVAC MECHANIC <i>PIPEFITTERS LOCAL 537 (Local 138)</i>	09/01/2024	\$67.08	\$12.70	\$21.80	\$0.00	\$101.58
	03/01/2025	\$68.88	\$12.70	\$21.80	\$0.00	\$103.38
For apprentice rates see "Apprentice- PIPEFITTER" or "PLUMBER/PIPEFITTER"						
HYDRAULIC DRILLS <i>LABORERS - ZONE 2</i>	06/01/2024	\$39.28	\$9.65	\$18.40	\$0.00	\$67.33
	12/01/2024	\$40.61	\$9.65	\$18.40	\$0.00	\$68.66
	06/01/2025	\$42.00	\$9.65	\$18.40	\$0.00	\$70.05
	12/01/2025	\$43.38	\$9.65	\$18.40	\$0.00	\$71.43
	06/01/2026	\$44.82	\$9.65	\$18.40	\$0.00	\$72.87
	12/01/2026	\$46.26	\$9.65	\$18.40	\$0.00	\$74.31
	06/01/2027	\$47.71	\$9.65	\$18.40	\$0.00	\$75.76
	12/01/2027	\$49.16	\$9.65	\$18.40	\$0.00	\$77.21
	06/01/2028	\$50.66	\$9.65	\$18.40	\$0.00	\$78.71
	12/01/2028	\$52.16	\$9.65	\$18.40	\$0.00	\$80.21
For apprentice rates see "Apprentice- LABORER"						
HYDRAULIC DRILLS (HEAVY & HIGHWAY) <i>LABORERS - ZONE 2 (HEAVY & 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 & FROST INSULATORS LOCAL 6 (BOSTON)</i>	09/01/2024	\$56.92	\$14.75	\$19.61	\$0.00	\$91.28
	09/01/2025	\$60.34	\$14.75	\$19.61	\$0.00	\$94.70
	09/01/2026	\$63.76	\$14.75	\$19.61	\$0.00	\$98.12

Classification

Effective Date Base Wage Health Pension Supplemental Unemployment Total Rate

Apprentice - ASBESTOS INSULATOR (Pipes & Tanks) - Local 6 Boston

Effective Date - 09/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$28.46	\$14.75	\$14.32	\$0.00	\$57.53
2	60	\$34.15	\$14.75	\$15.37	\$0.00	\$64.27
3	70	\$39.84	\$14.75	\$16.43	\$0.00	\$71.02
4	80	\$45.54	\$14.75	\$17.49	\$0.00	\$77.78

Effective Date - 09/01/2025

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$30.17	\$14.75	\$14.32	\$0.00	\$59.24
2	60	\$36.20	\$14.75	\$15.37	\$0.00	\$66.32
3	70	\$42.24	\$14.75	\$16.43	\$0.00	\$73.42
4	80	\$48.27	\$14.75	\$17.49	\$0.00	\$80.51

Notes:

Steps are 1 year

Apprentice to Journeyworker Ratio:1:4

IRONWORKER/WELDER	03/16/2024	\$49.56	\$8.35	\$26.70	\$0.00	\$84.61
<i>IRONWORKERS LOCAL 7 (LAWRENCE AREA)</i>						

Apprentice - IRONWORKER - Local 7 Lawrence

Effective Date - 03/16/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	\$29.74	\$8.35	\$26.70	\$0.00	\$64.79
2	70	\$34.69	\$8.35	\$26.70	\$0.00	\$69.74
3	75	\$37.17	\$8.35	\$26.70	\$0.00	\$72.22
4	80	\$39.65	\$8.35	\$26.70	\$0.00	\$74.70
5	85	\$42.13	\$8.35	\$26.70	\$0.00	\$77.18
6	90	\$44.60	\$8.35	\$26.70	\$0.00	\$79.65

Notes:

Apprentice to Journeyworker Ratio:1:4

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
JACKHAMMER & PAVING BREAKER OPERATOR LABORERS - ZONE 2	06/01/2024	\$38.78	\$9.65	\$18.40	\$0.00	\$66.83
	12/01/2024	\$40.11	\$9.65	\$18.40	\$0.00	\$68.16
	06/01/2025	\$41.50	\$9.65	\$18.40	\$0.00	\$69.55
	12/01/2025	\$42.88	\$9.65	\$18.40	\$0.00	\$70.93
	06/01/2026	\$44.32	\$9.65	\$18.40	\$0.00	\$72.37
	12/01/2026	\$45.76	\$9.65	\$18.40	\$0.00	\$73.81
	06/01/2027	\$47.21	\$9.65	\$18.40	\$0.00	\$75.26
	12/01/2027	\$48.66	\$9.65	\$18.40	\$0.00	\$76.71
	06/01/2028	\$50.16	\$9.65	\$18.40	\$0.00	\$78.21
	12/01/2028	\$51.66	\$9.65	\$18.40	\$0.00	\$79.71

For apprentice rates see "Apprentice- LABORER"

LABORER LABORERS - ZONE 2	06/01/2024	\$38.53	\$9.65	\$18.40	\$0.00	\$66.58
	12/01/2024	\$39.86	\$9.65	\$18.40	\$0.00	\$67.91
	06/01/2025	\$41.25	\$9.65	\$18.40	\$0.00	\$69.30
	12/01/2025	\$42.63	\$9.65	\$18.40	\$0.00	\$70.68
	06/01/2026	\$44.07	\$9.65	\$18.40	\$0.00	\$72.12
	12/01/2026	\$45.51	\$9.65	\$18.40	\$0.00	\$73.56
	06/01/2027	\$46.96	\$9.65	\$18.40	\$0.00	\$75.01
	12/01/2027	\$48.41	\$9.65	\$18.40	\$0.00	\$76.46
	06/01/2028	\$49.91	\$9.65	\$18.40	\$0.00	\$77.96
	12/01/2028	\$51.41	\$9.65	\$18.40	\$0.00	\$79.46

Apprentice - LABORER - Zone 2

Effective Date - 06/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	\$23.12	\$9.65	\$18.40	\$0.00	\$51.17
2	70	\$26.97	\$9.65	\$18.40	\$0.00	\$55.02
3	80	\$30.82	\$9.65	\$18.40	\$0.00	\$58.87
4	90	\$34.68	\$9.65	\$18.40	\$0.00	\$62.73

Effective Date - 12/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	\$23.92	\$9.65	\$18.40	\$0.00	\$51.97
2	70	\$27.90	\$9.65	\$18.40	\$0.00	\$55.95
3	80	\$31.89	\$9.65	\$18.40	\$0.00	\$59.94
4	90	\$35.87	\$9.65	\$18.40	\$0.00	\$63.92

Notes:

Apprentice to Journeyworker Ratio:1:5

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
LABORER (HEAVY & HIGHWAY) <i>LABORERS - ZONE 2 (HEAVY & HIGHWAY)</i>	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

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

LABORER: CARPENTER TENDER <i>LABORERS - ZONE 2</i>	06/01/2024	\$38.53	\$9.65	\$18.40	\$0.00	\$66.58
	12/01/2024	\$39.86	\$9.65	\$18.40	\$0.00	\$67.91
	06/01/2025	\$41.25	\$9.65	\$18.40	\$0.00	\$69.30
	12/01/2025	\$42.63	\$9.65	\$18.40	\$0.00	\$70.68
	06/01/2026	\$44.07	\$9.65	\$18.40	\$0.00	\$72.12
	12/01/2026	\$45.51	\$9.65	\$18.40	\$0.00	\$73.56
	06/01/2027	\$46.96	\$9.65	\$18.40	\$0.00	\$75.01
	12/01/2027	\$48.41	\$9.65	\$18.40	\$0.00	\$76.46
	06/01/2028	\$49.91	\$9.65	\$18.40	\$0.00	\$77.96
	12/01/2028	\$51.41	\$9.65	\$18.40	\$0.00	\$79.46

For apprentice rates see "Apprentice- LABORER"

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
LABORER: CEMENT FINISHER TENDER <i>LABORERS - ZONE 2</i>	06/01/2024	\$38.53	\$9.65	\$18.40	\$0.00	\$66.58
	12/01/2024	\$39.86	\$9.65	\$18.40	\$0.00	\$67.91
	06/01/2025	\$41.25	\$9.65	\$18.40	\$0.00	\$69.30
	12/01/2025	\$42.63	\$9.65	\$18.40	\$0.00	\$70.68
	06/01/2026	\$44.07	\$9.65	\$18.40	\$0.00	\$72.12
	12/01/2026	\$45.51	\$9.65	\$18.40	\$0.00	\$73.56
	06/01/2027	\$46.96	\$9.65	\$18.40	\$0.00	\$75.01
	12/01/2027	\$48.41	\$9.65	\$18.40	\$0.00	\$76.46
	06/01/2028	\$49.91	\$9.65	\$18.40	\$0.00	\$77.96
	12/01/2028	\$51.41	\$9.65	\$18.40	\$0.00	\$79.46
For apprentice rates see "Apprentice- LABORER"						
LABORER: HAZARDOUS WASTE/ASBESTOS REMOVER <i>LABORERS - ZONE 2</i>	06/03/2024	\$38.62	\$9.65	\$17.76	\$0.00	\$66.03
	12/02/2024	\$39.95	\$9.65	\$17.76	\$0.00	\$67.36
	06/02/2025	\$41.34	\$9.65	\$17.76	\$0.00	\$68.75
	12/01/2025	\$42.72	\$9.65	\$17.76	\$0.00	\$70.13
	06/01/2026	\$44.16	\$9.65	\$17.76	\$0.00	\$71.57
	12/07/2026	\$45.60	\$9.65	\$17.76	\$0.00	\$73.01
	06/07/2027	\$47.05	\$9.65	\$17.76	\$0.00	\$74.46
	12/06/2027	\$48.50	\$9.65	\$17.76	\$0.00	\$75.91
	06/05/2028	\$50.00	\$9.65	\$17.76	\$0.00	\$77.41
	12/04/2028	\$51.50	\$9.65	\$17.76	\$0.00	\$78.91
For apprentice rates see "Apprentice- LABORER"						
LABORER: MASON TENDER <i>LABORERS - ZONE 2</i>	06/01/2024	\$38.78	\$9.65	\$18.40	\$0.00	\$66.83
	12/01/2024	\$40.11	\$9.65	\$18.40	\$0.00	\$68.16
	06/01/2025	\$41.50	\$9.65	\$18.40	\$0.00	\$69.55
	12/01/2025	\$42.88	\$9.65	\$18.40	\$0.00	\$70.93
	06/01/2026	\$44.32	\$9.65	\$18.40	\$0.00	\$72.37
	12/01/2026	\$45.76	\$9.65	\$18.40	\$0.00	\$73.81
	06/01/2027	\$47.21	\$9.65	\$18.40	\$0.00	\$75.26
	12/01/2027	\$48.66	\$9.65	\$18.40	\$0.00	\$76.71
	06/01/2028	\$50.16	\$9.65	\$18.40	\$0.00	\$78.21
	12/01/2028	\$51.66	\$9.65	\$18.40	\$0.00	\$79.71
For apprentice rates see "Apprentice- LABORER"						
LABORER: MASON TENDER (HEAVY & HIGHWAY) <i>LABORERS - ZONE 2 (HEAVY & 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)"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
LABORER: MULTI-TRADE TENDER <i>LABORERS - ZONE 2</i>	06/01/2024	\$38.53	\$9.65	\$18.40	\$0.00	\$66.58
	12/01/2024	\$39.86	\$9.65	\$18.40	\$0.00	\$67.91
	06/01/2025	\$41.25	\$9.65	\$18.40	\$0.00	\$69.30
	12/01/2025	\$42.63	\$9.65	\$18.40	\$0.00	\$70.68
	06/01/2026	\$44.07	\$9.65	\$18.40	\$0.00	\$72.12
	12/01/2026	\$45.51	\$9.65	\$18.40	\$0.00	\$73.56
	06/01/2027	\$46.96	\$9.65	\$18.40	\$0.00	\$75.01
	12/01/2027	\$48.41	\$9.65	\$18.40	\$0.00	\$76.46
	06/01/2028	\$49.91	\$9.65	\$18.40	\$0.00	\$77.96
	12/01/2028	\$51.41	\$9.65	\$18.40	\$0.00	\$79.46
For apprentice rates see "Apprentice- LABORER"						
LABORER: TREE REMOVER <i>LABORERS - ZONE 2</i>	06/01/2024	\$38.53	\$9.65	\$18.40	\$0.00	\$66.58
	12/01/2024	\$39.86	\$9.65	\$18.40	\$0.00	\$67.91
	06/01/2025	\$41.25	\$9.65	\$18.40	\$0.00	\$69.30
	12/01/2025	\$42.63	\$9.65	\$18.40	\$0.00	\$70.68
	06/01/2026	\$44.07	\$9.65	\$18.40	\$0.00	\$72.12
	12/01/2026	\$45.51	\$9.65	\$18.40	\$0.00	\$73.56
	06/01/2027	\$46.96	\$9.65	\$18.40	\$0.00	\$75.01
	12/01/2027	\$48.41	\$9.65	\$18.40	\$0.00	\$76.46
	06/01/2028	\$49.91	\$9.65	\$18.40	\$0.00	\$77.96
	12/01/2028	\$51.41	\$9.65	\$18.40	\$0.00	\$79.46
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"						
LASER BEAM OPERATOR <i>LABORERS - ZONE 2</i>	06/01/2024	\$38.78	\$9.65	\$18.40	\$0.00	\$66.83
	12/01/2024	\$40.11	\$9.65	\$18.40	\$0.00	\$68.16
	06/01/2025	\$41.50	\$9.65	\$18.40	\$0.00	\$69.55
	12/01/2025	\$42.88	\$9.65	\$18.40	\$0.00	\$70.93
	06/01/2026	\$44.32	\$9.65	\$18.40	\$0.00	\$72.37
	12/01/2026	\$45.76	\$9.65	\$18.40	\$0.00	\$73.81
	06/01/2027	\$47.21	\$9.65	\$18.40	\$0.00	\$75.26
	12/01/2027	\$48.66	\$9.65	\$18.40	\$0.00	\$76.71
	06/01/2028	\$50.16	\$9.65	\$18.40	\$0.00	\$78.21
	12/01/2028	\$51.66	\$9.65	\$18.40	\$0.00	\$79.71
For apprentice rates see "Apprentice- LABORER"						
LASER BEAM OPERATOR (HEAVY & HIGHWAY) <i>LABORERS - ZONE 2 (HEAVY & 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 & TILE</i>	08/01/2024	\$49.32	\$11.49	\$21.62	\$0.00	\$82.43
	02/01/2025	\$50.36	\$11.49	\$21.62	\$0.00	\$83.47
	08/01/2025	\$52.08	\$11.49	\$21.62	\$0.00	\$85.19
	02/01/2026	\$53.16	\$11.49	\$21.62	\$0.00	\$86.27
	08/01/2026	\$54.92	\$11.49	\$21.62	\$0.00	\$88.03
	02/01/2027	\$56.04	\$11.49	\$21.62	\$0.00	\$89.15

Classification

Effective Date Base Wage Health Pension Supplemental Unemployment Total Rate

Apprentice - MARBLE & TILE FINISHER - Local 3 Marble & Tile

Effective Date - 08/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$24.66	\$11.49	\$21.62	\$0.00	\$57.77
2	60	\$29.59	\$11.49	\$21.62	\$0.00	\$62.70
3	70	\$34.52	\$11.49	\$21.62	\$0.00	\$67.63
4	80	\$39.46	\$11.49	\$21.62	\$0.00	\$72.57
5	90	\$44.39	\$11.49	\$21.62	\$0.00	\$77.50

Effective Date - 02/01/2025

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$25.18	\$11.49	\$21.62	\$0.00	\$58.29
2	60	\$30.22	\$11.49	\$21.62	\$0.00	\$63.33
3	70	\$35.25	\$11.49	\$21.62	\$0.00	\$68.36
4	80	\$40.29	\$11.49	\$21.62	\$0.00	\$73.40
5	90	\$45.32	\$11.49	\$21.62	\$0.00	\$78.43

Notes:

Apprentice to Journeyworker Ratio:1:3

MARBLE MASONS, TILELAYERS & TERRAZZO MECH	08/01/2024	\$64.52	\$11.49	\$23.56	\$0.00	\$99.57
BRICKLAYERS LOCAL 3 - MARBLE & TILE	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 - 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

Effective Date - 02/01/2025

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$32.91	\$11.49	\$23.56	\$0.00	\$67.96
2	60	\$39.49	\$11.49	\$23.56	\$0.00	\$74.54
3	70	\$46.07	\$11.49	\$23.56	\$0.00	\$81.12
4	80	\$52.66	\$11.49	\$23.56	\$0.00	\$87.71
5	90	\$59.24	\$11.49	\$23.56	\$0.00	\$94.29

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 2) <i>MILLWRIGHTS LOCAL 1121 - Zone 2</i>	01/01/2024	\$42.76	\$10.08	\$21.47	\$0.00	\$74.31
	01/06/2025	\$45.09	\$10.08	\$21.47	\$0.00	\$76.64
	01/05/2026	\$47.42	\$10.08	\$21.47	\$0.00	\$78.97

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
----------------	----------------	-----------	--------	---------	---------------------------	------------

Apprentice - MILLWRIGHT - Local 1121 Zone 2

Effective Date - 01/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	55	\$23.52	\$10.08	\$5.50	\$0.00	\$39.10
2	65	\$27.79	\$10.08	\$6.50	\$0.00	\$44.37
3	75	\$32.07	\$10.08	\$18.97	\$0.00	\$61.12
4	85	\$36.35	\$10.08	\$19.97	\$0.00	\$66.40

Effective Date - 01/06/2025

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	55	\$24.80	\$10.08	\$5.50	\$0.00	\$40.38
2	65	\$29.31	\$10.08	\$6.50	\$0.00	\$45.89
3	75	\$33.82	\$10.08	\$18.97	\$0.00	\$62.87
4	85	\$38.33	\$10.08	\$19.97	\$0.00	\$68.38

Notes: 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

Apprentice to Journeyworker Ratio:1:4

MORTAR MIXER LABORERS - ZONE 2	06/01/2024	\$38.78	\$9.65	\$18.40	\$0.00	\$66.83
	12/01/2024	\$40.11	\$9.65	\$18.40	\$0.00	\$68.16
	06/01/2025	\$41.50	\$9.65	\$18.40	\$0.00	\$69.55
	12/01/2025	\$42.88	\$9.65	\$18.40	\$0.00	\$70.93
	06/01/2026	\$44.32	\$9.65	\$18.40	\$0.00	\$72.37
	12/01/2026	\$45.76	\$9.65	\$18.40	\$0.00	\$73.81
	06/01/2027	\$47.21	\$9.65	\$18.40	\$0.00	\$75.26
	12/01/2027	\$48.66	\$9.65	\$18.40	\$0.00	\$76.71
	06/01/2028	\$50.16	\$9.65	\$18.40	\$0.00	\$78.21
	12/01/2028	\$51.66	\$9.65	\$18.40	\$0.00	\$79.71

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"

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
OTHER POWER DRIVEN EQUIPMENT - CLASS II <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"						
PAINTER (BRIDGES/TANKS) <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

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. <i>PAINTERS LOCAL 35 - ZONE 2</i>	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

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. PAINTERS LOCAL 35 - ZONE 2	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 1)</i> For apprentice rates see "Apprentice- PILE DRIVER"	08/01/2020	\$49.07	\$9.40	\$23.12	\$0.00	\$81.59
PILE DRIVER <i>PILE DRIVER LOCAL 56 (ZONE 1)</i>	08/01/2020	\$49.07	\$9.40	\$23.12	\$0.00	\$81.59

Apprentice - PILE DRIVER - Local 56 Zone 1

Effective Date - 08/01/2020

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$24.54	\$9.40	\$23.12	\$0.00	\$57.06
2	60	\$29.44	\$9.40	\$23.12	\$0.00	\$61.96
3	70	\$34.35	\$9.40	\$23.12	\$0.00	\$66.87
4	75	\$36.80	\$9.40	\$23.12	\$0.00	\$69.32
5	80	\$39.26	\$9.40	\$23.12	\$0.00	\$71.78
6	80	\$39.26	\$9.40	\$23.12	\$0.00	\$71.78
7	90	\$44.16	\$9.40	\$23.12	\$0.00	\$76.68
8	90	\$44.16	\$9.40	\$23.12	\$0.00	\$76.68

Notes:

% Indentured After 10/1/17; 45/45/55/55/70/70/80/80
Step 1&2 \$34.01/ 3&4 \$41.46/ 5&6 \$62.80/ 7&8 \$69.25

Apprentice to Journeyworker Ratio:1:5

PIPEFITTER & STEAMFITTER <i>PIPEFITTERS LOCAL 537 (Local 138)</i>	09/01/2024	\$67.08	\$12.70	\$21.80	\$0.00	\$101.58
	03/01/2025	\$68.88	\$12.70	\$21.80	\$0.00	\$103.38

Apprentice - PIPEFITTER Local 537 (Local 138)

Effective Date - 09/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	\$26.83	\$12.70	\$9.05	\$0.00	\$48.58
2	45	\$30.19	\$12.70	\$21.80	\$0.00	\$64.69
3	60	\$40.25	\$12.70	\$21.80	\$0.00	\$74.75
4	70	\$46.96	\$12.70	\$21.80	\$0.00	\$81.46
5	80	\$53.66	\$12.70	\$21.80	\$0.00	\$88.16

Effective Date - 03/01/2025

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	\$27.55	\$12.70	\$9.05	\$0.00	\$49.30
2	45	\$31.00	\$12.70	\$21.80	\$0.00	\$65.50
3	60	\$41.33	\$12.70	\$21.80	\$0.00	\$75.83
4	70	\$48.22	\$12.70	\$21.80	\$0.00	\$82.72
5	80	\$55.10	\$12.70	\$21.80	\$0.00	\$89.60

Notes:

** 1:3; 3:15; 1:10 thereafter / Steps are 1 yr.
Refrig/AC Mechanic **1:1;1:2;2:4;3:6;4:8;5:10;6:12;7:14;8:17;9:20;10:23(Max)

Apprentice to Journeyworker Ratio:**

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
PIPELAYER <i>LABORERS - ZONE 2</i>	06/01/2024	\$38.78	\$9.65	\$18.40	\$0.00	\$66.83
	12/01/2024	\$40.11	\$9.65	\$18.40	\$0.00	\$68.16
	06/01/2025	\$41.50	\$9.65	\$18.40	\$0.00	\$69.55
	12/01/2025	\$42.88	\$9.65	\$18.40	\$0.00	\$70.93
	06/01/2026	\$44.32	\$9.65	\$18.40	\$0.00	\$72.37
	12/01/2026	\$45.76	\$9.65	\$18.40	\$0.00	\$73.81
	06/01/2027	\$47.21	\$9.65	\$18.40	\$0.00	\$75.26
	12/01/2027	\$48.66	\$9.65	\$18.40	\$0.00	\$76.71
	06/01/2028	\$50.16	\$9.65	\$18.40	\$0.00	\$78.21
	12/01/2028	\$51.66	\$9.65	\$18.40	\$0.00	\$79.71
For apprentice rates see "Apprentice- LABORER"						
PIPELAYER (HEAVY & HIGHWAY) <i>LABORERS - ZONE 2 (HEAVY & 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 <i>PLUMBERS & GASFITTERS LOCAL 12 (Local 138)</i>	09/01/2024	\$69.54	\$14.32	\$19.11	\$0.00	\$102.97
	03/02/2025	\$71.34	\$14.32	\$19.11	\$0.00	\$104.77

Apprentice - PLUMBER/GASFITTER - Local 12 (Local 138)

Effective Date - 09/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	35	\$24.34	\$14.32	\$6.88	\$0.00	\$45.54
2	40	\$27.82	\$14.32	\$7.82	\$0.00	\$49.96
3	55	\$38.25	\$14.32	\$10.65	\$0.00	\$63.22
4	65	\$45.20	\$14.32	\$12.53	\$0.00	\$72.05
5	75	\$52.16	\$14.32	\$14.41	\$0.00	\$80.89

Effective Date - 03/02/2025

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	35	\$24.97	\$14.32	\$6.88	\$0.00	\$46.17
2	40	\$28.54	\$14.32	\$7.82	\$0.00	\$50.68
3	55	\$39.24	\$14.32	\$10.65	\$0.00	\$64.21
4	65	\$46.37	\$14.32	\$12.53	\$0.00	\$73.22
5	75	\$53.51	\$14.32	\$14.41	\$0.00	\$82.24

Notes: ** 1:2; 2:6; 3:10; 4:14; 5:19/Steps are 1 yr
Steps are 1 yr
Step 4 with lic\$69.00, Step5 with lic\$76.87

Apprentice to Journeyworker Ratio:**

PNEUMATIC CONTROLS (TEMP.) <i>PIPEFITTERS LOCAL 537 (Local 138)</i>	09/01/2024	\$67.08	\$12.70	\$21.80	\$0.00	\$101.58
	03/01/2025	\$68.88	\$12.70	\$21.80	\$0.00	\$103.38

For apprentice rates see "Apprentice- PIPEFITTER" or "PLUMBER/PIPEFITTER"

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
PNEUMATIC DRILL/TOOL OPERATOR <i>LABORERS - ZONE 2</i>	06/01/2024	\$39.28	\$9.65	\$18.40	\$0.00	\$67.33
	12/01/2024	\$40.61	\$9.65	\$18.40	\$0.00	\$68.66
	06/01/2025	\$42.00	\$9.65	\$18.40	\$0.00	\$70.05
	12/01/2025	\$43.38	\$9.65	\$18.40	\$0.00	\$71.43
	06/01/2026	\$44.82	\$9.65	\$18.40	\$0.00	\$72.87
	12/01/2026	\$46.26	\$9.65	\$18.40	\$0.00	\$74.31
	06/01/2027	\$47.71	\$9.65	\$18.40	\$0.00	\$75.76
	12/01/2027	\$49.16	\$9.65	\$18.40	\$0.00	\$77.21
	06/01/2028	\$50.66	\$9.65	\$18.40	\$0.00	\$78.71
	12/01/2028	\$52.16	\$9.65	\$18.40	\$0.00	\$80.21
For apprentice rates see "Apprentice- LABORER"						
PNEUMATIC DRILL/TOOL OPERATOR (HEAVY & HIGHWAY) <i>LABORERS - ZONE 2 (HEAVY & 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>	06/01/2024	\$39.53	\$9.65	\$18.40	\$0.00	\$67.58
	12/01/2024	\$40.86	\$9.65	\$18.40	\$0.00	\$68.91
	06/01/2025	\$42.25	\$9.65	\$18.40	\$0.00	\$70.30
	12/01/2025	\$43.63	\$9.65	\$18.40	\$0.00	\$71.68
	06/01/2026	\$45.07	\$9.65	\$18.40	\$0.00	\$73.12
	12/01/2026	\$46.51	\$9.65	\$18.40	\$0.00	\$74.56
	06/01/2027	\$47.96	\$9.65	\$18.40	\$0.00	\$76.01
	12/01/2027	\$49.41	\$9.65	\$18.40	\$0.00	\$77.46
	06/01/2028	\$50.91	\$9.65	\$18.40	\$0.00	\$78.96
12/01/2028	\$52.41	\$9.65	\$18.40	\$0.00	\$80.46	
For apprentice rates see "Apprentice- LABORER"						
POWDERMAN & BLASTER (HEAVY & HIGHWAY) <i>LABORERS - ZONE 2 (HEAVY & 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
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"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
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 - J.G. MacLellan (Lowell)</i>	05/01/2024	\$30.00	\$11.17	\$6.55	\$0.00	\$47.72
	01/01/2025	\$30.00	\$11.57	\$6.55	\$0.00	\$48.12
	05/01/2025	\$30.50	\$11.57	\$6.65	\$0.00	\$48.72
	01/01/2026	\$30.50	\$11.97	\$6.65	\$0.00	\$49.12
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>	06/01/2024	\$38.78	\$9.65	\$18.40	\$0.00	\$66.83
	12/01/2024	\$40.11	\$9.65	\$18.40	\$0.00	\$68.16
	06/01/2025	\$41.50	\$9.65	\$18.40	\$0.00	\$69.55
	12/01/2025	\$42.88	\$9.65	\$18.40	\$0.00	\$70.93
	06/01/2026	\$44.32	\$9.65	\$18.40	\$0.00	\$72.37
	12/01/2026	\$45.76	\$9.65	\$18.40	\$0.00	\$73.81
	06/01/2027	\$47.21	\$9.65	\$18.40	\$0.00	\$75.26
	12/01/2027	\$48.66	\$9.65	\$18.40	\$0.00	\$76.71
	06/01/2028	\$50.16	\$9.65	\$18.40	\$0.00	\$78.21
12/01/2028	\$51.66	\$9.65	\$18.40	\$0.00	\$79.71	
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"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
ROOFER (Inc.Roofing Waterproofing &Roofing Damproofg) ROOFERS LOCAL 33	08/01/2024	\$51.03	\$13.03	\$21.70	\$0.00	\$85.76
	02/01/2025	\$52.28	\$13.03	\$21.70	\$0.00	\$87.01
	08/01/2025	\$53.78	\$13.03	\$21.70	\$0.00	\$88.51
	02/01/2026	\$55.03	\$13.03	\$21.70	\$0.00	\$89.76

Apprentice - ROOFER - Local 33

Effective Date - 08/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$25.52	\$13.03	\$6.52	\$0.00	\$45.07
2	60	\$30.62	\$13.03	\$21.70	\$0.00	\$65.35
3	65	\$33.17	\$13.03	\$21.70	\$0.00	\$67.90
4	75	\$38.27	\$13.03	\$21.70	\$0.00	\$73.00
5	85	\$43.38	\$13.03	\$21.70	\$0.00	\$78.11

Effective Date - 02/01/2025

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$26.14	\$13.03	\$6.52	\$0.00	\$45.69
2	60	\$31.37	\$13.03	\$21.70	\$0.00	\$66.10
3	65	\$33.98	\$13.03	\$21.70	\$0.00	\$68.71
4	75	\$39.21	\$13.03	\$21.70	\$0.00	\$73.94
5	85	\$44.44	\$13.03	\$21.70	\$0.00	\$79.17

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 ROOFERS LOCAL 33	08/01/2024	\$51.28	\$13.03	\$21.70	\$0.00	\$86.01
	02/01/2025	\$52.53	\$13.03	\$21.70	\$0.00	\$87.26
	08/01/2025	\$54.03	\$13.03	\$21.70	\$0.00	\$88.76
	02/01/2026	\$55.28	\$13.03	\$21.70	\$0.00	\$90.01

For apprentice rates see "Apprentice- ROOFER"

SHEETMETAL WORKER SHEETMETAL WORKERS LOCAL 17 - A	08/01/2024	\$58.97	\$14.59	\$27.50	\$2.98	\$104.04
	02/01/2025	\$60.72	\$14.59	\$27.50	\$2.98	\$105.79
	08/01/2025	\$62.57	\$14.59	\$27.50	\$2.98	\$107.64
	02/01/2026	\$64.52	\$14.59	\$27.50	\$2.98	\$109.59

Classification

Effective Date Base Wage Health Pension Supplemental Unemployment Total Rate

Apprentice - SHEET METAL WORKER - Local 17-A

Effective Date - 08/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	42	\$24.77	\$14.59	\$6.13	\$0.00	\$45.49
2	42	\$24.77	\$14.59	\$6.13	\$0.00	\$45.49
3	47	\$27.72	\$14.59	\$12.11	\$1.63	\$56.05
4	47	\$27.72	\$14.59	\$12.11	\$1.63	\$56.05
5	52	\$30.66	\$14.59	\$13.09	\$1.75	\$60.09
6	52	\$30.66	\$14.59	\$13.34	\$1.76	\$60.35
7	60	\$35.38	\$14.59	\$14.75	\$1.94	\$66.66
8	65	\$38.33	\$14.59	\$15.73	\$2.06	\$70.71
9	75	\$44.23	\$14.59	\$17.69	\$2.30	\$78.81
10	85	\$50.12	\$14.59	\$19.15	\$2.52	\$86.38

Effective Date - 02/01/2025

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	42	\$25.50	\$14.59	\$6.13	\$0.00	\$46.22
2	42	\$25.50	\$14.59	\$6.13	\$0.00	\$46.22
3	47	\$28.54	\$14.59	\$12.11	\$1.66	\$56.90
4	47	\$28.54	\$14.59	\$12.11	\$1.66	\$56.90
5	52	\$31.57	\$14.59	\$13.09	\$1.78	\$61.03
6	52	\$31.57	\$14.59	\$13.34	\$1.79	\$61.29
7	60	\$36.43	\$14.59	\$14.75	\$1.97	\$67.74
8	65	\$39.47	\$14.59	\$15.73	\$2.09	\$71.88
9	75	\$45.54	\$14.59	\$17.69	\$2.33	\$80.15
10	85	\$51.61	\$14.59	\$19.15	\$2.56	\$87.91

Notes:
Steps are 6 mos.

Apprentice to Journeyworker Ratio:1:4

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 550 - (Section B) Zone 2</i>	03/01/2024	\$62.14	\$11.51	\$23.30	\$0.00	\$96.95
	10/01/2024	\$63.76	\$11.51	\$23.30	\$0.00	\$98.57
	03/01/2025	\$65.38	\$11.51	\$23.30	\$0.00	\$100.19

Apprentice - SPRINKLER FITTER - Local 550 (Section B) Zone 2

Effective Date - 03/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	35	\$21.75	\$11.51	\$12.90	\$0.00	\$46.16
2	40	\$24.86	\$11.51	\$13.70	\$0.00	\$50.07
3	45	\$27.96	\$11.51	\$14.50	\$0.00	\$53.97
4	50	\$31.07	\$11.51	\$15.30	\$0.00	\$57.88
5	55	\$34.18	\$11.51	\$16.10	\$0.00	\$61.79
6	60	\$37.28	\$11.51	\$16.90	\$0.00	\$65.69
7	65	\$40.39	\$11.51	\$17.70	\$0.00	\$69.60
8	70	\$43.50	\$11.51	\$18.50	\$0.00	\$73.51
9	75	\$46.61	\$11.51	\$19.30	\$0.00	\$77.42
10	80	\$49.71	\$11.51	\$20.10	\$0.00	\$81.32

Effective Date - 10/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	35	\$22.32	\$11.51	\$12.90	\$0.00	\$46.73
2	40	\$25.50	\$11.51	\$13.70	\$0.00	\$50.71
3	45	\$28.69	\$11.51	\$14.50	\$0.00	\$54.70
4	50	\$31.88	\$11.51	\$15.30	\$0.00	\$58.69
5	55	\$35.07	\$11.51	\$16.10	\$0.00	\$62.68
6	60	\$38.26	\$11.51	\$16.90	\$0.00	\$66.67
7	65	\$41.44	\$11.51	\$17.70	\$0.00	\$70.65
8	70	\$44.63	\$11.51	\$18.50	\$0.00	\$74.64
9	75	\$47.82	\$11.51	\$19.30	\$0.00	\$78.63
10	80	\$51.01	\$11.51	\$20.10	\$0.00	\$82.62

Notes: Apprentice entered prior 9/30/10:
40/45/50/55/60/65/70/75/80/85
Steps are 850 hours

Apprentice to Journeyworker Ratio:1:3

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
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"					
TELECOMMUNICATION TECHNICIAN <i>ELECTRICIANS LOCAL 103</i>	09/01/2024	\$51.02	\$13.00	\$20.24	\$0.00	\$84.26
	03/01/2025	\$51.98	\$13.00	\$20.27	\$0.00	\$85.25
	09/01/2025	\$53.51	\$13.00	\$20.32	\$0.00	\$86.83
	03/01/2026	\$54.47	\$13.00	\$20.34	\$0.00	\$87.81
	09/01/2026	\$56.00	\$13.00	\$20.39	\$0.00	\$89.39
	03/01/2027	\$56.95	\$13.00	\$20.42	\$0.00	\$90.37
	09/01/2027	\$58.49	\$13.00	\$20.46	\$0.00	\$91.95
	03/01/2028	\$59.45	\$13.00	\$20.49	\$0.00	\$92.94

Classification

Effective Date Base Wage Health Pension Supplemental Unemployment Total Rate

Apprentice - TELECOMMUNICATION TECHNICIAN - Local 103

Effective Date - 09/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	45	\$22.96	\$13.00	\$0.69	\$0.00	\$36.65
2	45	\$22.96	\$13.00	\$0.69	\$0.00	\$36.65
3	50	\$25.51	\$13.00	\$16.16	\$0.00	\$54.67
4	50	\$25.51	\$13.00	\$16.16	\$0.00	\$54.67
5	55	\$28.06	\$13.00	\$16.57	\$0.00	\$57.63
6	60	\$30.61	\$13.00	\$16.97	\$0.00	\$60.58
7	65	\$33.16	\$13.00	\$17.38	\$0.00	\$63.54
8	70	\$35.71	\$13.00	\$17.78	\$0.00	\$66.49
9	75	\$38.27	\$13.00	\$18.18	\$0.00	\$69.45
10	80	\$40.82	\$13.00	\$18.58	\$0.00	\$72.40

Effective Date - 03/01/2025

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	45	\$23.39	\$13.00	\$0.70	\$0.00	\$37.09
2	45	\$23.39	\$13.00	\$0.70	\$0.00	\$37.09
3	50	\$25.99	\$13.00	\$16.16	\$0.00	\$55.15
4	50	\$25.99	\$13.00	\$16.16	\$0.00	\$55.15
5	55	\$28.59	\$13.00	\$16.57	\$0.00	\$58.16
6	60	\$31.19	\$13.00	\$16.97	\$0.00	\$61.16
7	65	\$33.79	\$13.00	\$17.38	\$0.00	\$64.17
8	70	\$36.39	\$13.00	\$17.78	\$0.00	\$67.17
9	75	\$38.99	\$13.00	\$18.18	\$0.00	\$70.17
10	80	\$41.58	\$13.00	\$18.58	\$0.00	\$73.16

Notes:

Apprentice to Journeyworker Ratio:1:1

TERRAZZO FINISHERS	08/01/2024	\$63.44	\$11.49	\$23.59	\$0.00	\$98.52
BRICKLAYERS LOCAL 3 - MARBLE & TILE	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

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
----------------	----------------	-----------	--------	---------	---------------------------	------------

Apprentice - TERRAZZO FINISHER - Local 3 Marble & Tile

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

Effective Date - 02/01/2025

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$32.37	\$11.49	\$23.59	\$0.00	\$67.45
2	60	\$38.84	\$11.49	\$23.59	\$0.00	\$73.92
3	70	\$45.32	\$11.49	\$23.59	\$0.00	\$80.40
4	80	\$51.79	\$11.49	\$23.59	\$0.00	\$86.87
5	90	\$58.27	\$11.49	\$23.59	\$0.00	\$93.35

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"

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"

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
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"						
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"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
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
WAGON DRILL OPERATOR <i>LABORERS - ZONE 2</i>	06/01/2024	\$39.28	\$9.65	\$18.40	\$0.00	\$67.33
	12/01/2024	\$40.61	\$9.65	\$18.40	\$0.00	\$68.66
	06/01/2025	\$42.00	\$9.65	\$18.40	\$0.00	\$70.05
	12/01/2025	\$43.38	\$9.65	\$18.40	\$0.00	\$71.43
	06/01/2026	\$44.82	\$9.65	\$18.40	\$0.00	\$72.87
	12/01/2026	\$46.26	\$9.65	\$18.40	\$0.00	\$74.31
	06/01/2027	\$47.71	\$9.65	\$18.40	\$0.00	\$75.76
	12/01/2027	\$49.16	\$9.65	\$18.40	\$0.00	\$77.21
	06/01/2028	\$50.66	\$9.65	\$18.40	\$0.00	\$78.71
12/01/2028	\$52.16	\$9.65	\$18.40	\$0.00	\$80.21	
For apprentice rates see "Apprentice- LABORER"						
WAGON DRILL OPERATOR (HEAVY & HIGHWAY) <i>LABORERS - ZONE 2 (HEAVY & 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"						
WATER METER INSTALLER <i>PLUMBERS & GASFITTERS LOCAL 12 (Local 138)</i>	09/01/2024	\$70.54	\$14.07	\$18.36	\$0.00	\$102.97
	03/02/2025	\$71.34	\$14.32	\$18.61	\$0.00	\$104.27
For apprentice rates see "Apprentice- PLUMBER/PIPEFITTER" or "PLUMBER/GASFITTER"						
Marine Drilling						
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

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
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
Op Eng Marine (Dredging Work)						
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
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
Outside Electrical - East						
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"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
DRIVER / GROUNDMAN CDL <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i> For apprentice rates see "Apprentice- LINEMAN"	08/30/2020	\$34.62	\$9.25	\$10.07	\$0.00	\$53.94
DRIVER / GROUNDMAN -Inexperienced (<2000 Hrs) <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i> For apprentice rates see "Apprentice- LINEMAN"	08/30/2020	\$27.20	\$9.25	\$1.82	\$0.00	\$38.27
EQUIPMENT OPERATOR (Class A CDL) <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i> For apprentice rates see "Apprentice- LINEMAN"	08/30/2020	\$42.03	\$9.25	\$14.35	\$0.00	\$65.63
EQUIPMENT OPERATOR (Class B CDL) <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i> For apprentice rates see "Apprentice- LINEMAN"	08/30/2020	\$37.09	\$9.25	\$10.87	\$0.00	\$57.21
GROUNDMAN <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i> For apprentice rates see "Apprentice- LINEMAN"	08/30/2020	\$27.20	\$9.25	\$1.82	\$0.00	\$38.27
GROUNDMAN -Inexperienced (<2000 Hrs.) <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i> For apprentice rates see "Apprentice- LINEMAN"	08/30/2020	\$22.25	\$9.25	\$1.82	\$0.00	\$33.32
JOURNEYMAN LINEMAN <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>	08/30/2020	\$49.45	\$9.25	\$17.48	\$0.00	\$76.18

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

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
-----------------------	-----------------------	------------------	---------------	----------------	----------------------------------	-------------------

Additional Apprentices 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. Apprentices 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.

THIS PAGE IS INTENTIONALLY LEFT BLANK

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 **4**

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

THIS PAGE INTENTIONALLY LEFT BLANK

"General Decision Number: MA20240018 09/20/2024

Superseded General Decision Number: MA20230018

State: Massachusetts

Construction Type: Highway

County: Essex 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).

<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 higher) for all hours 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 extended on or after January 30, 2022:</p>	<p>. Executive Order 13658 generally applies to the contract. . The contractor must pay all covered workers at least \$12.90 per hour (or the applicable wage rate listed on this wage determination, 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	03/15/2024
3	03/22/2024
4	05/31/2024
5	06/21/2024
6	09/13/2024
7	09/20/2024

CARP0339-004 03/01/2024

	Rates	Fringes
CARPENTER (Includes Form Work)...	\$ 46.86	30.94

* ELEC0103-007 09/01/2024

	Rates	Fringes
ELECTRICIAN.....	\$ 63.78	36.22

ENGI0004-025 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; Milling Machine; Roller

IRON0007-026 03/16/2024

	Rates	Fringes
IRONWORKER (ORNAMENTAL AND STRUCTURAL).....	\$ 54.68	36.48

LABO0022-016 12/01/2023

	Rates	Fringes
LABORER		
Asphalt, Includes Raker, Shoveler, Spreader, and Distributor.....	\$ 37.86	28.09
Common or General.....	\$ 37.86	28.09
Landscape.....	\$ 37.86	28.09

LABO0039-001 06/01/2021

	Rates	Fringes
LABORER (Guardrail Installation).....	\$ 35.00	25.94

PAIN0035-023 07/01/2024

	Rates	Fringes
PAINTER (Steel).....	\$ 56.76	36.00

SUMA2014-008 01/11/2017

	Rates	Fringes
CEMENT MASON/CONCRETE FINISHER....	\$ 56.70	21.08
IRONWORKER, REINFORCING.....	\$ 49.94	22.45
LABORER: Concrete Saw (Hand Held/Walk Behind).....	\$ 41.78	18.37
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)....	\$ 41.14	15.50
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.....	\$ 38.92	9.73
TRUCK DRIVER: Flatbed Truck.....	\$ 48.53	0.00

WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

=====

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)).

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.

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.

=====

END OF GENERAL DECISION"

"General Decision Number: MA20240008 09/20/2024

Superseded General Decision Number: MA20230008

State: Massachusetts

Construction Types: Heavy (Heavy and Marine)

Counties: Barnstable, Bristol, Dukes, Essex, Middlesex, Nantucket, Norfolk, Plymouth and Suffolk Counties in Massachusetts.

HEAVY AND MARINE CONTRUCTION 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.</p> <p>. 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 higher) for all hours 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 extended on or after January 30, 2022:</p>	<p>. Executive Order 13658 generally applies to the contract.</p> <p>. The contractor must pay all covered workers at least \$12.90 per hour (or the applicable wage rate listed on this wage determination, 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	02/09/2024
3	03/01/2024
4	03/22/2024
5	05/31/2024
6	06/21/2024
7	07/05/2024
8	09/06/2024
9	09/13/2024
10	09/20/2024

BOIL0029-001 01/01/2021

	Rates	Fringes
BOILERMAKER.....	\$ 45.87	29.02

BRMA0001-011 02/01/2023

FOXBORO CHAPTER

BRISTOL (Attleboro, Berkley, Dighton, Mansfield, North Attleboro, Norton, Raynham, Rehoboth, Seekonk, Taunton); NORFOLK, (Bellingham, Canton, Dedham, Foxboro, Franklin, Norfolk, Norwood, Plainville, Sharon, Walpole, Westwood, Wrentham); and PLYMOUTH (Lakeville)

	Rates	Fringes
Bricklayer/Cement Mason.....	\$ 60.35	34.40

BRMA0001-012 02/01/2023

LOWELL CHAPTER

MIDDLESEX (Acton, Ashby, Ayer, Bedford, Billerica, Boxboro, Carlisle, Chemsford, Dracut, Dunstabale, Ft Devens, Groton, Littleton, Lowell, North Acton, Pepperell, Shirley, South Acton, Tewksbury, Townsend, Tyngsboro, West Acton, Westford, Wilmington)

	Rates	Fringes
BRICKLAYER.....	\$ 58.21	33.71

BRMA0001-013 08/01/2023

LOWELL CHAPTER

MIDDLESEX (Ashland, Framingham, Holliston, Hopkinton, Hudson, Maynard, Natick, Sherbvnorn, Stow); and NORFOLK (Medfield, Medway, Millis)

	Rates	Fringes
BRICKLAYER.....	\$ 62.40	34.40

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

BRMA0003-003 08/01/2023

BOSTON CHAPTER

MIDDLESEX (Arlington, Cambridge, Everett, Malden, Medford, Melrose, Somerville); NORFOLK (Brookline, Milton); and SUFFOLK

	Rates	Fringes
BRICKLAYER.....	\$ 62.40	34.40

BRMA0003-011 08/01/2023

LYNN CHAPTER

ESSEX (Amesbury, Andover, Beverly, Boxford, Danvers, Essex, Georgetown, Gloucester, Groveland, Hamilton, Haverhill, Ipswich, Lawrence, Lynn, Lynnfield, Manchester, Marblehead, Merrimac, Methuen, Middleton, Nahant, Newbury, Newburyport, North Andover, Peabody, Rockport, Rowley, Salisbury, Salem, Saugus, Swampscott, Topsfield, Wakefield, Wenham, West Newbury); and MIDDLESEX (North Reading, Reading, Wakefield)

	Rates	Fringes
Bricklayer/Cement Mason.....	\$ 62.40	34.40

BRMA0003-012 08/01/2023

	Rates	Fringes
BRICKLAYER		
WALTHAM CHAPTER -		
MIDDLESEX (Belmont,		
Burlington, Concord,		
Lexington, Lincoln,		
Stoneham, Sudbury,		
Waltham, Watertown,		
Wayland, Weston,		
Winchester, Woburn).....	\$ 62.40	34.40

BRMA0003-014 08/01/2023

QUINCY CHAPTER

PLYMOUTH COUNTY (Abington, Bridgewater, Brockton, Carver, Duxbury, East Bridgewater, Halifax, Hanover, Hanson, Hingham, Hull, Kingston, Marshfield, Middleboro, Norwell, Pembroke, Plymouth, Rockland, Scituate, West Bridgewater, Whitman)

	Rates	Fringes
Bricklayer/Cement Mason.....	\$ 62.40	34.40

BRMA0003-025 08/01/2023

NEW BEDFORD CHAPTER

BARNSTABLE; BRISTOL (Acushnet, Darmouth, Fairhaven, Fall River, Freetown, New Bedford, Somerset, Swansea, Westport); DUKES; NANTUCKET; PLYMOUTH (Marion, Mattapoisett, Rochester, Wareham)

	Rates	Fringes
Bricklayer/Cement Mason.....	\$ 62.40	34.40

BRMA0003-033 08/01/2023

NEWTON CHAPTER

MIDDLESEX (Newton); NORFOLK (Dover, Needham, Wellesley)

	Rates	Fringes
Bricklayer, Plasterer.....	\$ 62.40	34.40

* CARP0056-001 08/01/2024

All of SUFFOLK COUNTY; and those areas of BARNSTABLE, BRISTOL, ESSEX, MIDDLESEX, NORFOLK, and PLYMOUTH COUNTIES situated INSIDE Boston Beltway (I-495) and North of Cape Cod Canal. ALL of DUKES and NANTUCKET COUNTIES

	Rates	Fringes
PILEDRIVERMAN.....	\$ 55.79	35.47

* CARP0056-002 08/01/2024

The areas of BARNSTABLE, BRISTOL, PLYMOUTH, and NORFOLK COUNTIES situated OUTSIDE Boston Beltway (I-495) and South of Cape Cod Canal

	Rates	Fringes
PILEDRIVERMAN.....	\$ 51.97	35.47

* CARP0056-003 08/01/2024

Those areas of ESSEX and MIDDLESEX COUNTIES situated OUTSIDE Boston Beltway (I-495)

	Rates	Fringes
PILEDRIVERMAN.....	\$ 49.19	35.47

* CARP0056-004 08/01/2024

	Rates	Fringes
DIVER TENDER.....	\$ 61.70	35.47
DIVER.....	\$ 78.11	35.47

CARP0327-002 03/01/2024

MIDDLESEX (Belmont, Cambridge, Everett, Malden, Medford, Somerville); NORFOLK (Brookline, Dedham, Milton); AND SUFFOLK COUNTIES

	Rates	Fringes
CARPENTER.....	\$ 57.20	31.04

CARP0339-002 03/01/2024

BRISTOL (Attleborough, North Attleborough); ESSEX; MIDDLESEX (Except Belmont, Cambridge, Everett, Malden, Medford, Somerville); AND NORFOLK (Bellingham, Braintree, Canton, Cohasset, Foxboro, Franklin, Medfield, Medway, Millis, Needham, Norfolk, Norwood, Plainville, Quincy, Sharon, Walpole, Wellesley, Westwood, Weymouth, Wrentham) COUNTIES

	Rates	Fringes
CARPENTER.....	\$ 46.86	30.94

CARP0346-001 03/01/2024

NORFOLK (Braintree, Quincy, Cohasset, Weymouth, etc.) PLYMOUTH (Duxbury, Hanover, Hull, Hingham, Marshfield, Norwell, Pembroke Rockland, Scituate)

	Rates	Fringes
CARPENTER.....	\$ 46.86	30.94

CARP0624-002 09/01/2017

DUKES; NANTUCKET

	Rates	Fringes
CARPENTER.....	\$ 46.43	28.35

CARP0624-006 09/01/2017

BARNSTABLE; BRISTOL (Except Attleboro & North Attleboro); NORFOLK (Avon, Holbrook, Randolph, Stoughton); PLYMOUTH (Bridgewater, Kingston, Lakeville, Middleboro, Plymouth, S. Hanover, Whitman)

	Rates	Fringes
CARPENTER.....	\$ 39.28	27.90

CARP1121-001 01/01/2024

SUFFOLK COUNTY

	Rates	Fringes
MILLWRIGHT.....	\$ 48.03	33.49

CARP1121-005 01/01/2024

BARNSTABLE, BRISTOL, DUKES, ESSEX, MIDDLESEX, NANTUCKET,
NORFOLK and PLYMOUTH COUNTIES

	Rates	Fringes
MILLWRIGHT.....	\$ 42.76	33.24

ELEC0096-001 09/03/2023

MIDDLESEX (Ashby, Ashland, Ayer, Ft. Devens, Groton, Hopkinton,
Hudson, Marlboro, Pepperell, Shirley, Stow, Townsend)

	Rates	Fringes
ELECTRICIAN.....	\$ 45.99	33.06
Teledata System Installer.....	\$ 34.49	31.44

* ELEC0099-001 06/01/2024

BRISTOL (Attleboro, North Attleboro, Seekonk)

	Rates	Fringes
ELECTRICIAN.....	\$ 52.11	47.25%
Teledata System Installer.....	\$ 39.09	11.02%+15.31

* ELEC0103-002 09/01/2024

ESSEX (Amesbury, Andover, Boxford, Georgetown, Groveland,
Haverhill, Lawrence, Merrimac, Methuen, Newbury, Newburyport,
North Andover, Rowley, Salisbury, West Newbury); MIDDLESEX
(Bedford, Billerica, Boxboro, Burlington, Carlisle, Chelmsford,
Dracut, Dunstable littleton, Lowell, North Reading, Tewksbury,
Tyngsboro, Westford, Wilmington)

	Rates	Fringes
ELECTRICIAN.....	\$ 63.78	36.22

* ELEC0103-004 09/01/2024

ESSEX (Beverly, Danvers, Essex, Gloucester, Hamilton, Ipswich, Manchester, Marblehead, Middleton, Peabody, Rockport, Salem, Topsfield, Wenham)

	Rates	Fringes
ELECTRICIAN.....	\$ 63.78	36.22

* ELEC0103-005 09/01/2024

ESSEX (Lynn, Lynnfield, Nahant, Saugus, Swampscott); MIDDLESEX (Acton, Arlington, Belmont, Cambridge, Concord, Everett, Framingham, Holliston, Lexington, Lincoln, Malden, Maynard, Medford, Melrose, Natick, Newton, Reading, Sherborn, Somerville, Stoneham, Sudbury, Wakefield, Waltham, Watertown, Wayland, Weston, Winchester, Woburn); NORFOLK (Bellingham, Braintree, Brookline, Canton, Cohasset, Dedham, Dover, Foxboro, Franklino, Medfield, Medway, Millis, Milton, Needham, Norfolk, Norwood, Quincy, Sharon, Walpole, Wellesley, Westwood, Weymouth, Wrentham); PLYMOUTH (Hingham and Hull); SUFFOLK

	Rates	Fringes
ELECTRICIAN.....	\$ 63.78	36.22

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.

* ELEC0223-002 09/01/2024

BARNSTABLE, BRISTOL (Except Attleboro, North Attleboro, Seekonk); DUKES; NANTUCKET; PLYMOUTH (Except Hingham and Hull Twp); NORFOLK (Avon, Halbrook, Randolph, Sloughton)

	Rates	Fringes
ELECTRICIAN.....	\$ 50.02	31.09%+15.50

ENGI0004-009 06/01/2024

	Rates	Fringes
Power equipment operators:		
Group 1.....	\$ 56.03	32.75
Group 2.....	\$ 55.41	32.75
Group 3.....	\$ 36.17	32.75
Group 4.....	\$ 45.23	32.75
Group 5.....	\$ 24.71	32.75
Group 6.....	\$ 30.28	32.75

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

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 [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; post 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)

IRON0007-001 03/16/2024

AREA 1: BRISTOL (Easton); ESSEX (Beverly, Gloucester, Lynn,
Lynnfield, Manchester, Marblehead, Nahant, Rockport, Salem,
Saugus, Swampscott); MIDDLESEX (Arlington, Bedford, Belmont,
Burlington, Cambridge, Carlisle, Concord, Dunstable, Everett,
Framingham, Lexington, Lincoln, Malden, Maynard, Medford,
Melrose, Natick, Newton, Reading, Sherborn, Somerville,
Stoneham, Sudbury, Wakefield, Waltham, Watertown, Wayland,
Weston, Winchester, Woburn); NORFOLK (Except Medway); PLYMOUTH
(Abington, Bridgewater, Brocton, Duxbury, East Bridgewater,
Halifax, Hanover, Hanson, Hingham, Hull, Kingston, Marshfield,
Norwell, Pembroke, Plymouth, Plympton, Rockland, Scituate, West
Bridgewater, Whitman); SUFFOLK

AREA 2: ESSEX (Amesbury, Andover, Boxford, Danvers, Essex,
Georgetown, Hamilton, Haverhill, Ipswich, Lawrence, Merrimac,
Methuen, Newbury, Newburyport, North Andover, Rowley,
Salisbury, Topsfield, Wenham, West Newbury); MIDDLESEX
(Action, Billerica, Chelmsford, Dracut, Groton, Groveland,
Littleton, Lowell, Middleton, North Reading, Pepperell,
Tewksbury, Tyngsboro, Westford, Wilmington)

	Rates	Fringes
IRONWORKER		
AREA 1.....	\$ 54.68	36.48
AREA 2.....	\$ 50.27	36.48

IRON0007-010 03/16/2024

MIDDLESEX (Ashby, Ashland, Ayer, Boxboro, Holliston, Hopkinton, Hudson, Marlboro, Shirley, Stow, Townsend); NORFOLK (Medway)

	Rates	Fringes
IRONWORKER.....	\$ 54.38	36.48

IRON0037-002 03/16/2024

BARNSTABLE; BRISTOL (Acushnet, Attleboro, Berkley, Dartmouth, Dighton, Fairhaven, Fall River, Freetown, Mansfield, New Bedford, North Attleboro, Norton, Raynham, Rehoboth, Seekonk, Somerset, Swansea, Taunton, Westport); DUKES; NANTUCKET; NORFOLK (Billingham, Franklin, Plainville, Wrentham); PLYMOUTH (Lakeville, Marion, Mattapoisett, Middleboro, Rochester, Wareham)

	Rates	Fringes
IRONWORKER.....	\$ 40.75	32.83

LABO0022-006 12/01/2021

SUFFOLK COUNTY (Boston, Chelsea, Revere, Winthrop, Deer & Nut Islands); 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)

	Rates	Fringes
Laborers:		
GROUP 1.....	\$ 41.18	27.52
GROUP 2.....	\$ 41.43	27.52
GROUP 3.....	\$ 41.93	27.52
GROUP 4.....	\$ 42.18	27.52
GROUP 5.....	\$ 24.50	27.52
GROUP 6.....	\$ 43.18	27.52

LABORERS CLASSIFICATIONS

GROUP 1: Laborers; carpenter tenders; cement finisher 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

GROUP 3: Air track operator; block paver; rammer; curb setter

GROUP 4: Blaster; powderman

GROUP 5: Flagger

GROUP 6: Asbestos Abatement; Toxic and Hazardous Waste Laborers

LABO0022-012 12/01/2021

Counties of BARNSTABLE; BRISTOL; DUKES; ESSEX; NANTUCKET; PLYMOUTH; MIDDLESEX (With the exception of Arlington, Belmont, Burlington, Cambridge, Everett, Malden, Melrose, Reading, Somerville, Stoneham, Wakefield, Winchester, Winthrop and Woburn); NORFOLK (With the exception of Brookline, Dedham, and Milton)

	Rates	Fringes
Laborers:		
GROUP 1.....	\$ 35.41	26.59
GROUP 2.....	\$ 35.66	26.59
GROUP 3.....	\$ 36.16	26.59
GROUP 4.....	\$ 36.41	26.59
GROUP 5.....	\$ 24.50	26.59
GROUP 6.....	\$ 37.41	26.59

LABORERS CLASSIFICATIONS

GROUP 1: Laborers; carpenter tenders; cement finisher tenders

GROUP 2: Asphalt raker; fence and guard rail erector; laser beam operator; mason tender; pipelayer; pneumatic drill operator; pneumatic tool operator; wagon drilloperator

GROUP 3: Air track operator; block paver; rammer; curb setter; hydraulic & similar self powere drills

GROUP 4: Blaster; powderman

GROUP 5: Flagger

GROUP 6: Asbestos Abatement; Toxic and Hazardous Waste Laborers

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

LABO1421-001 12/01/2023

WRECKING LABORERS:

	Rates	Fringes
Laborers: (Wrecking)		
Group 1.....	\$ 44.48	28.52
Group 2.....	\$ 45.23	28.52
Group 3.....	\$ 45.48	28.52
Group 4.....	\$ 40.48	28.52
Group 5.....	\$ 43.58	28.52
Group 6.....	\$ 44.48	28.52

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.

PAIN0035-001 07/01/2024

BARNSTABLE BRISTOL; DUKES; ESSEX; NANTUCKET; PLYMOUTH
(Remainder of NORFOLK; MIDDLESEX AND SUFFOLK COUNTIES)

	Rates	Fringes
PAINTER		
NEW CONSTRUCTION:		
Bridge.....	\$ 50.36	30.25
Brush, Taper.....	\$ 39.86	30.25
Spray, Sandblast.....	\$ 41.26	30.25
REPAINT:		
Bridge.....	\$ 56.76	36.00
Brush, Taper.....	\$ 37.92	30.25
Spray, Sandblast.....	\$ 39.32	30.25

PAIN0035-015 07/01/2024

MIDDLESEX (Cambridge, Everett, Malden, Medford, Somerville)
SUFFOLK COUNTY (Boston, Chelsea) NORFOLK COUNTY (Brookline)

	Rates	Fringes
PAINTER		
NEW CONSTRUCTION:		
Brush, Taper.....	\$ 46.26	36.00
Spray, Sandblast.....	\$ 47.66	36.00
Spray, Sandblast.....	\$ 47.05	30.25
REPAINT:		
Bridge.....	\$ 56.76	36.00
Brush, Taper.....	\$ 44.32	36.00
Spray, Sandblast.....	\$ 45.72	36.00

PLAS0534-001 07/01/2023

ESSEX; MIDDLESEX; NORFOLK AND SUFFOLK COUNTY

	Rates	Fringes
CEMENT MASON/CONCRETE FINISHER...	\$ 48.19	39.37

* PLUM0004-001 09/01/2024

MIDDLESEX (Ashby, Ayer-West of Greenville branch of Boston and
Maine Railroad, Ft. Devens, Groton, Shirley, Townsend)

	Rates	Fringes
Plumbers and Pipefitters.....	\$ 55.00	28.77

* PLUM0012-001 09/01/2024

ESSEX (Ames, Andover, Beverly, Boxford, Byfield, Danvers, Essex, Georgetown, Gloucester, Groveland, Hamilton, Haverhill, Ipswich, Lawrence, Manchester, Marblehead, Merrimac, Methuen, Middleton, Newbury, Newburyport, North Andover, Peabody, Rockport, Rowley, Salem, Salisbury, Topsfield, Wenham, West Newbury)

	Rates	Fringes
PLUMBER.....	\$ 69.04	35.53

* PLUM0012-003 09/01/2024

ESSEX (Ames, Andover, Beverly, Boxford, Byfield, Danvers, Essex, Georgetown, Gloucester, Groveland, Hamilton, Haverhill, Ipswich, Lawrence, Manchester, Marblehead, Merrimac, Methuen, Middleton, Newbury, Newburyport, North Andover, Peabody, Rockport, Rowley, Salem, Salisbury, Topsfield, Wenham, West Newbury)

	Rates	Fringes
Plumber, Pipefitter, Steamfitter.....	\$ 69.04	35.53

* PLUM0012-006 09/01/2024

ESSEX (Lynn, Lynnfield, Nahant, Saugus, and Swampscott); MIDDLESEX (Acton, Arlington, Ashland, Ayer - except W. of Greenville Branch of Boston & Maine RR, Bedford, Belmont, Billerica, Boxboro, Burlington, Cambridge, Carlisle, Chelmsford, Concord, Dracut, Dunstable, Everett, Framingham, Hudson, Holliston, Hopkinton, Lexington, Lincoln, Littleton, Lowell, Malden, Marlboro, Maynard, Medford, Melrose, Natick, Newton, North Reading, Pepperell, Reading, Sherborn, Somerville, Stoneham, Stow, Sudbury, Tewksbury, Tyngsboro, Wakefield, Waltham, Watertown, Wayland, Westford, Wilmington, Winchester, Woburn); NORFOLK (Bellingham, Braintree,

Brookline, Canton, Cohasset, Dedham, Dover, Foxboro, Franklin, Medfield, Medway, Millis, Milton, Needham, Norfolk, Norwood, Plainville, Quincy, Sharon, Walpole, Wellesley, Westwood, Weymouth, Wrentham); PLYMOUTH (Hingham, Hull, Scituate); SUFFOLK

	Rates	Fringes
PLUMBER.....	\$ 69.04	35.53

PLUM0051-005 08/26/2024		

BARNSTABLE; BRISTOL; DUKES; NANTUCKET; NORFOLK (Avon, Holbrook, Randolph, Stoughton) PLYMOUTH (Remainder of County)

	Rates	Fringes
Plumbers and Pipefitters.....	\$ 52.49	33.60

PLUM0537-001 09/01/2023		

MIDDLESEX (Arlington, Cambridge, Everett, Malden, Medford, Melrose, Reading, Wakefield, Winchester and Woburn); NORFOLK (Bellingham, Braintree, Brookline, Canton, Cohasset, Dedham, Foxboro, Franklin, Millis, Milton, Sharon, Walpole, Westwood, and Wrentham); PLYMOUTH (Hingham, Hull, Scituate); ESSEX (Ames, Andover, Beverly, Boxford, Byfield, Danvers, Essex, Georgetown, Gloucester, Groveland, Hamilton, Haverhill, Ipswich, Lawrence, Lynn, Lynnfield, Manchester, Marblehead, Merrimac, Methuen, Middleton, Nahant, Newbury, Newburyport, North Andover, Peabody, Rockport, Rowley, Salem, Salisbury, Saugus, Swampscott, Topsfield, Wenham, West Newbury)

	Rates	Fringes
PIPEFITTER.....	\$ 63.48	36.67

TEAM0379-001 06/01/2024

	Rates	Fringes
Truck drivers:		
Group 1.....	\$ 39.78	35.24+a+b
Group 2.....	\$ 39.95	35.24+a+b
Group 3.....	\$ 40.02	35.24+a+b
Group 4.....	\$ 40.14	35.24+a+b
Group 5.....	\$ 40.24	35.24+a+b
Group 6.....	\$ 40.53	35.24+a+b
Group 7.....	\$ 40.82	35.24+a+b

POWER TRUCKS \$.25 DIFFERENTIAL BY AXLE
TUNNEL WORK (UNDERGROUND ONLY) \$.40 DIFFERENTIAL BY AXLE
HAZARDOUS MATERIALS (IN HOT ZONE ONLY) \$2.00 PREMIUM

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)

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 and 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.

=====

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)).

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.

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.

=====

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).

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: 	. 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 higher) for all hours spent performing on the contract in 2024.
If the contract was awarded on or between January 1, 2015 and January 29, 2022, and the contract is not renewed or extended on or after January 30, 2022: 	. Executive Order 13658 generally applies to the contract. . The contractor must pay all covered workers at least \$12.90 per hour (or the 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.

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

ENGI0025-001 10/01/2023

STATEWIDE

	Rates	Fringes
Dredging:		
CLASS A1.....	\$ 45.26	15.17+a+b
CLASS A2.....	\$ 40.33	14.82+a+b
CLASS B1.....	\$ 39.14	14.74+a+b
CLASS B2.....	\$ 36.84	14.58+a+b
CLASS C1.....	\$ 35.83	14.26+a+b
CLASS C2.....	\$ 34.68	14.18+a+b
CLASS D.....	\$ 28.81	13.77+a+b

CLASSIFICATIONS:

CLASS A1: Deck Captain; Mechanical Dredge Operator, Leverman, Licensed Tug Operator over 1000 HP.

CLASS A2: Crane Operator (360 swing).

CLASS B1: Derrick Operator (180 swing), Spider/Spill Barge Operator, Engineer, Electrician, Chief Welder, Chief Mate, Fill Placer, Operator II, Maintenance Engineer, Licensed Boat Operator, Licensed Crew Boat Operator.

CLASS B2: Certified Welder.

CLASS C1: Mate, Drag Barge Operator, Assistant Fill Placer, Welder, Steward.

CLASS C2: Boat Operator.

CLASS D: Oiler, Deckhand, Shoreman, Rodman, Scowman, Cook, Messman, Porter/Janitor.

INCENTIVE PAY: (Add to Hourly Rate)

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.

WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

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)).

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.

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.

=====

END OF GENERAL DECISION"

DOCUMENT A00801

SPECIAL PROVISIONS**LAWRENCE****Federal Aid Project No. CMQ-003S(733)X
Lawrence Manchester Rail Corridor (LMRC) Rail Trail**

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

The proposed LMRC corridor improvement project includes upgrading the existing abandoned rail line corridor to a shared-use path trail for approximately 1.5 miles. The City of Lawrence has entered into a 99 year lease agreement with the MBTA for use of the rail corridor therefore access and utility licenses are required for work within the corridor. Along this corridor there are intersections with public roadways that will also include traffic signal reconstruction, curb extensions, constructing new or rehabilitating existing sidewalks, constructing ADA/AAB accessible curb ramps, crosswalks and pedestrian signal equipment. Improvements also include installing granite curbing, minor upgrades to the drainage system and a mill and overlay of the existing pavement at the existing street intersection as well as full depth pavement for the shared-use path and limited roadway intersection areas. The project also includes rehabilitation of existing LMRC bridges over the Merrimack River and the South Canal, a new bridge over Manchester Street for the shared-use path, and replacement of the Lowell Street bridge with a precast concrete culvert structure. Additionally, the approaches on Lowell Street will be reconstructed to accommodate the proposed structure and meet into existing infrastructure.

The work includes earth excavation, Superpave asphalt pavement, cement concrete sidewalks, granite curbing, drainage structures & pipe, traffic signals, traffic signage, pavement markings, track removal, bridge rehabilitation, bridge construction, ornamental handrail installation, CM-TL3 bridge rail installation, lighting, landscaping and other incidental work. Work also includes coordination with environmental and landscape items.

The majority of the limits of work fall within the care and maintenance of National Grid high voltage power lines and must follow the rules and regulation required which can be found within National Grid's *Conditions for Proposed Activities Within Transmission Rights-of-way (July 2017) Document A00818*.

SCOPE OF WORK (Continued)

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.

SUBSECTION 7.05 INSURANCE REQUIREMENTS

B. Public Liability Insurance

The insurance requirements set forth in this subsection 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.

Paragraph 4

Asbestos Liability Insurance shall be obtained for this project. The Contractor and the Massachusetts Department of Transportation shall be named as additional insureds.

RAILROAD INSURANCE REQUIREMENTS

The insurance requirements set forth in this section are in addition to the requirements of the Standard Specifications.

Railroad Operations Directorate: Section F:

1. Refer to the railroad insurance requirements included in the lease agreement – Document A00813 included in the Contract Documents. Railroad special provisions are included in Document A00806.
2. Such insurance shall be written on an occurrence basis.
3. The MBTA and applicable railroads shall be the named insureds on such insurance. Additional named insured are listed below. Original policies and certificates shall be made out to the MBTA and applicable railroads and mailed to:

MBTA: Treasurer-Controller
 Massachusetts Bay Transportation Authority
 10 Park Plaza
 Boston, MA 02116
 Tel. (617) 222-3064

Keolis: General Counsel
 Keolis Commuter Services, LLC
 470 Atlantic Avenue
 Boston, MA 02210

4. Railroad Protective Liability is not required in this project.
5. Such policies shall provide 30 days notice to each named insured by the insurance company before any change or cancellation of the policies.
6. Such Railroad Protective Insurance policies may be provided in forms commonly referred to as AAR/AASHTO or ISO/RIMA but not Oregon.

Questions regarding insurance should be directed to the MBTA's Risk Manager at 617-222-3064.

The contractor shall be aware of the latest MBTA insurance limits / requirements. See the following link for more information:

<https://www.mbtarealty.com/licenses.html>

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. The MassDOT project file number and municipality is to be placed in the subject line.

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 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.

HOLIDAY WORK RESTRICTIONS (Continued)

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.

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.

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.

WORK SCHEDULE

(Supplementing Subsection 8.02)

The work schedule shall conform to the relevant provisions of Subsection 7.09 of the Standards Specifications and the following:

Work requiring lane closures that will impact traffic in the judgement of the Engineer will be allowed from 9:00 a.m. to 3:00 p.m. (Monday – Friday). Work schedule shall be a 5-day week not including Saturdays, Sundays or Holidays with the prime contractor and all subcontractors working on the same shifts.

Work not requiring lane closures is allowed from 7:00 a.m. to 3:00 p.m. only, 5-day week not including Saturdays, Sundays or Holidays with the prime contractor and all subcontractors working on the same shifts. Holiday work shall not be allowed on this project.

Work is allowed from 9:00 p.m. to 5:00 a.m. only with the approval of MassDOT District 4 and the City of Lawrence.

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 707.11 Timber Bench: L2 Drifter Bench with Backrest and Armrests, Model DB-L2-118-L2-CT as manufactured by Streetlife America LLC, Philadelphia, PA.
- Item 707.18 Stacked Timber Seating Structure: Drifter Structure, Model DB-STR-H3-800-250-CT as manufactured by Streetlife America LLC, Philadelphia, PA.
- Item 707.62 Gaming Table and Chairs (Fixed): Rautster, Model RTS157 wood with chessboard as manufactured by MMCite USA LLC., Charlotte, NC.
- Item 707.622 Table and Chairs (Fixed): Rautster, Model RTS212 perforated coated steel table and chair, ADA Compliant as manufactured by MMCite USA LLC., Charlotte, NC.
- Item 821.992 Light Fixture Type A (Pedestrian):
 - Fixture: Cat No. 1A SL730 24L40T3 MDL014 SV1 as manufactured by Sternberg, Roselle, IL.
 - Pole: Cat No. 18' STEEL W/25' BEND RADIUS as manufactured by Valmont, Valley, NE.
- Item 821.993 Light Fixture Type B (Bridge): Cat. No. MSC300M-F 16 30K DIM RGBW40K DMX-RDM GG as manufactured by Hess, Gaffney, SC.

Approval letter has been filed with MassDOT.

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.

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.

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 195-0217.

PIGEON WASTE

The Contractor shall remove and dispose of the pigeon waste and any other debris accumulated on the steel members and bridge seats in areas where work is being performed. Pigeon waste and debris material contaminants will require special handling and disposal in accordance with all Federal, state, and local requirements. No separate payment will be made for removal and disposal of pigeon waste. Cost shall be incidental to the contract pay items.

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.

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

BUILD AMERICA BUY AMERICA PREFERENCE (Continued)

(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.

ENVIRONMENTAL PERMITTING

If field conditions and/or Contractor-proposed erection, demolition, storage, or other procedures not originally allowed by existing environmental permits require work to occur in or otherwise impact water or wetland resource areas, the Contractor is advised that no associated work can occur until all required environmental permits have been either amended or obtained allowing such work. The Contractor must notify the District 4 Highway Director and Resident Engineer in writing at least 60 days prior to desired commencement of the proposed activity. All environmental submittals, including any contact with Local, State, or Federal environmental agencies, must be coordinated with the District 4 Environmental Engineer. The Contractor is expected to fully cooperate with requests for information and provide same in a timely manner. The Contractor is further advised that the Department will not entertain a delay claim due to the time required to modify or obtain the environmental permits.

NOTIFICATION OF FUNDING SOURCES FOR WORK TO BE PAID BY OTHERS

This contract has an agreement with the *City of Lawrence*; whereas when the construction costs for the contract scope exceed the total participating contract bid price by more than ten percent (10%), the *City* shall be responsible for the amount over 110% of the total participating contract bid price.

NOTICE TO OWNERS OF UTILITIES

(Supplementing Subsection 7.13)

Written notice shall be given by the Contractor to all public service corporations or municipal and State officials owning or having charge of publicly or privately owned utilities of its intention to commence operations affecting such utilities at least one week in advance of the commencement of such operations. The Contractor shall, at the same time, file a copy of such notice with the Engineer.

Before commencing work on service connections, the Contractor shall be responsible for contacting the Electric Company servicing the area to obtain construction requirements, standards, and to give notice of commencement of work in accordance with the respective utility company policy. The Contractor's attention is further directed to the requirements of work in the immediate vicinity of certain underground structures and poles herein included in these Special Provisions.

UTILITY CONTACTS

Utility Contacts are shown at website

<https://hwy.massdot.state.ma.us/webapps/utilities/select.asp>

Select "District 4" and then select Lawrence

The following are the names of owners and representatives of the principal utilities may be affected, but completeness of this list is not guaranteed by the Department:

National Grid (Electric)
40 Sylvan Road
Waltham, MA 02451

Murli Gupta
781-296-6483
Murli.gupta@nationalgrid.com

Eversource (Gas)
995 Belmont Street
Brockton, MA 02301

Jocelyn Forcier
jocelyn.forcier@eversource.com

Verizon (Telephone)
385 Myles Standish Boulevard
Taunton, MA 02780

Karen Mealey
774-409-3160
karen.m.mealey@verizon.com

MCI – Verizon Business
P.O. Box 600
Charlton, MA 01507

Stephen Parretti
508-248-1305
Stephen.parretti@verizon.com

UTILITY CONTACTS (Continued)

Lawrence Water & Sewer Department
396 Water Street
Lawrence, MA 01840

William Hale
978-620-3110
whale@cityoflawrence.com

Boott Hydropower
145 Pawtucket Street
Lowell, MA 01854

Andrew Sutherland
978 590-7507
asutherland@bootthydro.com

Greater Lawrence Sanitary District
240 Charles Street
North Andover, MA 01845

Cheri Cousins
978-685-1612
ccousins@glsd.org

MBTA Document Control Group
500 Arborway
Boston, MA 02130

Connor Campbell
ccampbell2@mbta.com

CSX Transportation
2000 West Cabot Blvd - Suite 130
Langhorne, PA 19047

Michael Sliper
Michael_Sliper@csx.com

Comcast Cable Corporation
5 Omni Way, PO Box 6505
Chelmsford, MA 01824

Wendy Brown
978-848-5163
Wendy_brown@comcast.com

AT&T/Teleport Communications
America, c/o Siena Engineering Group
50 Mall Road, Suite 203
Burlington, MA 01803

Erica Hudson
781-221-8400 (x7041)
Erica.hudson@sienaengineeringgroup.com

Crown Castle
80 Central Street
Boxborough, MA 01719

Mark Bonanno
508-616-7818
Mark.bonanno@crowncastle.com

MCI-Verizon Business
P.O. Box 600
Charlton, MA 01507

Stephen Parretti
508-248-1305
Stephen.parretti@verizon.com

UTILITY CONTACTS (Continued)

Lawrence Fire Alarm
60 Bodwell Street
Lawrence, MA 01841

Jeffery DiDomenico
978-620-3431
jdidomenico@cityoflawrence.com

Lawrence DPW-Engineering
200 Common Street – Rm. 102
Lawrence, MA 01840

Jorge Jaime
978-320-3090
jjaime@cityoflawrence.com

First Light
359 Corporate Drive
Portsmouth, NH 03801

Keith Mellor
kmellor@firstlight.net

Lawrence IS&T Department
51 Lawrence Street
Lawrence, MA 01840

Carlos Castillo
978-620-3710
carloscastillo@cityoflawrence.com

Extenet Systems
3030 Warrenville Road – Suite 340
Lisle, IL 60532

Chad Wagner
617-529-0973
cwagner1@extenetsystems.com

MassDOT District
Utility/Constructability Engineer
519 Appleton Street
Arlington, MA 02476

Ray Stinson
857-368-4135

Verizon Wireless Small Cell
20 Alexander Drive
Wallingford, CT 06492

Liz Glidden
elizabeth.glidden@verizonwireless.com

Police Camera

Angel Mejia
978-490-0315
amejia@lawpd.com

Street Lighting

Jeffery DiDomenico
978-620-3431
jdidomenico@cityoflawrence.com

NATIONAL GRID EMERGENCY TELEPHONE NUMBERS

ELECTRIC:

Outage/ Emergency: 1-800-465-1212

New Service: 1-800-375-7405

Customer Support: 1-800-322-3223

EVERSOURCE EMERGENCY TELEPHONE NUMBERS

GAS:

Outage/ Emergency: 800-592-2000

New Service: 866-678-2744

Customer Support: 800-592-2000

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 a traffic level 2 (0.3-10.0 million) 18-kip (80-kn) ESALs.

COORDINATION WITH MEVA

The Contractor shall note that Merrimack Valley Transit (MEVA) bus route 24 traverses the project area and will be affected by construction. <https://www.mvrta.com/>.

The contractor shall coordinate with the MEVA with a minimum of 30 days prior to the closure and/or relocation of an existing bus stop or for rerouting of bus route due to construction detour.

In the event of bus stop closure for construction activities, the contractor shall provide an alternate location, providing the necessary temporary signage, as directed by the MEVA.

MBTA COMMUTER RAIL

Keolis Commuter Service (KCS) operates the commuter rail for the MBTA. All references to MBTA in the provisions will mean Keolis Commuter Service (KCS).

MBTA FLAGGING

The Contractor shall provide a minimum two week notice for flagging support for MBTA bridges and railroads. This applies only to bridges and railroads operated by Keolis Commuter Services (KCS). This two week notice does not apply to emergency work, only to routine or scheduled work activities. The contact person for advance request for flagging services is Rich Arnold, MBTA Railroad Operations Department, Phone number (617)-222-3635, email address: rarnold@mbta.com.

RAILROAD FLAGGERS

Railroad flaggers are not anticipated, but in the case if it is required during construction time, then the Contractor will be reimbursed for the costs, as required by the Engineer.

MBTA RAILROAD COORDINATION / ACCESS TO MBTA PROPERTY

The Contractor shall be required to coordinate the work of this Contract with the MBTA and Keolis Commuter Services Co. (“KCS”) through the MassDOT Resident Engineer and MassDOT designated Field Staff. A majority of the prerequisites for the Contractor to perform work on or adjacent to MBTA transit lines may be found in the “MBTA Special Instructions” provided herein. The Contractor shall be required to comply with the all applicable requirements of the latest edition of the MBTA Special Instructions available at the time of Contract Award.

The Contractor will have to perform construction related activities on, over, under, within or adjacent to railroad property owned or controlled by the MBTA. Any work that will affect Commuter Rail operations, involve work on, over, under, within or adjacent to the commuter rail right of way must be coordinated with MBTA Railroad Operations and KCS and shall comply with the latest version of the MBTA Railroad Operations Directorate.

An owner or Contractor who wishes permission to enter upon or perform work over, on, under or adjacent to MBTA property shall submit to the offices of the MBTA’s designated representative, a request in writing, a minimum of forty-two (42) days prior to the owner or the Contractor’s planned commencement of any of the above stated activities.

NON-BID ITEM**ENGINEERING SERVICES**

Engineering Services may be required by the Engineer for MBTA/Keolis in case they need to get involved with any engineering or inspections services during the Construction period.

The Contractor will be reimbursed for the cost of Engineering Services as required by the Engineer, when the work is not included in any Contact bid Items.

Engineering Services Cost Estimate

When engineering designs or other consulting services are deemed necessary by the Engineer, the design firm will submit a cost estimate of the proposed work. This estimate will include the classification, estimated hours needed, and actual hourly rate for each individual anticipated to be used in developing the finished product. The billable rates shall include overhead and profit. Overhead shall be as approved by MassDOT Audit Section or in absence of approved audited rates a maximum 155% shall apply for overhead. The profit fee is 10%. The billable rate shall be calculated using $1.10 * (\text{Base Hourly Rate} + \text{Base Hourly} * \text{Overhead Rate} \%)$.

SUPPLEMENTAL REQUIREMENTS FOR NON-BID ITEMS

(Supplementing Subsection 3.04)

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.

CONTAMINATED SOIL AND SOIL STOCKPILING DIRECTIVE P-22-001

Soil to be removed from the project area shall not be assumed to be uncontaminated and must be evaluated prior to off-site management for potential contamination. No soil may be deposited offsite without proper assessment by the contractor and approval from the Resident Engineer (RE), District Environmental Engineer (DEE), or the project designee. Any stockpiling of soil must be performed in compliance with Policy Directive P-22-001, Off-Site Stockpiling of Soil from MassDOT Construction Projects. This directive limits the allowable locations for off-site stockpiling of soil generated during MassDOT projects and includes various requirements that must be satisfied by the contractor prior to off-site stockpiling.

NORTHERN LONG-EARED BAT AND TRICOLORED BAT PROTECTION

The northern long-eared bat (*Myotis septentrionalis*; NLEB) and tricolored bat (*Perimyotis subflavus*; TCB) are listed as federally endangered or proposed endangered, respectfully, under the Endangered Species Act (ESA). The U.S. Fish and Wildlife Service (USFWS) developed this guidance to address ESA compliance and promote conservation of NLEB and TCB. 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 July 27- August 1, 2022, Stantec, on behalf of MassDOT Highway Division Environmental Services, conducted a northern long-eared bat summer presence/absence survey using acoustic detection methods, in accordance with the 2022 survey guidelines. The survey confirmed the presence of NLEB and/or TCB, and as stated within the survey guidelines, the survey is valid for five years. If additional stressor producing work is proposed by the Contractor past this date, additional review is required by the MassDOT Highway Division's Environmental Services Section, and additional review and restrictions may be required by the USFWS.

The project is eligible for a May Affect, Not Likely to Adversely Affect (NLAA) determination, with Avoidance and Minimizations Measures (AMMs), in accordance with the FHWA, FRA and FTA Range-wide Programmatic Consultation for Indiana Bat and Northern Long-eared Bat. 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 NLAA documentation letter (see **Document A00872 USFWS NLAA**). Therefore, the project has completed Section 7 consultation through the ESA.

In advance of the uplisting of the TCB to endangered under the ESA, the following Avoidance and Minimization Measures (AMMs) must be strictly adhered to in order to protect NLEB and TCB and to be in compliance with the ESA. Contact MassDOT Environmental Services - Wildlife Unit Supervisor for questions about project limits, restrictions, or conservation measures.

General AMM

- The Contractor shall ensure all personnel working in on the project site are aware of all environmental commitments related to NLEB and TCB, including all applicable AMMs. NLEB and TCB information (<https://www.fws.gov/midwest/endangered/mammals/nleb/> and <https://www.fws.gov/species/tricolored-bat-perimyotis-subflavus>) shall be made available to all personnel.

NORTHERN LONG-EARED BAT AND TRICOLORED BAT PROTECTION (Continued)**Lighting AMMs**

- Direct temporary lighting away from suitable habitat during the active season: **April 1 to October 31.**
- When installing new or replacing existing permanent lights, use downward-facing, full cut-off lens lights (with same intensity or less for replacement lighting); or for those transportation agencies using the BUG system developed by the Illuminating Engineering Society, be as close to 0 for all three ratings with a priority of "uplight" of 0 and "backlight" as low as practicable.

Tree Removal AMMs

- *If additional cutting is proposed by the Contractor that is outside the scope of this contract, additional review is required by the MassDOT Highway Division's Environmental Services Section, and additional review and restrictions may be required by the USFWS.*
- Ensure tree removal is limited to that specified in project plans and ensure that contractors understand clearing limits and how they are marked in the field (e.g., install bright colored flagging/fencing prior to any tree clearing to ensure contractors stay within clearing limits).
- No tree cutting shall be conducted during the active season: **April 1 to October 31.**
- No tree cutting shall be conducted during the active season: **April 1 to October 31,** or if cutting inside of this timeframe is required, tree removal is limited to 10 or fewer trees per project at any time of year within 100 feet of existing road/rail surface and outside of documented roosting/foraging habitat or travel corridors; and a visual emergence survey must be conducted by *MassDOT Highway Division's Environmental Services Section or appointed representative with no bats observed.*
- Do not remove **documented** or NLEB and/or TCB roosts that are still suitable for roosting, or trees within 0.25 miles of roosts, or **documented** foraging habitat any time of year.
- The Contractor shall ensure all personnel working in on the project site are aware of all environmental commitments related to NLEB and/or TCB, including the **TOY** restriction. If this restriction needs to be waived at any location(s) the Resident Engineer shall send a locus map of the proposed work to MassDOT Highway Division's Environmental Services Section for review and a determination if the restriction can be waived.

GENERAL REQUIREMENTS FOR DEMOLITION AND WORK INVOLVING PAINTED STEEL

(02/06/2020)

Demolition and work involving painted steel shall conform to the requirements of Subsection 961 of the Standard Specifications.

Work Involving Painted Steel.

Hazardous materials shall be removed in the immediate area of any intended welding, heating, saw cutting or burning of steel. Hazardous material removal is required to allow the demolition of structural steel, railings, drainage systems, utility supports, steel lamp posts, etc.

The contractor shall assume that the coatings on the steel contain lead (Pb), unless otherwise determined by testing. The contractor shall certify in writing to the Engineer the results of all testing, and shall also certify that any lead (Pb) coated steel removed from the project was not reused or buried, but was sent to a scrap metal recycling facility.

Implement and maintain programs and procedures, which comply with the requirements of this specification and all applicable standards and regulations. Comply with all applicable regulations even if the regulation is not specifically referenced herein. If a state or local regulation is more restrictive than the regulation of this specification, follow the more restrictive requirements.

This requirement is intended only for the demolition and preparation prior to repair and does not include provisions for recoating of steel.

Environmental

All applicable portions of Subsections 961.65 “Worker Protection” and 961.66 “Environmental Protection and Monitoring” shall be followed when performing this work.

During chemical stripping a hand washing facility may be used in lieu of a decontamination/changing facility.

Hazardous material shall be collected during the disassembly and disposed of as outlined in Subsection 961.68 “Handling of Hazardous Waste and Reporting Release Programs”.

The applicable submittals shall be according to Subsection 961.69 “Submittals”.

**GENERAL REQUIREMENTS FOR DEMOLITION AND
WORK INVOLVING PAINTED STEEL** (Continued)**Cleaning/Removal****Cutting Or Burning Of Steel**

All surfaces to be welded, heated, saw cut or burned shall be cleaned so as to remove all contaminants and/or hazardous materials, which could be discharged to the environment as a function of the subsequent operations.

Lead paint shall be removed in its entirety in an area prescribed by a 6 inch (15 cm) minimum offset from the required work. The paint removal operation may be dry abrasive blasting, wet abrasive blasting or chemical stripping.

Proper level of containment shall be used when performing this work in accordance with Subsection 961.67 "Containment". Full containment is not required during chemical stripping operation however; the Contractor shall install proper shielding and/or tarpaulins under the chemical stripping operations in order to catch all debris generated during this procedure. A cleaned area must be inspected and approved before the demolition operations are started.

During cleaning operations the Contractor shall be required to furnish and erect temporary floodlights illuminating the steel surface at a minimum of 30-foot candles. This lighting shall be used in areas where there is insufficient lighting for proper cleaning operations and inspection. The Contractor shall supply electrical power.

The Contractor shall provide support for interim and final inspection of the bridge during cleaning operations. This support shall include the necessary traffic controls and safe access to the work.

Mechanical Disassembly Of Steel

All surfaces to be mechanically disassembled by shear cutting or removing bolts or rivets shall not require deleading. When shear cutting or removing bolts or rivets, the Contractor shall not use any method that will cause dust and/or particles to be emitted and/or dispersed into the environment to an extent that would expose the workers above the Action Levels of $30\mu\text{g}/\text{m}^3$.

For purposes of limiting the lead (Pb) dust, the Contractor will be required to dampen the lead paint work areas.

The contractor shall install a proper shielding and/or tarpaulins under all lead-paint-coated surfaces to be shear cut or bolts or rivets ordered removed in order to catch any loose lead paint chips, dust or particles.

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 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.

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 8.0 / 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 this VECP is issued.

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 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.

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.

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.

MATERIAL OPTIONS

The Contractor shall inform the Engineer of his option prior to the installation of the material. Once the option is designated, all material for the option item(s) shall remain the same throughout the job.

<u>OPTIONS</u>		
<u>Item Number</u>	<u>Item Description</u>	<u>Unit</u>
234.12	12 Inch Drainage Pipe-Option	Foot
235.12	12 Inch Drainage Pipe Flared End - Option	Each

- Pipe Options
- Reinforced Concrete Pipe
 - Corrugated Plastic (Polyethylene) Pipe
 - Corrugated Plastic (Polypropylene) Pipe

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.

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.

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.

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.

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.

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.

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 100.91 **PR – POST CONSTRUCTION SURVEY AND** **LUMP SUM**
VIBRATION MONITORING – BRIDGE L-04-027 (C90)

Work under this item shall include pre- and post-construction condition survey and vibration monitoring of the existing stone abutments and the adjacent buildings, within approximately 200 ft zone of influence of Bridge No. L-04-027 (C90), to ensure they remain undamaged during construction activities. These structures include:

- 283 Lowell St – Five story mill
- 284-286 Lowell St – Two story church
- 285 Lowell St – Two floor multi-family residence
- 291 Lowell St – Two story warehouse
- 292 Lowell St – Single story auto service shop
- 293 Lowell St – Two floor multi-family residence
- 39 Winter St – Single story auto service shop
- 33-37 Winter St – Single story auto body shop
- Existing abutment and wingwalls to remain

Work under this Item shall consist of performing pre-construction, during, and post-construction condition surveys of the structures listed above. The Contractor shall obtain right of entry to access private property. The Contractor must provide contingency plans in the event of the property owner limiting/denying access to the property.

The Contractor shall retain a Professional Land Surveyor registered in the Commonwealth of Massachusetts to perform condition surveys and to document location of the existing stone abutments and adjacent buildings.

PRE-CONSTRUCTION

The pre-construction condition survey shall serve as a baseline to monitor any potential movement that may occur as a result of construction activities. The Contractor shall coordinate the construction survey schedule, including a pre-construction site walk, with the Engineer to determine locations of ground and surface monitoring points along the face of the existing stone abutments, wingwalls and exterior of adjacent buildings.

Prior to beginning the work, the Contractor shall request in writing from each property owner permission to conduct the condition survey of the interior property. The intent of the condition survey shall be explained to the property owner.

ITEM 100.91 (Continued)

The buildings and abutment exteriors shall be observed. The exterior condition of all structures, sidewalks, curbing, pavements, landscaping features, miscellaneous site improvements, and so forth shall be surveyed and documented. Defects including, but not limited to, evidence of cracking, structural damage, discoloration, drainage, ponding and so forth shall be documented. Any existing cracks shall be located, measured and recorded at the time of inspection. All existing deficiencies, major or minor, shall be documented. The Contractor shall prepare documentation in the form of digital photographs with a written detailed log of each photograph and narrated video shall be produced. Any supplementary notes, sketches, or diagrams voluntarily produced at the Contractors' discretion shall be submitted in writing. Crack gauges shall be installed before the start of construction and shall be monitored during construction for movement.

DURING CONSTRUCTION

As construction progresses, the Contractor shall re-inspect monitoring points bi-weekly. The Contractor shall inspect monitoring points weekly during significant construction activities, including the installation of the earth support system, footing installation, and backfilling. Cracks and/or structural damage documented before the start of construction shall be monitored during construction. If during construction, it is believed that any unwarranted movement of the buildings or stone abutment has occurred due to construction activities, at the Engineer's discretion, the surveyor shall return to the site to re-shoot monitoring points along the wall face (or other established controls) to determine if any unwarranted movement has occurred. Re-mobilization of the surveyor shall come at no additional cost to this Item.

POST-CONSTRUCTION

Upon completion of the construction activities, the Contractor shall re-inspect and conduct condition survey, in a manner that duplicates the pre-construction inspection in order to compare existing conditions to the pre-construction conditions. The results of the post-construction inspection and condition survey shall be compared to the results of the pre-construction inspection and condition survey. Specific similarities and differences shall be noted in the post-condition survey report.

SUBMITTALS

The contractor shall submit to the Engineer the following prior to commencement of the Work:

1. Qualifications:
 - a. Instrumentation Engineer: Contractor's Instrumentation engineer shall be responsible for furnishing, installing, monitoring, maintaining and reporting of all vibration monitoring equipment and measurements, shall have 5 yrs. of direct field experience with the types of instruments specified herein.

ITEM 100.91 (Continued)

- b. Surveyor: All surveying activities shall be performed under the direct supervision of a licensed Professional Land Surveyor registered in the Commonwealth of Massachusetts and shall have experience in measurements of the types and accuracies specified herein. The field survey party chief shall also have experience in survey measurements of the types and accuracies specified herein.
2. Monitoring plan: Condition survey and vibration monitoring plan, which shall include, at a minimum, the following:
 - a. Manufacturers' product data sheets and calibration certifications describing all instruments to be installed, including requests for consideration of substitutes.
 - b. Detailed step-by-step procedure for installation, together with a sample installation record sheet, for each instrument to be installed, including:
 - i. Survey Monitoring Points: Installation on existing stone abutment, walls, and adjacent buildings within the excavation zone of influence.
 - ii. Vibration Monitoring Points: Installation at each corner of the bridge on top of the existing stone abutment.
 - c. Detailed step-by-step procedures for conducting all measurements, including baseline measurements and measurements during construction, to the specified accuracies, including types of surveying instruments or measurement devices (e.g., data loggers), type of monitoring devices, data reduction procedures, summary, data plotting procedures and frequency for checking survey and seismograph readings. Provide sample of summary plots for all anticipated data. The plan shall be submitted at least 21 calendar days prior to the start of the baseline monitoring period.
 - d. Location plan of monitoring points.
 - e. A schedule indicating the proposed contractor's construction schedule, instrument installation sequence, the proposed monitoring and reporting frequencies for all instruments specified herein.
 - f. Access to database with example data showing how data from all monitoring points will be displayed and reported to the various parties involved.
3. Reports: Documents of the results of the baseline monitoring to the Engineer for record keeping. At least one copy shall be kept in the construction trailer at all times. Data obtained during and post-construction shall be promptly delivered to the Engineer. Digital photographic images shall be stored on a USB. Digital format video recordings shall be stored on a USB and viewable by standard video software.

ITEM 100.91 (Continued)**PRE-CONSTRUCTION MEETINGS**

Conduct site walk at Project site at least thirty days prior to installation of monitoring instrumentation.

1. At a minimum, pre-installation conference shall be attended by the EOR (Engineer of Record), Contractor's Superintendent, and Instrumentation Engineer.
2. Determine locations of ground and surface monitoring points.
3. Review condition of site for installation of all geotechnical instrumentation, including coordination with temporary measures and temporary controls and protections.
4. Review proposed site clearing, excavation construction schedule, and demolition.

EQUIPMENT AND MATERIALS

All materials shall be new. The Contractor shall protect all monitoring instruments from damage due to construction operations, weather, traffic, and vandalism. If any monitoring instrument is damaged or inoperative due to inadequate protection by the Contractor, the Contractor's instrumentation personnel shall repair or replace,

The damaged or inoperative instrument shall be replaced within 72 hrs. at no additional cost to the Project. The Contractor shall notify the EOR at least 24 hrs. prior to repairing or replacing a damaged or inoperative monitoring instrument. The EOR will be the sole judge of whether repair or replacement is required. The EOR may impose a work stoppage in the vicinity of the damaged or inoperative instrument until it is again operational, at no additional cost to the Project.

Precision Level Survey Equipment

All vertical monitoring points shall be surveyed with an instrument with accuracy equal to 0.3 mm per 1 km double run or better per DIN 18723.

Use a total station with a minimum 1 second horizontal accuracy per ISO 17123.

All surveying equipment used in conjunction with the monitoring of instrumentation, including measuring tapes, precise levels, and theodolites shall be maintained and calibrated as required by the manufacturers.

ITEM 100.91 (Continued)Survey Monitoring Points

The following type of Deformation Monitoring Points (DMP) shall be used to monitor deformation:

1. DMP shall consist of a stainless steel PK nail driven into concrete or asphalt surfaces for vertical and horizontal movement monitoring of the existing stone abutment and walls. The nail shall be domed at top and manufactured from hardened, zinc-plated steel. It shall also have an indent in the center of its head. Alternative and equal DMPs may be utilized at the expressed approval of the Engineer and Owner.
2. Install DMPs at a spacing no greater than 10 feet along the stone abutment and walls to be monitored. Install DMP's at the top of the structure and near the exposed ground surface.

The following type of Building Monitoring Points (BMP) shall be used to monitor deformation:

1. BMP shall consist of a non-destructive and stable element that firmly attaches to the structure.
2. Install BMPs at a spacing no greater than 10 feet along the exterior walls to be monitored.

Crack Gauge

Use crack gauges with a minimum of 1mm horizontal and vertical accuracy. Crack gauges shall be installed using non-destructive methods.

DOCUMENTATION

The condition survey of adjacent buildings shall produce diagrams of the walls, partitions, floor and ceilings showing existing cracks, descriptions of interior basement or foundation cracks, elevations, photographs of exterior cracks or damage and such other data, including narrated videotape, as is applicable to locate and define the amount and extent of existing damage. All existing structural deficiencies, major and minor, shall be shown.

CONSTRUCTION METHODS

The Instrumentation Engineer's personnel shall install instruments in accordance with the approved Monitoring Plan. Install all instrumentation at the approximate locations shown in the Monitoring Plan or as required by the Engineer. Contractor and Instrumentation Engineer shall confer with the EOR as to the suitability of all planned locations. After installation of each instrument, the Instrumentation Engineer or his designee shall survey the as-built location to define the vertical and lateral positions of the exposed parts.

ITEM 100.91 (Continued)

All electronic readout devices and transducers shall be shaded from direct sunlight during use. Probes which are used inside access tubes shall be placed inside the tube and allowed to come to a stable temperature for at least 10 min. before use. Zero or starting values shall only be taken once temperature stabilization is complete.

The Contractor shall exercise care during construction so as to avoid damage to instrumentation. All locations shall be flagged and protected. Instrumentation which is damaged as a result of the Contractor's operation shall be repaired or replaced by the Contractor at his own expense.

The EOR will determine whether repair or replacement is required. It may be necessary to stop work until a damaged instrument has been repaired or replaced.

All instruments shall be clearly labeled with their reference number at the location where readings or measurements are taken. The labeling shall be permanent using a method or material to be agreed with the EOR and shall be clearly visible.

Installation of Deformation Monitoring Points

Install DMPs at the minimum locations described herein, locations within the excavation zone of influence and other locations deemed necessary by the Contractor. After completion of installation of a DMP, the as-built location in horizontal position and elevation shall be determined.

Installation and initialization of DMPs shall be completed a minimum of one week prior to the start of any construction work within 200 ft. of the monitoring points.

Deformation Monitoring

Monitoring frequency may be increased as required by the Engineer for some or all of the monitoring points if the threshold or limiting response values are approached or exceeded during the Work, at no additional cost to the Owner.

Initial survey of all displacement and building monitoring points will be made a minimum of 48 hrs. after completing each installation. A minimum of three independent rounds of survey readings will be taken to establish a single initial elevation or plan location and standard deviation for the measurement. Address methods to achieve required accuracy and repeat measurements if error at one standard deviation exceeds 0.01 ft. vertical or 0.01 ft. horizontal for initialization rounds. Monitoring points shall be monitored from the same benchmarks during re-surveys. The location of all monitoring points shall be located within a horizontal accuracy of ± 0.01 ft. and an elevation accuracy of ± 0.01 ft. at one standard deviation.

ITEM 100.91 (Continued)

Initial survey of monitoring points at top of the earth support systems shall be made a minimum of 48 hrs. after completing the installation, and 48 hrs. before the start of excavation.

In cases where instruments are installed during construction, three sets of readings shall be taken in quick succession and the results compared. These results shall be used to provide base readings in a manner to be agreed with the EOR.

Measurements shall be obtained at all instruments on a three time daily basis during all vibration inducing construction activities including typically demolition, excavation, installation of excavation support, drilling, pile driving, etc. In addition, the following guidelines shall be followed:

1. Obtain measurements at all DMPs when work is within 200 ft. of construction activities.

At the discretion of the EOR, data collection may be carried out more frequently than specified herein based on the evaluation of the collected data. Seismographs shall be set up to monitoring vibrations continuously during all vibration inducing activities. Vibration levels shall not exceed the limiting criteria established in USBM RI.

Whenever sets of data are measured, they shall be compared to previous sets of data. If anomalous readings are present which differ from the expected value or trend, then further readings shall be taken immediately and the EOR shall be informed. If the anomalous values persist, then the EOR shall be informed and an investigation shall be carried out to find the reasons for the anomalous readings.

If there are anomalies or sudden significant changes in the results, the EOR should be informed within one (1) day after monitoring.

Instrument data shall be made available to EOR within one working day of reading.

ITEM 100.91 (Continued)Vibration Monitoring

The Contractor shall install a total of four (4) seismographs, one at each corner of the bridge on top of the existing stone abutment walls, meeting the requirements outlined below:

- Seismic Range – 0.01 to 4.00 inches per second with accuracy of $\pm 5\%$ of the measured peak particle velocity or better at frequencies between 10 and 100 Hertz, and with a resolution of 0.01 inches per second or less.
- Three channels for vibration monitoring.
- Power Sources – an internal rechargeable battery with charger and 115 volts alternating current. The battery must be of appropriate size and type to supply continuous power to the monitor for a minimum of 24 hours.
- Instruments must be capable of producing strip chart recordings and readings on site within one hour of readings. The Contractor shall provide the appropriate computer and software to perform the analysis and produce reports of the continuous monitoring.
- The continuous monitoring mode must be capable of recording single-component peak particle velocities and the frequency of peaks shall have an interval of one minute or less.

The Contractor shall obtain baseline vibration levels by operating the equipment for a minimum of five consecutive 24-hour periods prior to commencing any construction activities.

The Contractor shall operate the monitoring equipment and continuously record data for the duration of significant construction activities including the installation of the earth support system, bridge demolition, footing installation, bridge delivery/erection and backfilling, etc. The Contractor shall document with photos, sketches and notes, if appropriate, all events responsible for measured vibration levels and submit documentation along with the readings to the Engineer.

Should the peak particle velocity ever exceed $\frac{1}{2}$ " per second, the Contractor shall 1.) double the frequency of the readings, 2.) notify the Engineer, 3.) verify with the Engineer that all work is being conducted according to the Contract Documents and 4.) schedule a meeting with the Engineer to be held within 48 hours of the reading to discuss further action.

Should the peak particle velocity ever exceed 1" per second, the Contractor shall 1.) stop all construction activities immediately, 2.) verify the readings and 3.) schedule a meeting with the Engineer to be held immediately to discuss further action.

ITEM 100.91 (Continued)Threshold and Limit Levels

The table provided below establishes the Threshold and Limit levels as defined herein.

Instrument	Threshold	Limit Level
Deformation monitoring Points (Vertical and Horizontal) Abutment	0.25 in.	0.5 in.
Deformation monitoring Points (Vertical and Horizontal) Wall	0.25 in.	0.5 in.
Building monitoring Points (Vertical and Horizontal)	0.25 in.	0.5 in.
Vibration Monitoring Points	0.5 in./sec.	1.0 in/sec

If the Threshold level is reached on any monitoring point, immediately notify the EOR and increase the frequency of movement monitoring as required. Review and modify work operations and procedures as needed to minimize additional movements and prevent reaching the Limit Level. All modifications to the work must be agreed upon with the EOR before implementation.

If the “Limit” level is reached, immediately halt work activities except those needed to prevent instability from occurring, and notify the EOR and Structure Owner (if applicable). Review and modify work operations and procedures, and structure/utility support requirements as needed. Mitigation and repair actions plan shall be submitted for approval by the Owner, EOR, and Owner of the impacted structure prior to implementation.

BASIS OF PAYMENT

Item 100.91 will be paid at the Contract Lump Sum price, which shall include all labor, equipment, materials, engineering services, submittals, and incidental costs required to complete the work. No additional payments will be considered for re-mobilizing the surveyor for additional shots to monitor movement.

1. The first payment of 50% of the Lump Sum Contract price for the Pre-Construction Survey and Vibration Monitoring – Bridge L-04-027 (C90) will be made upon the completion of the baseline survey and installation of seismographs, as described above.
2. The second payment of 50% of the Lump Sum Contract price for Pre-Construction Survey and Vibration Monitoring – Bridge L-04-027 (C90) will be made upon Substantial Completion.

ITEM 102.01

SELECTIVE CLEARING AND GRUBBING

LUMP SUM

The work under this Item shall conform to the relevant provisions of Subsection 101 of the Standard Specifications and the following:

The work under this Items shall consist of limited clearing and grubbing of vegetation such as small trees, shrubs, and limbs as may be necessary to provide adequate visibility for signs installed under this Contract and other selected areas as directed by the Engineer. If the existing ground area is disturbed by any work or equipment, the Contractor shall rough grade and loam and seed if necessary disturbed areas without additional compensation.

All debris shall be removed and properly disposed of from the site in accordance with the Emerald Ash Borer Advisory clause.

BASIS OF PAYMENT

Item 102.01 will be paid for at the Contract Lump Sum unit price, which price shall include all labor, tools, equipment, materials, disposal, and all incidental costs required to complete the work.

ITEM 102.1

TREE TRIMMING

FOOT

The work under this item shall conform to the relevant provisions of Section 100 and Subsection 101 of the Standard Specifications and the following:

Add to Subsection 101.62: The work shall also include meeting with utility companies to coordinate tree trimming to be done in advance of the relocation of overhead wires. The contractor shall be line clearance qualified to work near National Grid utilities for any tree trimming adjacent to National Grid power lines.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Item 102.1 will be measured and paid for in accordance with Subsections 101.80 and 101.81 of the Standard Specifications accordingly.

ITEM 102.3 **HERBICIDE TREATMENT OF INVASIVE PLANTS** **HOUR**

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

QUALIFICATIONS

The applicators shall submit and meet the qualifications outlined below. A list of contractors specializing in invasive management and approved by MassDOT Landscape Design Section is available on the following website: <https://www.mass.gov/lists/landscape-design-and-roadside-maintenance> under Invasive Plant Management.

Requirements

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)

SUBMITTALS

No work shall begin without approval of the submittals.

Submittals include the following items:

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.

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 and upon leaving the site.

ITEM 102.3 (Continued)

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.

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 IMPS.

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.

ITEM 102.3 (Continued)

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.

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.

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 AND PRUNING EACH

The work under this item shall conform to the relevant provisions of Sections 771 of the Standard Specifications and the following:

Tree protection – armoring and pruning shall be used for instances where construction activity (the use of heavy equipment), comes within proximity to potentially damage tree trunk(s) or limbs.

The work shall include the furnishing and installing of temporary tree trunk protection, minor limb pruning, or removal of lower tree limbs to prevent injury to the tree from construction equipment and activities; as shown on the Drawings; and/or as required 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. Material used for trunk armoring or mounting shall be such that installation and removal shall not damage the trunk.

Acceptable trunk armoring materials shall include two by four (2x4) wood cladding, mounted with wire or metal strapping, or when duration of construction activities is less than three months, slotted corrugated plastic pipe, mounted with duct tape. Eight (8) once untreated burlap shall be used to wrap the tree trunk prior to installation of cladding.

Alternative armoring methods or materials may be acceptable if approved by the Engineer.

The height of tree trunk cladding shall be measured from the base of the tree (including root flare) to the bottom of the first branch, or to a height of eight (8) feet, or as may be required by the Engineer.

METHODS OF WORK

Prior to construction activities, the Engineer, Contractor, and the Arborist (if item is included in the contract), shall review trees noted on the Drawings to be protected. Final decision and selection of trees to be 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 maintained such that it is effective for as long as required or replaced when materials are found to be damaged or ineffective, as determined by the Engineer. Replacement, if required, shall be incidental to the work. Armoring shall be removed immediately upon completion of work activities adjacent to the protected tree(s).

Pruning of limbs shall conform to the techniques and standards of the most recent ANSI A300 standards.

ITEM 102.511 (Continued)**DAMAGES OR LOSS**

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, secure the services of an Arborist, described in Item 102.55. The Arborist shall be approved by MassDOT.

If, based on the recommendation 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; soil injection fertilization; and/or watering; the damage shall be repaired as soon as possible, within the appropriate season for such work and according to industry standards.

If, based on the recommendation of the Arborist, the Engineer determines that damages are irreparable, or that the damages are such that the tree is sufficiently compromised to pose a future safety hazard, the tree shall be removed. Tree removal shall include cleanup of all wood, 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. Such tree removal(s), grinding, debris removal, and topsoil filling, shall be at the Contractor's expense.

Tree removal from improper or inadequate tree protection shall result in the Engineer assessing the Contractor monetary damages consistent with industry standards for assessed value and/or replacement.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Item 102.511 will be measured and paid at the contract unit price per EACH tree to be armored and pruned. 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 or as required by the Engineer.

Payment for work under this item will be scheduled as follows:

40% of the value shall be paid upon installation of trunk armoring and completion of pruning work, if required.

60% of the value shall be paid at the end of construction operations that would potentially 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.

No separate payment will be made for costs of remedial actions, Arborist services, tree removal, but all costs in connection therewith shall be included in the Contract unit price bid.

Tree damages assessed, due to lack of or improper tree and plant protective measures being taken, shall be deducted from the contract price of the work.

ITEM 102.513**AIR EXCAVATION AND ROOT PRUNING****EACH**

This item is for the services of excavating soil with an air pressure tool in order to expose tree roots, and for associated services and materials necessary to complete the work of pruning, backfilling with existing soil, watering, mulching, and fertilizing. This item shall include the furnishing and operating the air excavating tool.

Associated Item: All references to Arborist herein shall refer to the Arborist under Item 102.55 Arborist. Arborist shall meet the requirements as specified under that Item and shall be compensated under that Item.

Trees to be air spaded shall be those shown on the plans, listed below, and/or as determined necessary by the Engineer per the recommendations of the Arborist.

Locations: STA 34+12, 49' LT STA 73+41, 40' RT
 STA 71+30, 30' RT STA 73+48, 39' RT
 STA 71+59, 33' RT STA 75+19, 22' LT

REFERENCES

The standards from American National Standards Institute (ANSI): A300 (Part 8)-2013 Root Management with special attention to Section 84 shall apply to this work. If requested, the Contractor shall provide the Engineer one copy of this reference. Provision of reference shall be incidental to this item.

METHODS

Air excavation and pruning work shall be performed by or overseen by the Arborist.

Air excavation of soil and root pruning shall occur any time prior to equipment work within the root zone of marked trees.

Air excavation shall be done along the limit of proposed excavation. Trench shall be of sufficient width to observe and cut roots and shall be to the depth of proposed excavation. Immediately following air excavation, roots shall be pruned.

Following pruning, roots shall immediately be fully covered with backfill and immediately watered. Roots shall continue to be watered and fertilized as directed by the Arborist.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Item 102.513 will be measured and paid per foot where air spading, pruning, watering, and fertilizing are performed. This item will include full compensation for all labor, equipment, materials, and incidentals required for the satisfactory completion of the work.

Arborist services shall be per Item 102.55 Arborist and compensated under that Item.

ITEM 102.522 TREE AND PLANT PROTECTION FENCE - CHAIN LINK 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 shall consist of furnishing, installing, and maintaining vertical and stable chain link fence for tree and plant protection; removing and resetting fence(s) as may be required; and final removal of protection fence(s) at the completion of construction activities, or as otherwise required by the Engineer.

The purpose of the fencing is to signify a construction work-free zone and physical barrier, thereby preventing damage to tree roots, tree trunks, soil, and all other vegetation within this delineated Tree and Plant Protection Zone (TPPZ), as shown on the Drawings, as required by the Engineer, and as described herein.

Chain link fencing for tree and plant protection shall remain in place for the duration of the construction activities, unless otherwise required by the Engineer.

MATERIALS

Chain link fence for tree and plant protection shall be six (6) foot tall metal chain link, set in metal frame panels on movable core drilled concrete blocks of sufficient size to hold the fence erect. Panels shall be such that they create a barrier to encompass the entire TPPZ or root zone area, to the extent possible.

Unless otherwise indicated, the following types of chain link fence are acceptable:

- New materials or previously used salvaged chain link fencing in good condition, subject to inspection and approval by the Engineer.
- Posts: Galvanized steel pipe of diameter to provide rigidity.
- 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.

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 THE TPPZ

Fencing shall be used for construction areas, staging areas, and stockpile areas as shown on the plans, or as required by the Engineer, to establish the TPPZ.

ITEM 102.522 (Continued)

Fencing shall be located as close to the work zone limit and as far from tree trunk(s) and plants 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.

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. Accessing or traversing the TPPZ shall not be permitted.

METHOD OF WORK

TPPZ fencing shall be installed prior to any construction work or staging activities. Fence(s) shall be repositioned where and as necessary for optimum tree and plant protection. Repositioning shall be incidental to this item. TPPZ fencing 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 required by the Engineer, fencing panels, posts, and anchoring 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. In the event that handwork is not feasible, work shall be conducted with the smallest mechanized equipment necessary to do the work, with permission of the Engineer.

ITEM 102.522 (Continued)**TREE AND PLANT DAMAGES OR LOSS**

If the TPPZ is encroached by construction activity without approval, at the discretion of the Engineer the Contractor may be required to provide a more durable barrier (e.g., Jersey Barriers) to secure the area. Costs of furnishing and installing additional or more durable barrier(s) shall be borne by the Contractor.

In such cases of encroachment, soils shall be considered compacted and tree root damage will be assumed. Action shall 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, secure the services of an Arborist, described under Item 102.55. 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.

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 shall be repaired as soon as possible, within the appropriate season for such work, and according to industry standards.

If the recommendation determine that damages are irreparable, or that the damages are such that the tree is sufficiently compromised to pose a future safety hazard, the tree shall be removed. Tree removal shall include cleanup of all wood, 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. Such removal(s) and related activities shall be at the Contractor's expense.

Tree removal from improper or inadequate protection of the TPPZ shall result in the Engineer assessing the Contractor monetary damages in the amount based upon industry standards per diameter inch at breast height (DBH) per tree.

Shrubs removals from improper or inadequate protection of the TPPZ shall be replaced with plants of similar species and equal size or the largest size plants reasonably available. The Engineer shall approve the size, quality, and quantity of the replacement plant(s). Each replacement shall include a minimum of one year of watering and establishment care, specified under Section 771.

ITEM 102.522 (Continued)

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Item 102.522 Tree and Plant Protection Fence—Chain Link will be measured and paid for payment by the FOOT, complete in place.

This will include all labor, materials, equipment, maintenance, resetting, final removal/disposal of the protective fence(s), damage repair, and all incidental costs required to complete the work.

Payment for work under this item will be scheduled as follows:

- Forty (40) percent of the value payment will be made upon installation of TPPZ fencing.
- Sixty (60) percent of the value payment will be made when TPPZ fencing 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, Arborist services, tree or plant removal, shrub replacement and establishment, but all costs in connection therewith shall be included in the Contract unit price bid.

Tree damages assessed, due to lack of or improper tree and plant protective measures being taken, shall be deducted from the contract price of the work.

ITEM 102.531

TREE CARE - PRUNING

EACH

The work under this item shall conform to the relevant provisions of Sections 771 and shall be for when specialized or significant limb pruning is required. Pruning shall be to prevent injury to the tree from construction equipment and activities, pruning of dead limbs, and/or pruning for health and balance of the tree to mitigate impacts of construction activities on the root zone.

This Item will be used for pruning of existing canopy overgrowth from abutting properties and/or as determined by the Engineer per the recommendations of the Arborist.

QUALIFICATIONS

Individuals performing the work must have at a minimum, an ISA Certified Tree Worker or demonstrate equivalent training and experience. Certification shall be submitted to the Engineer for approval prior to work.

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.

METHODS OF WORK

Prior to construction activities, the Engineer, the Contractor, and the Arborist shall review trees noted on the plans and listed herein to be pruned. Final decision as to trees pruned shall be per the Engineer.

Pruning of limbs shall conform to the techniques and standards of the most recent ANSI A300 standards.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Item 102.531 will be measured and paid at the contract unit price per Each. This will include full compensation for all labor, equipment, tools, materials, and incidentals for the satisfactory completion of the work.

ITEM 102.533

TREE CARE - WATERING

GALLON

The work under this item shall conform to the relevant provisions of Subsections 440 and 771 of the Standard Specifications and the following:

The purpose of this item is to provide watering for tree care during and after root pruning as directed by the Arborist. Watering shall occur during daytime hours only.

MATERIAL

Water shall be water from an approved source.

SUBMITTALS

Schedule for watering shall be determined in consultation with the arborist. Expected schedule shall be submitted to the Engineer. Source of the water shall be approved by the Engineer and included in the submittal.

Contractor shall submit metered record of water used or other measure approved by the Engineer. Record must show date of watering and quantity used.

METHODS

At least one day prior to watering on site, the contractor shall notify the Engineer.

Watering equipment shall be approved by the Engineer prior to watering under this item. Equipment shall be such that there is no water leaking from the tank, hoses, or any other parts. Water shall be pumped and have a minimum flow of 50 PSI. Gravity fed watering shall not be accepted under this item.

If water runs off root zone area due to slope, too high a flow rate, slow infiltration, or any other reason, water will not be approved for payment.

Watering method shall not damage plants or seeded areas or cause erosion. All damages shall be repair at the Contractor's expense.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Item 102.533 shall be measured by the Gallon and shall be based on the submittals described herein. Payment shall be for all labor, equipment, and materials to complete the work specified.

Item 102.533 will be paid for at the Contract unit price per Gallon which price shall include all labor equipment, materials and incidental costs required to complete the work.

ITEM 102.55**ARBORIST****HOUR****DESCRIPTION**

The work under this Item is for the services of a Certified Arborist. Arborist shall be an International Society of Arboriculture (ISA) Certified Arborist or a Massachusetts Certified Arborist. The Arborist shall have at least 10 years of experience in tree care, including tree protection during construction, and shall demonstrate a familiarity with the American National Standards Institute (ANSI) A300 Standard Practices for Tree, Shrub, and Other Woody Plant Maintenance Part 1 Pruning, Part 5 Construction Management Standards, and Part 9 Tree Risk Assessment.

The Arborist's general responsibilities include protecting high priority trees within and adjacent to the project limits, stating areas, and access routes; recommending removal of diseased, damaged or otherwise unhealthy trees that pose a potential safety hazard; evaluating effects of construction on future health of trees close to proposed work; and recommending and/or overseeing tree work and care.

The Arborist for this item shall not be from the same company as the company responsible for selective clearing or tree removal work.

For projects with multiple phases, projects where construction activities (work or stockpiling) shifts, or when otherwise directed by the Engineer, the Arborist shall re-evaluate conditions and provide follow-up recommendations.

SUBMITTALS

- B Contractor shall submit to the Engineer for approval by MassDOT Landscape Design the qualifications and experience of the Arborist. Submittal shall include copy of current certification and a resume summarizing specific construction experience (including relevant MassDOT projects) for a minimum of five projects.
- B Arborist's Report documenting recommendations shall be submitted to the Engineer and an electronic copy forwarded to MassDOT Landscape Design Section. Report shall include the following:

SCOPE OF WORK

The Arborist shall be responsible for the following tasks:

- Initial Evaluation and Report
 - review and modify, if necessary, tree protection measures shown on the drawings
 - review and recommend protection measures for high priority trees;
 - submit a marked-up Construction Plan that briefly notes recommendations and decisions made in the field;
 - submit a corresponding report including photo documentation;
- Oversight
 - direct or execute pruning of branches and/or roots, air spading, and/or other tree care operations

ITEM 102.55 (Continued)

- Special Care
 - oversee tree pruning for health and aesthetics
 - recommend fertilization and amendments
 - recommend and oversee pest control

METHODS

Prior to any work, the Arborist shall walk the site with the Contractor, the Engineer, the City Tree Warden, and the MassDOT Landscape Architect, to review trees, limits of construction activities, and other concerns. Where required for proper assessment of tree impacts, limits of work shall be staked or otherwise marked in the field prior to the site walk.

Trees to be removed shall be painted or otherwise marked.

Trees to be retained shall be marked such that it does not mar or damage the tree and such that marker is not easily removed. As applicable to the work and scope of the project, trees designated for removal or to be retained shall be noted on the plan and/or in the arborist's report and photographed.

Trees designated to remain that are damaged or removed by construction activities shall be noted and photographed for inclusion in inspection reports submitted to the Engineer.

MEASUREMENT AND BASIS OF PAYMENT

Item 102.55 will be measured for payment by the Hour of time spent onsite.

Item 102.55 will be paid at the contract unit price per hour upon submittal and acceptance of Reports described above.

<u>ITEM 107.971</u>	<u>STRUCTURAL STEEL REPAIRS, BRIDGE NO. L-04-32 (C82)</u>	<u>POUND</u>
<u>ITEM 107.972</u>	<u>STRUCTURAL STEEL REPAIRS, BRIDGE NO. L-04-045 (C91)</u>	<u>POUND</u>

The work under these items shall conform to the relevant provisions of Subsection 960 of the Standard Specifications and the following:

The work under these items shall include the repair of steel for Bridge No. L-04-032 (C82) and Bridge No. L-04-045 (C91) with areas of measurable section loss that have not been identified in the Contract.

Existing steel with areas of excessive corrosion, section loss, or missing fasteners shall be repaired to the limits as determined and approved by the Engineer. Areas of repair shall be identified after all surfaces have been cleaned under Items 961.201 and 961.202. Steel repairs under this item shall consist of the furnishing, fabricating, transporting, and erecting necessary to fully remove and dispose of existing steel and install the replacement steel.

This work shall also include the replacement of all necessary rivets with high strength bolts.

This work shall also include filling any open rivet holes with high strength bolts.

Any temporary support of existing steel required for the removal and installation of repairs shall be considered incidental to this item.

All work shall be done as directed by and to the satisfaction of the Engineer in accordance with the details shown.

The replacement steel shall be painted to match the repainted steel superstructure.

MATERIALS

All new structural steel and high strength bolts shall conform to the requirements of Sections M8.05.0 and M8.04.3 of the Standard Specifications respectively.

Replacement stringers shall be painted to match the repainted steel. The intermediate and finish coats shall be applied after the stringer replacements have been completed. If primer is applied ahead of these activities, the Contractor shall blast clean and reprime. If painting operations are completed prior to placement of the bridge deck, all surfaces to be in contact with concrete shall be primed only. Damaged coating shall be touched-up with the same finish coat that was used in the shop.

ITEMS 107.971 AND 107.972 (Continued)**SUBMITTALS**

The Contractor shall prepare and submit a plan indicating the proposed removal procedures, temporary support of adjacent stringers, surface preparation and installation of replacement stringers. The procedure and any necessary calculations and drawings shall be stamped by a Professional Engineer registered in the Commonwealth of Massachusetts.

All shop drawings for the replacement steel shall be prepared and submitted to the Engineer for review and approval, in accordance with Subsection 960 of the Standard Specifications.

The contractor shall take care not to damage any portion of the structure to remain. If the Contractor's operations damage any member to remain, the member shall be repaired at the Contractor's expense to the satisfaction of the Engineer. Mechanical disassembly of steel shall conform to the requirements of Items 114.11 and 114.12.

CONSTRUCTION

High strength bolts shall be installed after nicks, burrs and foreign substances that might interfere with the seating of the bolt head and nut washers are removed. Light grinding may be ordered by the Engineer. No additional compensation will be made for required grinding, drilling and reaming. The Contractor should note that existing rivets are assumed to be 7/8" in diameter. Replacement high strength bolts shall be generally the same size as the rivet replaced. Open rivet holes to receive new high strength bolts shall be standard size holes, 1/16" larger in diameter than the bolt diameter. In the event that upon removal of the existing rivets, the hole is found to be out of round or the connected elements have corroded to the extent that required fit cannot be made by cleaning, the hole shall be reamed smooth. Hole diameters exceeding the bolt size +1/16" shall require the use of oversized washers. Hole diameters shall be kept to the smallest diameter possible to install the bolt, and shall not exceed the bolt diameter +3/16". If deformations in adjacent holes require adjustment, the Engineer shall be contacted prior to widening the holes if less than 2" of steel would remain between holes after the holes have been reamed. If more than 3 holes in any single connection require reaming, the Engineer shall be contacted for direction.

Existing rivets may be removed by mechanical methods, that will not damage the members to remain and as approved by the Engineer. Flame cutting of existing rivets shall not be permitted. Existing rivets are to be removed by shearing the head using a pneumatic river breaker and driving out the shank with a pneumatic punch. If, in the opinion of the Engineer, punching will damage the base metal, the shank shall be removed by drilling.

ITEMS 107.971 AND 107.972 (Continued)

METHOD OF MEASUREMENT

Items 107.971 and 107.972 will be measured for payment respectively by the actual net weight of new steel in Pounds, including nuts, bolt heads and permanent washers installed in the structure, completed and accepted by the Engineer. Any excess steel material ordered at the Contractor's discretion to facilitate fabrication and installation of the required finished product as defined to the limits on the drawings requirements shall not be measured for payment. The quantity of steel to be calculated and paid for shall only include the weight of the steel that meets the repair detail requirements for each location measured separately. The removal and disposal of the existing steel shall be considered incidental to this item. The painting of the replacement steel shall be considered incidental to this item.

BASIS OF PAYMENT

Items 107.971 and 107.972 will be paid for at the respective Contract unit bid prices per Pound which prices shall include all labor, materials, equipment, tools, submittals, testing and all incidental costs required to complete the work.

ITEM 107.98 **FOUNDATION AND WALL SURFACE REPAIR** **SQUARE FOOT**

The work under this item shall consist of surface area building or wall, concrete and brick surface restoration which is exposed due to lower grade changes at the back of sidewalk. The Contractor shall inspect each location and acquire the appropriate materials to match or reasonably aesthetically blend the newly exposed areas to the adjacent surfaces as required by the Engineer.

Wall and building locations are at the intersection of Broadway, Canal Street and Water Street on or adjacent to 606 Canal Street, 3 Broadway, 6 Broadway, and the Railroad Corridor. Building locations at the Lowell Street Bridge approaches are on or adjacent to 283 Lowell Street, 284-286 Lowell Street, and 292 Lowell Street.

The work shall include power washing and/or air pressure cleaning, surface grinding; masonry restoration, repointing, crack repair, spalls, chips and voids masonry repair, improperly executed previous masonry repairs, surface preparation and paint finishing.

The actual methodologies to be used shall be determined in the field through consultation with all parties.

METHOD OF MEASUREMENT

Item 107.98 will be measured for payment by the Square Foot, complete in place, horizontally along the back of sidewalk and to the vertical limits from the top of gravel subbase to the existing grade or to the limits established by the Engineer.

BASIS OF PAYMENT

Item 107.98 will be paid for at the Contract unit price per Square Foot, which price shall include all labor, equipment, materials and incidental costs required to complete the work as required by the Engineer.

**ITEM 114.11 PARTIAL DEMOLITION OF SUPERSTRUCTURE OF LUMP SUM
BRIDGE NO. L-04-032 (C82)**

The work under this item shall conform to the relevant provision of Subsection 112 of the Standard Specifications and the following:

The work under this item shall consist of furnishing all labor and materials necessary to perform the partial demolition and removal of the metal fence, steel rails, timber ties, abandoned utilities, abandoned steam and condensate lines at the subject location in accordance with the Plans and as required by the Engineer.

Except as specified, all material and debris shall become the property of the Contractor and shall be disposed of properly in accordance with all applicable local, state, and federal requirements. The removal and proper disposal of all timber that is part of the existing bridge superstructure and scheduled for removal shall be considered incidental to this item. All timber scheduled for removal beyond the limits of the existing bridge shall be removed and disposed of in accordance with Item 184.1.

The Contractor is advised to conduct a field investigation prior to bidding. The Department makes no assurances regarding the presented conditions, dimensions, and materials of the existing structure as shown on the Contract Drawings. The Contractor shall verify all existing conditions and construction features of the structure 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.

The Contractor shall be solely responsible for maintaining the stability of the existing structure at all times during the demolition. The Contractor shall prepare and submit a plan indicating the proposed demolition procedures and methods to be used including equipment, tools, devices, bracing, crane capacity and location, schedule of operations, methods of utility protection, etc., to the Engineer for approval. The requirements for equipment and all procedures utilized shall be in conformance with the intent of Subsection 960.61, Steel Erection of the Standard Specifications. The submittal shall include drawings and calculations of all loads and selection of crane and lifting devices

The Contractor shall restore portions of the site affected by the operation to their original undisturbed condition or better. The Contractor shall install temporary shielding to prevent debris falling into the river below, this shall be paid for under Item 994.111.

The removal of the existing stringers for replacement shall be considered incidental to Item 960.2.

The removal of the existing utility conduits and connections (once necessary relocations have occurred) shall be considered incidental to this item.

No demolition work shall begin until existing utilities to be relocated have been relocated to the east edge of the bridge and the temporary protective shielding is installed.

ITEM 114.11 (Continued)**SUBMITTALS**

The Contractor shall prepare and submit a plan indicating the proposed demolition procedures which shall include a schedule of operations and disposal location for the Engineer's review and approval. The demolition procedure and any necessary calculations and drawings shall be stamped by a Professional Engineer registered in the Commonwealth of Massachusetts.

The following information shall be included in the submittal:

2. Plan showing the location of all roadways, utilities and other appurtenances in the area of demolition.
3. The location of cranes, excavators, or other machinery to be used and their operating radii.
4. Lifting equipment information, including rating data and pick weight computations. Information shall include counterweights to be used and boom capability. Crane capacity shall be adequate for 150% of the total pick weight.
5. The type, size and arrangement of slings, shackles or other lifting and connecting devices, including relative technical data.
6. Methods, materials and design calculations for temporary supports for demolition purposes.
7. Methods of preventing damage to bridge elements to remain.

Any change to this demolition procedure will require prior review by the Engineer. The Contractor shall be responsible for removing any debris falling onto the river or other areas.

Work under this item may not commence until the Engineer has given written approval.

The Contractor shall take care not to damage any newly constructed structural components as shown on the Plans. Any structural components so designated that are damaged or otherwise made unsatisfactory for continued use by the Contractor's operations, as determined by the Engineer, shall be replaced or repaired to the satisfaction of the Engineer by the Contractor at their own expense.

BASIS OF PAYMENT

Item 114.11 will be paid for at the Contract LUMP SUM bid price, which price shall include all labor, materials, equipment, submittals, and all incidental costs required to complete the work.

**ITEM 114.12 PARTIAL DEMOLITION OF SUPERSTRUCTURE OF LUMP SUM
BRIDGE NO. L-04-045 (C91)**

The work under this item shall conform to the relevant provision of Subsection 112 of the Standard Specifications and the following:

The work under this item shall consist of furnishing all labor and materials necessary to perform the partial demolition and removal of the steel rails, timber hand rails, timber ties and abandoned utilities at the subject location in accordance with the Plans and as required by the Engineer.

Except as specified, all material and debris shall become the property of the Contractor and shall be disposed of properly in accordance with all applicable local, state, and federal requirements. The removal and proper disposal of all timber that is part of the existing bridge superstructure and scheduled for removal shall be considered incidental to this item. All timber scheduled for removal beyond the limits of the existing bridge shall be removed and disposed in accordance with Item 184.1.

The Contractor is advised to conduct a field investigation prior to bidding. The Department makes no assurances regarding the presented conditions, dimensions, and materials of the existing structure as shown on the Contract Drawings. The Contractor shall verify all existing conditions and construction features of the structure 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.

The Contractor shall be solely responsible for maintaining the stability of the existing structure at all times during the demolition. The Contractor shall prepare and submit a plan indicating the proposed demolition procedures and methods to be used including equipment, tools, devices, bracing, crane capacity and location, schedule of operations, methods of utility protection, traffic management procedures, etc., to the Engineer for approval. The requirements for equipment and all procedures utilized shall be in conformance with the intent of Subsection 960.61, Steel Erection of the Standard Specifications. The submittal shall include drawings and calculations of all loads and selection of crane and lifting devices.

The Contractor shall restore portions of the site affected by the operation to their original undisturbed condition or better. The Contractor shall install temporary shielding to prevent debris falling into the canal below, this shall be paid for under Item 994.112.

SUBMITTALS

The Contractor shall prepare and submit a plan indicating the proposed demolition procedures which shall include a schedule of operations and disposal location for the Engineer's review and approval. The demolition procedure and any necessary calculations and drawings shall be stamped by a Professional Engineer registered in the Commonwealth of Massachusetts.

ITEM 114.12 (Continued)

The following information shall be included in the submittal:

1. Plan showing the location of all roadways, utilities and other appurtenances in the area of demolition.
2. The location of cranes, excavators, or other machinery to be used and their operating radii.
3. Lifting equipment information, including rating data and pick weight computations. Information shall include counterweights to be used and boom capability. Crane capacity shall be adequate for 150% of the total pick weight.
4. The type, size and arrangement of slings, shackles or other lifting and connecting devices, including relative technical data.
5. Methods, materials and design calculations for temporary supports for demolition purposes.
6. Methods of preventing damage to bridge elements to remain.

M

Any change to this demolition procedure will require prior review by the Engineer. The Contractor shall be responsible for removing any debris falling onto the river or other areas.

Work under this item may not commence until the Engineer has given written approval.

The Contractor shall take care not to damage any newly constructed structural components as shown on the Plans. Any structural components so designated that are damaged or otherwise made unsatisfactory for continued use by the Contractor's operations, as determined by the Engineer, shall be replaced or repaired to the satisfaction of the Engineer by the Contractor at their own expense.

BASIS OF PAYMENT

Item 114.12 will be paid for at the Contract LUMP SUM bid price, which price shall include all labor, materials, equipment, submittals, and all incidental costs required to complete the work.

ITEM 115.1**DEMOLITION OF BRIDGE, NO. L-04-027 (C90)****LUMP SUM**

The work under this item shall conform to the relevant provision of Subsection 112 of the Standard Specifications and the following:

The work under this item includes furnishing all labor and materials necessary to demolish the entire existing superstructure and intermediate piers of Bridge No. L-04-027 (C90) in accordance with the Plans or as directed by the Engineer. The work under this item shall also include the demolition of all existing timber piers, backwalls, and abutments within the limits of the proposed bridge, per the Plans, and as directed by the Engineer.

The Contractor shall demolish, remove and dispose of the entire bridge superstructure, timber railing, and selective portions of the substructure including but not limited to the following major items: wearing surface, timber bridge deck, timber beams and bracing, timber curbs and sidewalks, timber fencing/railing (on bridge and bridge approaches), Verizon duct bank, timber bents, backwalls (as needed), and stone abutments (as needed).

Unless otherwise specified, all material and debris shall become the property of the Contractor and shall be disposed of properly in accordance with all applicable local, state, and federal requirements. The removal and proper disposal of all timber that is part of the existing bridge superstructure or substructure shall be considered incidental to this item. All timber scheduled for removal beyond the limits of the existing bridge shall be removed and disposed in accordance with Item 184.1.

The Contractor is advised to conduct a field investigation prior to bidding. The Department makes no assurances regarding the presented conditions, dimensions, and materials of the existing structure as shown on the Contract Drawings. The Contractor shall verify all existing conditions and construction features of the structure 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.

The Contractor shall be solely responsible for maintaining the stability of the existing structure at all times during the demolition including bracing of the existing deck or beams as required. The Contractor shall prepare and submit a plan indicating the proposed demolition procedures and methods to be used including equipment, tools, devices, bracing, crane capacity and location, schedule of operations, methods of utility protection, traffic management procedures, etc., to the Engineer for approval. The submittal shall include drawings and calculations of all loads and selection of crane and lifting devices.

ITEM 115.1 (Continued)**SUBMITTALS**

The Contractor shall prepare and submit a demolition plan for the Engineer's review and approval. The demolition procedure and any necessary calculations and drawings shall be stamped by a Professional Engineer registered in the Commonwealth of Massachusetts.

The following information shall be included in the submittal:

1. Plan showing the location of all roadways, utilities and other appurtenances in the area of demolition.
2. The location of cranes, excavators, or other machinery to be used and their operating radii.
3. Lifting equipment information, including rating data and pick weight computations. Information shall include counterweights to be used and boom capability. Crane capacity shall be adequate for 150% of the total pick weight.
4. The type, size and arrangement of slings, shackles or other lifting and connecting devices, including relative technical data.
5. Methods, materials and design calculations for temporary supports for demolition purposes. The plan shall certify that all existing members and elements are suitably braced and supported throughout the demolition process.
6. Methods of preventing damage to bridge elements to remain.

Any change to this demolition procedure will require prior review by the Engineer. The Contractor shall be responsible for removing any debris falling onto the wetlands or other sensitive areas.

Work under this item may not commence until the Engineer has given written approval and Verizon infrastructure currently located on the bridge is relocated overhead.

The Contractor shall take care not to damage any newly constructed structural components as shown on the Plans. Any structural components so designated that are damaged or otherwise made unsatisfactory for continued use by the Contractor's operations, as determined by the Engineer, shall be replaced or repaired to the satisfaction of the Engineer by the Contractor at their own expense.

BASIS OF PAYMENT

Item 115.1 will be paid for at the Contract LUMP SUM bid price, which price shall include all labor, materials, equipment, submittals, disposal fees, transportation, and incidental costs required to complete the work.

The Contractor shall make his own investigation of the structure to be demolished including the materials that are part of the structure. No increase will be made to the bid price due to the nature of the materials involved in the demolition. All costs for permits, dump fees, etcetera, shall be included in the bid price of the demolition item.

ITEM 129.5**TRACK EXCAVATION****FOOT**

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 the dismantling and removal of the existing railroad track steel rails, switch components, joint bars, plates, bolts, anchors, spikes, relay equipment, and wood ties as shown on the plans. The track steel rails, switch components, joint bars, plates, bolts, anchors, spikes, relay equipment, and wood ties shall be sorted and stacked at accessible locations along the corridor adjacent to the roadway in an area that is convenient for loading and transport.

All steel rails, switch components, joint bars, plates, bolts, anchors, and spikes, (hereafter referred to as “OTM” – Other Track Material) shall remain the property of Keolis.

Rails to be removed must be disconnected from adjacent rail segments at the joint bars and removed as whole segments. Care shall be taken not to damage the rails. Rails shall be cut to a maximum length of 39 feet. Bolts at the joints shall be carefully torch cut and the joint bars knocked off with a sledge hammer. All anchors shall be knocked off and all spikes shall be pulled. All individual rails and OTM such as joint bars, tie plates, bolt scraps, anchors and spikes shall be accounted for, and stacked for transport.

All materials for salvage shall be stacked and transport shall be coordinated with:

Keolis
Jack Connors
Phone: 617-593-1851
Email: john.connors@keoliscs.com

MBTA RR Operations
Robert Proulx
Phone: 617-593-1851
Email: rproulx@mbta.com

The disposal of creosote wood ties shall be in accordance with and paid for under Item 184.1 Disposal of Treated Wood Products.

The removal and disposal of all other materials related to the railroad facilities shall be in accordance with and paid for under Item 120. Earth Excavation.

SUBMITTALS

The Contractor shall submit or review and approval the methods and equipment proposed for removal of the track steel rails and switch components.

METHOD OF MEASUREMENT

Item 129.5 will be measured for payment by the foot along the centerline of the track bed and shall include both rails and all associated hardware.

BASIS OF PAYMENT

Item 129.5 will be paid for at the Contract unit bid price per foot, which price shall include all labor, materials, equipment, submittals, and all incidental costs required to complete the work.

ITEM 153. CONTROLLED DENSITY FILL – EXCAVATABLE CUBIC YARD

The work under this item shall conform to the relevant provisions of Subsection 150 of the Standard Specifications and the following:

Controlled Density Fill (CDF) shall be used to backfill areas where compaction of backfill cannot be achieved by normal means, as required by the Engineer in areas where normal compaction methods may not be possible, and at locations shown on the Construction Drawings.

CDF shall be used as required to backfill excavations and trenches for utilities and conduits constructed in mill and overlay pavement areas as required by the Engineer.

MATERIALS

CDF shall conform to the MassDOT Standard Specifications approved and listed on the MassDOT QCML. CDF shall be Type CLSM – Manual Excavatable.

Contractor shall submit the proposed CDF mix to the Engineer for review and approval.

METHOD OF MEASUREMENT

Item 153. will be measured for payment by the Cubic Yard of materials placed, complete in place.

BASIS OF 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 156.01 CRUSHED STONE FOR MAINTENANCE STRIP TON

The work under this Item shall conform to the relevant provisions of Subsection 150 of the Standard Specifications, as shown on the Drawings, and the following:

The work under this item includes the furnishing and installation of Crushed Stone for Maintenance Strips under proposed fencing along designated portions of the corridor.

MATERIALS

The Crushed Stone for Maintenance Strip shall comply with the requirements of M2.01.0, utilizing stone size M2.01.1; 1-1/2 inch stone, of the Standard Specifications.

Each load of crushed stone shall be reasonably well graded from smallest to the maximum size specified. The crushed stone shall be reasonably free from clay, loam or deleterious material and not more than 0.5% of satisfactory material passing the No. 200 sieve.

Geotextile Fabric for Separation shall be installed below Dumped Riprap and shall be installed and paid for under Item 698.1 GEOTEXTILE FABRIC FOR SEPARATION of this specification.

CONSTRUCTION METHODS

Installation of Crushed Stone for Maintenance Strip shall be according to Section 156. of the Standard Specification.

Excavate, level and compact to depth required per the Drawings, install geotextile fabric for separation, and then place Crushed Stone in one lift to the lines and grades shown on the Drawings.

No geotextile fabric shall be visible above finished grade or through the Crushed Stone for Maintenance Strip material.

METHOD OF MEASUREMENT

Item 156.01 will be measured for payment by the Ton of crushed stone.

BASIS OF PAYMENT

Item 156.01 will be paid for at the Contract unit price per Ton, which price shall include all labor, materials, equipment, and incidental costs required to complete the work

Geotextile Fabric for Separation will be paid for under ITEM 698.1.

ITEM 156.21**DUMPED RIPRAP – 50 LB STONE****TON**

The work under this Item shall conform to the relevant provisions of Subsection 150 of the Standard Specifications, as shown on the drawings, and the following:

The work under this item includes the furnishing and installation of Dumped Riprap under the Lowell Street Bridge adjacent to the path to face of new bridge abutment.

MATERIALS

Dumped Riprap shall comply with the requirements of M2.02.2, utilizing 50lbs stone size, of the Standard Specifications.

Each load of dumped riprap shall be reasonably well graded from smallest to the maximum size specified. Stones smaller than the specified 10% size and spalls will not be permitted in an amount exceeding 10% by weight of each load. Control of gradation will be by visual inspection by Engineer.

Geotextile Fabric for Separation shall be installed below Dumped Riprap and shall be installed and paid for under Item 698.1 GEOTEXTILE FABRIC FOR SEPARATION of this specification.

CONSTRUCTION METHODS

Installation of Dumped Riprap shall be according to Section 150.6 of the Standard Specification.

Excavate, level and compact to depth required per the Drawings, install geotextile fabric for separation, and then place Dumped Riprap in one lift to the lines and grades shown on the Drawings.

No geotextile fabric shall be visible above finished grade or through the Dumped Riprap material.

METHOD OF MEASUREMENT

Item 156.21 will be measured for payment by the Ton of dumped riprap installed, complete in place.

BASIS OF PAYMENT

Item 156.21 will be paid for at the Contract unit price per Ton, which price shall include all labor, materials, equipment, and incidental costs required to complete the work.

Geotextile Fabric for Separation will be paid for under ITEM 698.1.

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.

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).

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.

In order 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.

<u>ITEM 181.11</u>	<u>DISPOSAL OF UNREGULATED SOIL</u>	<u>TON</u>
<u>ITEM 181.12</u>	<u>DISPOSAL OF REGULATED SOIL - IN-STATE FACILITY</u>	<u>TON</u>
<u>ITEM 181.13</u>	<u>DISPOSAL OF REGULATED SOIL - OUT-OF-STATE FACILITY</u>	<u>TON</u>
<u>ITEM 181.14</u>	<u>DISPOSAL OF HAZARDOUS WASTE</u>	<u>TON</u>
<u>ITEM 181.15</u>	<u>DISPOSAL OF MEDICAL OR BIOLOGIC WASTE</u>	<u>TON</u>

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 through 181.15 (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 in order 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.

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 provided that 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.

ITEMS 181.11 through 181.15 (Continued)

HAZARDOUS WASTE AND MEDICAL OR BIOLOGIC 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.

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

ITEMS 181.11 through 181.15 (Continued)

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 in order 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. The Contractor should be aware of the potential presence of sharps such as needles.

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.

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.

ITEMS 181.11 through 181.15 (Continued)**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 baseplan 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.

Excavated material which has been characterized may be re-used within the limits of work provided the proposed re-use area shall be characterized and determined to meet MassDEP regulations and the MassDEP Policy for Best Management Practices for Rail Trails and has been approved by the Engineer. The Contract shall attempt to maximize the on-site re-use of soil where possible.

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.

ITEMS 181.11 through 181.15 (Continued)

The Contractor shall identify and propose locations for construction staging of both on or offsite temporary soil stockpiles and miscellaneous materials, soil/waste treatment technologies and treatment areas (on-site or offsite), disposal, recycling and treatment facilities, facilities for the beneficial re-use of excavated materials including but not limited to soil, debris, or other miscellaneous materials, temporary storage facilities, landfills, soil recycling and hazardous waste treatment, storage and disposal facilities for all 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.

The Contractor shall not be permitted to transport materials off-site until all storage, disposal, or recycling facility documentation has been received, reviewed, and approved by the MassDOT. The Contractor shall transport materials from the site to the storage, disposal, reuse or recycling facility in accordance with all United State Department of Transportation (DOT), USEPA, MassDEP, and applicable state and local regulations. The Hauler(s) shall be licensed in all states affected by transport.

The Contractor shall be responsible for ensuring that free liquid is properly transported. "Wet soils" shall not be loaded for transport. The Contractor shall dewater "wet soils", and properly dispose of free liquid in accordance with local, state, and federal regulations. The Contractor shall dispose of any free liquids that may result during transportation at no additional cost to the MassDOT.

All excavated material transported upon public roadways shall be covered to minimize fugitive dust, and where necessary truck tire and undercarriage decontamination shall be employed to minimize tracking of soils onto public roadways.

ITEMS 181.11 through 181.15 (Continued)**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.

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.

Method Of Measurement And Basis Of Payment

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.

ITEMS 181.11 through 181.15 (Continued)

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.

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.

ITEM 181.15 Measurement for Disposal of Medical or Biologic Waste shall be under the Contract Unit Price by the weight in tons of medical or biologic waste removed from the site and transported to and disposed of at the licensed 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.

ITEM 182.1**INSPECTION AND TESTING FOR ASBESTOS****LUMP SUM**

The work under this item shall include the inspecting and testing of all materials suspected of containing asbestos. Existing Verizon utilities carried by the Lowell Street Bridge that are scheduled to be removed are considered suspect materials for asbestos. Any destructive testing and demolition required to enable the inspection and testing of the suspected material will be considered incidental to this Item. All work must be in accordance with the regulations stated below.

The Contractor shall employ the services of a Massachusetts licensed "Asbestos Inspector" to inspect the material to determine whether or not asbestos is present. Should the asbestos inspector determine laboratory testing is required, a state certified laboratory shall be used to perform all necessary tests.

Dust suppression in the form of light water sprays, foams, dust suppressants and calcium chloride must be implemented to control dusting during trenching and excavation. Intrusive activities may be reduced or curtailed under high wind or heavy rain conditions if the Engineer deems continued operations to be a safety hazard to the workers.

REGULATIONS

U.S. Department of Labor, Occupational Safety and Health Administration, (OSHA) including but not limited to:

- 29 CFR 1910 Section 1001 and 29 CFR 1926 Section 58 Occupational exposure to Asbestos, Tremolite, Anthophyllite and Actinolite, Final Rule
- 29 CFR 1910 Section 134 Respiration Protection
- 29 CFR 1926 Construction Industry
- 29 CFR 1910 Section 2 Access to Employee Exposure and Medical Records
- 29 CFR 1910 Section 1200 Hazard Communication
- 29 CFR 1910 Section 145 Specifications for Accident Prevention Signs and Tags

U.S. Environmental Protection Agency, (EPA) including but not limited to:

- 40 CFR 762, CPTS 62044, FRL 2843-9, Federal Register Vol. 50 no.134, July 12, 1985 p.28530 - 28540 Asbestos Abatement Projects Rule
- 40 CFR 61 Subpart A Regulation for Asbestos
- 40 CFR 61 Subpart M (Revised Subpart B) National Emission Standard for Asbestos

ITEM 182.1 (Continued)

U.S. Department of Transportation 49 CFR 172 and 173

Massachusetts Department of Labor Standards Regulations, (DLS) including but not limited to:

454 CMR 28.00 Removal, Containment and Encapsulation of Asbestos

Massachusetts Department of Environmental Protection (DEP) including but not limited to (supplementing subsection 7.01):

310 CMR 7.00, Section 7.09 Odor and Dust, Section 7.10 Noise, Section 7.15 Air Pollution Control Regulations

310 CMR 18.00 and 19.00 Solid Waste Regulations

Massachusetts Division of Industrial Safety 45 CMR 10.00

Local Requirements including but not limited to those of Health Departments, Fire Departments and Inspection Services Departments

Wherever there is a conflict or overlap of the above references, the most stringent provision shall apply.

Method of Measurement and Basis of Payment:

Measurement and payment will be at the contract unit price per Lump Sum for ITEM 182.1 INSPECTION AND TESTING FOR ASBESTOS as specified above including all materials, tools, equipment and labor to complete the inspecting and testing of the asbestos suspected material.

All costs in the connection with the protection of general public, private property, and all costs associated with the proper inspecting and testing of the material shall be included in the price and no additional compensation will be allowed.

ITEM 182.2**REMOVAL OF ASBESTOS****FOOT**

The work shall include the removal and satisfactory disposal of existing asbestos. The Contractor's attention is directed to the fact that existing asbestos shall be inspected and tested prior to removal, to determine if special removal and disposal is required. The Contractor shall follow all the rules and regulations stated in "ITEM 182.1 INSPECTION AND TESTING FOR ASBESTOS". If asbestos is present, the Contractor shall follow all the rules and regulations stated in the section "REMOVAL AND DISPOSAL OF ASBESTOS CONTAINING MATERIALS", under this item. The Contractor should notify and coordinate his/her efforts with the proper utility accordingly.

REMOVAL AND DISPOSAL OF ASBESTOS CONTAINING MATERIALS

This section specifies the requirements for the handling and removal of asbestos containing material. The Contractor must perform all asbestos handling and removal work in accordance with these specifications and the following additional requirements.

U.S. Department of Labor, Occupational Safety and Health Administration, (OSHA) including but not limited to:

29 CFR 1910 Section 1001 and 29 CFR 1926 Section 58
Occupational exposure to Asbestos, Tremolite,
Anthophyllite and Actinolite, Final Rule
29 CFR 1910 Section 134 Respiration Protection
29 CFR 1926 Construction Industry
29 CFR 1910 Section 2 Access to Employee Exposure
and Medical Records
29 CFR 1910 Section 1200 Hazard Communication
29 CFR 1910 Section 145 Specifications for Accident
Prevention Signs and Tags

U.S. Environmental Protection Agency, (EPA) including but not limited to:

40 CFR 762, CPTS 62044, FRL 2843-9, Federal Register Vol. 50 no.134,
July 12, 1985 p.28530 - 28540 Asbestos Abatement Projects Rule
40 CFR 61 Subpart A Regulation for Asbestos
40 CFR 61 Subpart M (Revised Subpart B) National Emission
Standard for Asbestos

U.S. Department of Transportation 49 CFR 172 and 173

Massachusetts Department of Labor Standards, (DLS) including but not limited to:

454 CMR 28.00 Removal, Containment and
Encapsulation of Asbestos

ITEM 182.2 (Continued)

(supplementing subsection 7.01):

310 CMR 7.00, Section 7.09 Odor and Dust, Section 7.10
Noise, Section 7.15 Air Pollution Control Regulations
310 CMR 18.00 and 19.00 Solid Waste Regulations

Massachusetts Division of Industrial Safety 45 CMR 10.00

Local Requirements including but not limited to those of Health Departments, Fire Departments and Inspection Services Departments

Wherever there is a conflict or overlap of the above references, the most stringent provision shall apply.

All asbestos material shall be removed and properly disposed of by a contractor or subcontractor with a current Massachusetts Abatement Contractors License issued by the Department of Labor Standards. Work shall be supervised by a competent person as required by OSHA in 29 CFR 1926 to ensure regulatory compliance. This person must have completed a course at an EPA Training Center or equivalent course in asbestos abatement procedures, have had a minimum of four years on-the-job training and meet any additional requirements set forth in 29 CFR 1926 for a Competent Person. This person must also be certified by the Commonwealth as an Asbestos Supervisor and Asbestos Project Designer as required by 454 CMR 28.00.

Asbestos removal work shall be coordinated with all other work under the contract and shall be completed prior to performing any activities which could disturb the asbestos material or produce airborne asbestos fibers.

Dust suppression in the form of light water sprays, foams, dust suppressants and calcium chloride will be implemented as required to control dusting during trenching and excavation. Alternatively, intrusive activities may be reduced or curtailed under high wind or heavy rain conditions, which in the opinion of the Health and Safety Plan (HASP) may pose a safety hazard to the workers.

NOTIFICATION AND PERMITS

The Contractor shall prepare a formal pre-notification form at least ten (10) days prior to the start of asbestos removal work. This form must be submitted to the appropriate Regional Office of the Massachusetts Department of Environmental Protection and to the U.S. Environmental Protection Agency Region I Air and Hazardous Material Division. A copy of the submitted forms must be provided to the Engineer and kept at the work site.

Prior to starting any work, the Contractor shall also obtain any required asbestos removal permit(s) from the city/town. A copy of the permit(s) must be provided to the Engineer and posted at the work site.

The Contractor shall also obtain and pay all other applicable asbestos waste transportation and disposal permits, licenses and fees.

ITEM 182.2 (Continued)

STANDARD OPERATING PROCEDURES

The standard operating procedure shall ensure the following:

1. Proper site security including posting of warning signs and restricting access to prevent unauthorized entry into the work spaces.
2. Proper protective clothing and respiratory protection prior to entering the work spaces.
3. Safe work practices including provisions for communications; exclusion of eating, drinking, smoking, or use of procedures or equipment that would in any way reduce the effectiveness of respiratory protection or other engineering controls.
4. Proper exit practices from the work space through the showering and decontamination facilities.
5. Removing asbestos containing material in ways that minimize release of fibers.
6. Packing, labeling, loading, transporting and disposing of contaminated material in a way that minimizes or prevents exposure and contamination.
7. Emergency evacuation of personnel, for medical or safety (fire and smoke) so that exposure will be minimized.
8. Safety from accidents in the work space, especially from electrical shocks, slippery surfaces and entanglements in loose hoses and equipment.
9. Provisions for effective supervision and OSHA - specified personnel air monitoring for exposure during work.

REQUIRED SUBMITTALS

The Contractor shall submit to the Engineer the following listed items at least ten (10) calendar days prior to the start of asbestos work. No asbestos removal work activities shall commence until these items are reviewed by the Engineer, unless otherwise waived. Submittals shall be clearly labeled and in sufficient detail to enable the Engineer to form an opinion as to its conformity to the specifications.

1. Name, experience and DLS certification of proposed Supervisors and Foreman responsible for asbestos work.
2. Summary of workforce by disciplines and a notarized statement documenting that all proposed workers, by name, have received all required medical exams and have been properly trained and certified for asbestos removal work, respirator use and appropriate Massachusetts DLS, EPA and OSHA standards.

ITEM 182.2 (Continued)

3. Notarized statement that workers are physically fit and able to wear and use the type of respiratory protection proposed for the project. Notarized certification signed by an officer of the abatement contracting firm that exposure measurements, medical surveillance and worker training records are being kept in conformance with 29 CFR 1926.
4. Written plan of action and standard operating procedures (HASP) to include: location and layout of decontamination areas; sequencing of asbestos work; detailed schedule of work activities by date and interface with other project activities which affect work performance; methods used to assure safety and security; worker protection and exposure monitoring; contingency and emergency evacuation procedures; detailed description of methods to be employed to control pollution; waste handling procedures.
5. Written respiratory protection program specifying level of protection intended for each operation required by the project and details of daily inspection and maintenance elements.
6. Copies of the U.S. EPA, State and local asbestos removal pre-notification forms. If applicable, lists and copies of all permits, licenses, or manifests which will be applied for and used.
7. Name, location and applicable approval certificates for primary and secondary landfill for disposal of asbestos-containing or asbestos contaminated waste. Name, address and licenses number(s) of hauler permitted to transport waste. (Submit copies of completed manifests upon disposal).

The Contractor must provide copies of daily inspection and record logs upon request of the Engineer, at any time during project. This information will include but is not limited to work area entry data, respirator inspections and maintenance, HEPA-exhaust inspections and maintenance and other work applicable activities or reports of accidents or unusual events.

Method Of Measurement:

ITEM 182.2 will be measured by the FOOT for the complete removal and disposal of the asbestos containing material.

Basis Of Payment:

Payment will be at the contract unit price per FOOT for ITEM 182.2 REMOVAL OF ASBESTOS, as specified above including all materials, tools, equipment and labor necessary to complete the work specified above.

All costs in connection with the protection of the general public, private property and all costs associated with the proper disposal of the material removed shall be included in the price and no additional compensation will be allowed.

ITEM 184.1

DISPOSAL OF TREATED WOOD PRODUCTS

TON

GENERAL

Work under this item shall include the transportation and disposal of all treated existing wood product as directed by the Engineer.

The timber components of the existing structure are suspected to be treated with creosote, pentachlorophenol and/or CCA. This item shall include all costs for sampling, laboratory testing, loading, transportation, and disposal of the treated wood. The Contractor is required to submit disposal manifests to the Engineer prior to the completion of the project. All aspects of this Item are to be completed in accordance with state and federal regulations.

Compensation

Measurement and payment will be by the weight, in tons, of treated timber transported and accepted at a licensed facility. The work shall be considered full compensation for all labor, tools, equipment, materials, testing, loading, transportation, approvals, and permits necessary for the completion of the work.

Removal and disposal of all treated timber at the bridge structures shall be considered incidental to the respective demolition items. No additional payment shall be made for the removal and disposal of any treated timber located on the bridges.

ITEM 203.12 **STORMWATER BASIN OUTLET STRUCTURE** **EACH**

The work under this Item shall include excavation and backfilling, furnishing, and setting precast concrete structure, trash rack, and any other incidental work required to construct the stormwater basin outlet structure in accordance with the requirements herein, where indicated, and as detailed on the Plans or as required by the Engineer.

MATERIALS

Materials shall conform to the relevant provisions and requirements of Section 201 of the Standard Specifications. Stormwater basin outlet structure shall consist of a precast reinforced concrete structure as shown on the Plans. Concrete shall have a minimum 28-day strength of 4000 psi, with steel reinforcement meeting the requirements of ASTM A-615 Standards, Grade 60 1-inch minimum cover. The structure shall have a design loading of AASHTO HS20-44.

CONSTRUCTION METHODS

Construction methods shall conform to the relevant provisions and requirements of Section 201 of the Standard Specifications and the following:

Precast concrete structure shall be as manufactured by a MassDOT Approved fabricator. Shop Drawings shall be submitted to the Engineer for review. Excavation, dewatering, sheeting, and shoring operations where required shall conform to the relevant provisions and requirements specified in Section 140 of the Standard Specifications.

METHOD OF MEASUREMENT

Item 203.12 will be measured for payment by EACH outlet control structure installed, complete in place.

BASIS OF PAYMENT

Item 203.12 will be paid for at the Contract unit price per EACH, which price shall be full compensation for all labor, tools, equipment, and materials required to complete the work including, but not limited to, excavation and backfilling, furnishing and setting precast concrete structure, cast-iron frame and grate, crushed stone bedding, and any other incidental work required to construct the stormwater basin outlet structure in accordance with the requirements herein, where indicated and as detailed on the Plans, or as required by the Engineer. Transportation, delivery, and installation of the frame and grate shall be included in the contract unit price bid for the item listed herein.

No separate payment will be made for Crushed stone (M2.01.1) placed below the bottom of the structure to obtain a stable base, but all costs in connection therewith shall be included in the unit price bid.

No separate payment will be made for the additional excavation required for the placement of crushed stone (M2.01.1) placed below the bottom of the structure, but all costs associated therewith shall be included in the unit price bid.

ITEM 222.3 FRAME AND GRATE (OR COVER) MUNICIPAL STANDARD EACH

The work under this item shall conform to the relevant provisions of Subsections 201 and 220 of the Standard Specifications and the following:

Work under this item consists of furnishing Frame and Grate (or Cover) Municipal Standard.

Frames and grates shall have a two-directional or “grid-pattern” type and shall be manufactured by a MassDOT approved fabricator listed on the Qualified Construction Materials List (QCML). Casting date shall be listed on the QCML.

Frames and covers shall have a diamond pattern; pick holes and the appropriate word “DRAIN” or “SEWER” cast in 3-inch letters to match the corresponding utility. Frames and covers shall be manufactured by a MassDOT approved fabricator listed on the Qualified Construction Materials List (QCML). Casting date shall be listed on the QCML.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Item 222.3 will be measured and paid for in accordance with Subsections 201.80 and 201.81 of the Standard Specifications, respectively.

ITEM 222.31

BEEHIVE GRATE

EACH

The work under this item shall conform to the relevant provisions of Subsections 201 and 220 of the Standard Specifications and the following:

Work under this item consists of furnishing Beehive Grates.

Beehive grates shall be manufactured by EJ, Co., Neenah Enterprises, Inc., or Ironsmith, Inc. or approved equal. Beehive grate shall be gray iron, heavy duty, 12-inch diameter, AASHTO M105, with a total grate open area of 185 square inches.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Item 222.31 will be measured and paid for in accordance with Subsections 201.80 and 201.81 of the Standard Specifications, respectively.

ITEM 223.1

**FRAME AND GRATE (OR COVER)
REMOVED AND STACKED**

EACH

The work under this item shall conform to the relevant provisions of Subsection 220 of the Standard Specifications and the following:

The work shall include removing and stacking of existing frames and grates (or covers). The frames and grates (or covers) shall be stacked on boards at the Lawrence Department of Public Works, 200 Common Street, Lawrence, MA; exact location on site shall be as directed by the Engineer, in coordination with the DPW.

If any of the existing frames and/or grates delivered to the DPW are not wanted by the City, that unit shall become the property of the Contractor and shall be removed and discarded, with no additional payment.

If the existing frames and/or grates are damaged by the Contractor's operations during the removal and stacking process, a new frame and grate of the same size and material shall be provided to the City at the Contractor's expense.

Frames and grates (or covers) determined to be unsuitable for reuse shall become the property of the Contractor and shall be carefully removed, transported, and discarded in accordance with all applicable regulations.

METHOD OF MEASUREMENT

Item 223.1 will be measured for payment by Each Frame and Grate (or Cover) Removed and Stacked.

BASIS OF PAYMENT

Item 223.1 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.

Each frame and grate or frame and cover shall be considered as one unit.

ITEM 281.3 **GROUTED STONE PAVING (WATERWAYS)** **SQUARE YARD**

The work under this item shall conform to the relevant provision of Subsection 280 of the Standard Specifications and the following:

Work under this Item shall include excavation and backfilling, furnishing, and setting and grouting stone paving, and any other incidental work required to construct the grouted stone paving (waterways) in accordance with the requirements herein, where indicated, and as detailed on the Plans or as required by the Engineer.

Grouted Stone Paving shall be utilized at the lowest portion of each proposed sediment forebay.

The stone paving shall include pavers with a minimum depth of 4 inches, and minimum surface area of 96 square inches. Pavers shall be spaced no more than 2” apart. A minimum of a 4” gravel borrow base shall be used and compacted hand tamping or rolling. Tamping and rolling shall be limited to only the areas where stone paving is proposed.

Grout shall be added between each paver as needed to prevent vegetation growth and movement of stone paving.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Grouted Stone Paving (Waterways) will be measured and paid for by the Square Yard in accordance with subsections 280.80 and 280.81 of the Standard Specifications, respectively.

ITEM 376.5

HYDRANT – ADJUSTED

EACH

The work under this item shall conform to the relevant provisions of Subsection 301 of the Standard Specifications and the following:

All hydrants designated to be “Adjusted” shall be done so one hydrant at a time. The Contractor shall have all the required tools, materials, equipment and workmen needed to do the work on site and ready before any hydrant is removed. The Contractor shall give at least 48 hours written notice to the City of Lawrence Water Department prior to working on any hydrant. Hydrants which will be out of service for more than twenty-four (24) hours shall be replaced by temporary hydrants.

HYDRANT ADJUSTED

Hydrants noted on the plans to be adjusted shall be carefully removed and temporarily set on blocks. The Contractor shall install a riser extension of the appropriate length on the existing riser and reset the hydrant. Extension sections used to adjust hydrants shall be ductile iron only and shall adapt readily to the existing hydrant and fittings. Extension sections shall also include extensions for hydrant stem approved by the City, including all fittings. Extensions shall be a minimum of 6-inch long. The hydrant shall be reset to a height that provides 2-inch to 4-inch of clear distance from the top of finished grade to the bottom of the breakaway flange.

METHOD OF MEASUREMENT

Item 376.5 will be measured for payment by Each Hydrant adjusted, complete in place.

BASIS OF PAYMENT

Item 376.5 will be paid for at the Contract unit bid price per Each, which price shall include all labor, materials, equipment and incidental costs required to complete the work.

ITEM 458.71**LIGHTWEIGHT AGGREGATE FILL****CUBIC YARD**

The work under this Item shall conform to the relevant provisions of Subsection 150 of the Standard Specifications and the following:

The work under this Item includes but is not limited to all materials, equipment, and labor necessary to furnish and install the lightweight aggregate fill used behind abutments at the Manchester Street Bridge - Bridge No. L-04-030 (8JA) as shown on the Plans.

MATERIALS

Lightweight aggregate fill shall be an approved rotary kiln expanded shale meeting all the requirements of ASTM C 330. No by-product slag, cinders, or by-products of coal combustion shall be permitted. Lightweight aggregate shall have a proven record of durability, as determined by ASTM C 88 and ASTM C 131, and be non-corrosive, as determined by CAL DOT 422 with the following physical properties:

Sieve Designation	Total Percent Passing
1"	100
3/4"	90-100
3/8"	10-50
No. 4	0-15

1. The dry loose density shall be less than 50 pound/cubic foot.
2. The maximum in-situ density (moist, surface dry) shall be less than 60 pound/cubic foot. The minimum compacted dry density shall be equal to 65% relative density as determined by ASTM D 4253 and D 4254, or as otherwise specified by the Engineer.
3. The maximum soundness loss when tested with 5 cycles of magnesium sulfate shall be 10%(ASTM C 88).
4. The maximum chloride content (CAL DOT 422) shall be 100 ppm.
5. The minimum strength of loosely placed material, as determined from drained triaxial tests, shall equal that of cohesionless soil with an angle of internal friction of 36°. Minimum strength of material compacted to 65% relative density shall equal that of a cohesionless soil with an angle of internal friction of 40°.
6. Abrasion loss shall not exceed 40% (ASTM C131)

CONSTRUCTION METHOD

Lightweight fill can be placed in approximately uniform layers not to exceed 12" loose thickness. Each layer shall be compacted using vibratory compaction equipment weighing not more than 13 tons static weight.

ITEM 458.71 (Continued)

Excessive compaction should be avoided to minimize crushing of the aggregate. Construction equipment, other than for compaction, shall not operate on the exposed lightweight fill.

The top surface of lightweight fill lying directly below the gravel course shall be chinked by additional rolling of the lightweight fill to prevent infiltration of fines.

QUALITY ASSURANCE

The certified supplier/producer of lightweight aggregate fill shall be regularly engaged in the production of lightweight aggregate fill. This shall include the production of lightweight aggregate with a minimum production of 10,000 total cubic yards in the previous two (2) years. The material shall have been successfully applied on at least three engineered fill projects which have performed satisfactory for at least five years.

QUALITY CONTROL

Contractor shall assume full responsibility for control inspection and testing and give sufficient notice to the Resident Engineer to permit witnessing of the inspections or tests.

Contractor shall engage a qualified, independent testing agency to perform quality control testing and inspection.

DELIVERY, STORAGE AND HANDLING

Deliver, store, and handle materials in accordance with manufacturer's recommendations.

During all stages of manufacture, shipment, storage, and construction, minimize the amount of material moves to prevent particle breakage and physical damage. Minimize traffic on lightweight aggregate until an adequate thickness of cover material is placed over the lightweight aggregate.

The Contractor shall check the material upon delivery to assure that proper material has been received. A product certification should be provided with each shipment. Item shall be protected from weather and damage during temporary storage. Damaged Items prior to acceptance shall be rejected and replaced at no additional cost.

SUBMITTALS

The Contractor shall submit the following to the Engineer for review and approval: manufacturer's specifications, catalog cuts, methods of placement and other engineering data needed to demonstrate compliance as specified herein.

At least four weeks prior to placing, a 50 pound representative sample of the Lightweight Aggregate Fill material shall be submitted. The approved sample shall become the standard of the material finished under this contract.

ITEM 458.71 (Continued)

Prior to material delivery of material to the project site, the manufacturer shall provide a written certification or manufacturer's quality control data which specifies that the product meets or exceeds the values specified herein.

METHOD OF MEASUREMENT

Item 458.71 will be measured for payment by the CUBIC YARD, of material placed, complete in place to the limits and dimensions shown on the contract drawings, and as required by the Engineer.

BASIS OF PAYMENT

Item 458.71 will be paid for at the Contract unit price per CUBIC YARD, which price shall include all labor, materials, tools, equipment, submittals, staging, access, removals, storage, all field measurements and survey required, lightweight aggregate, testing, and incidental costs required to complete the work.

<u>ITEM 638.22</u>	<u>VERTICAL WELDED WIRE SCREEN FENCE</u> <u>(PIPE TOP RAIL)</u>	<u>FOOT</u>
---------------------------	--	--------------------

The work under this item shall conform to the relevant provisions of Section 600 of the Standard Specifications and the following.

The work under this item shall consist of all labor, materials and accessories necessary for installation of commercial vertical welded wire screen fence with pipe top rail as indicated on the Contract Documents, as specified, and as follows.

Coordination

Coordinate installation of posts and footing for vertical welded wire screen fence. Submit shop drawings, structural stamped drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, fence panel clips, and hardware. Deliver items to Project site in time for installation.

Coordinate installation of vertical welded wire screen fence with adjacent construction to ensure that adjacent construction is protected from damage by the work of this Section.

Submittal

The manufacturer's submittal package shall be provided prior to installation.

Quality Assurance

Installer Qualifications: The installer shall have completed similar installations in material, design.

MATERIALS

Panel heights should be approximately: 6ft. as indicated in the Contract Documents.

Wire mesh panels shall be precut to specified lengths of approximately 8'2"; actual, 8'-2³/₄" or 98.75" wide.

Steel Wire mesh fence panels shall be welded by resistance welding per ASTM F2453 using pre-galvanized steel wire; using one Vertical 4 GA pre-galvanized steel wires and two Horizontal 0 GA pre-galvanized steel wires to form a mesh opening of 2" x 8". Welded wire fence panels shall be hot dipped galvanized steel with "Custom Light Blue RAL" powder coated color to be selected and approved by The City of Lawrence.

One end of the vertical wires of the panel shall exceed 1" from the first horizontal wire creating a spiked top.

The cold rolled wire shall have a tensile strength of at least 74,000 psi and 68,000 psi shear strength. Wire strand shall be galvanized before welded (GBW), 0.50 ounces per square foot zinc coating conforming to the ASTM A641.

ITEM 638.22 (Continued)

Post for Vertical Welded Wire Mesh Fence Panels shall be 2 3/8" Round Post 10' long for a dig and set method. Posts shall be hot dipped galvanized and primed prior to application of a "Custom Yellow RAL" powder coated color to be selected and approved by The City of Lawrence.

Panel Mounting Brackets to posts shall be 13 GA U-Clamp with 1.5" carriage bolt with washer and 5/16-18" nut. Corner brackets may be used for 90-degree angles. Where not 90-degrees use two end/universal brackets stacked to adjust for the angle of the fence. All bracket and hardware shall be galvanized, and powder coated with color to match the fence posts "Custom Yellow RAL" powder coated color to be selected and approved by The City of Lawrence.

Coating System

Hot-dip galvanized: The wire mesh is coated with 0.5 oz./sq. ft. (150 g/m²) zinc in conformity with ASTM A641 (1989) Class 1.

Pre-galvanized and polyester powder coated: The polyester surface coating color shall be custom colors as per RAL chart. Polyester coating to be minimum 4 mils (0.102mm) with an average thickness of 100µm (4 mils approx.) applied by an electrostatic method. Coating shall cover all surfaces of the wire sections, posts and bracket assemblies.

Corrosion: The wires are galvanized according to ASTM A641/A641M with a minimum of 40 gr/m². After the welding process the panels will be pre-treated and provided with a conversion layer for a better anti-corrosion effect and better adhesion of the polyester powder coating.

CONSTRUCTION METHODS

Installation shall be laid out by the contractor in accordance with the Contract Documents. The manufacturers' drawings shall identify the necessary fence hardware and installation recommendations required for the application.

METHOD OF MEASUREMENT

Item 638.22 will be measured for payment by Foot of vertical welded wire screen fence (pipe top rail), complete in place.

BASIS OF PAYMENT

ITEM 638.22 will be paid for at the Contract unit price per Foot which price shall include all material, coatings, equipment, tools, tests, labor, submittal, , excavation, concrete footings, posts, fence panels, brackets, top rail, top rail caps, hardware, steel fabrication, surface preparation, hot dip galvanizing, coating system, shipping, delivery, and all incidental costs required to complete the work.

ITEM 655.3**WOODEN SAFETY RAIL****FOOT**

The work under this item shall conform to the relevant provisions of Subsections 150, 170 and 600 of the Standard Specifications and the following:

The work under this item shall consist of furnishing and installing the timber railing fence fastened to wood posts, as shown on the plans.

Timber railings shall be IPE.

SUBMITTALS

The Contractor shall submit to the Engineer for approval a complete set of shop drawings, showing the layout of all railings, including bolt holes.

QUALITY ASSURANCE

Beams that contain unsound knots and shakes, excessive checking or other defects that may be detrimental to their structural integrity will be rejected and shall not be used in the proposed work.

MATERIALS

Timber for rails and rail posts shall be IPE, *Tabebuia* spp., lapacho group. IPE lumber shall have a minimum density of 64 pounds per cubic foot. Lumber dimensions shown on the plans are nominal.

The mechanical properties of the IPE lumber shall be verified using US Forest Product Laboratories testing methods (2" standard) and shall exceed the values listed below:

Modulus of Elasticity: 2,900,000 pounds per square inch
Bending Strength: 22,500 pounds per square inch
Crush Strength: 10,000 pounds per square inch

The lumber shall be dried to a moisture content of no more than 19%. Dimensions shall have a tolerance of plus/minus 0.08" at 19% moisture.

The IPE lumber supplier shall provide proof of membership in the Certified Forest Products Council.

Ends of the lumber shall be sealed after cutting using a clear aqueous wax end sealer appropriate for use with IPE to reduce end checking.

The lumber shall be in sound condition, free from worm holes, knots, longitudinal heart cracks, soft sap wood, fungus, and deformation (twisting or cupping) that cannot be removed during installation using normal installation methods and tools. Natural drying checks to a maximum of 1/8 inch width will be acceptable.

ITEM 655.3 (Continued)

All holes shall be predrilled. Bolt holes shall be 1/16 inch larger than bolt thread diameter, unless otherwise noted on the plans.

ITEM 655.3 (Continued)

All connectors, fasteners, and hardware shall be either stainless steel type 304 or 316 alloy or shall be Hot-dip galvanized meeting the requirements of ASTM A153 and A123, with 2 ounces of zinc coating per square foot minimum. Fasteners, connectors, and hardware used together shall be of the same type.

CONSTRUCTION METHODS

Wood rail fence posts shall be set plumb, backfilled with ordinary borrow, as required, and compacted to the lines and grades shown on the Plans and/or as required by the Engineer.

The Contractor shall be required to furnish extra length posts at transition areas or where field conditions warrant. These posts shall be of such length that the minimum depth in the ground, as shown on the Plans, is maintained.

The Contractor shall take extreme care in the handling of the railings. Any damaged timbers will be replaced by the Contractor at the discretion of the Engineer and at no additional cost.

Rails shall span a minimum of three members.

Wood rails shall be erected to form a smooth continuous rail conforming to the required line and grade. Butt adjoining rail sections with a maximum separation between adjoining rail sections of 1/16 inch.

Rails shall be butt jointed at alternate posts or as directed. Hammering or other forceful method of inserting bolt shall not be used.

METHOD OF MEASUREMENT

Item 655.3 will be measured for payment by the Foot of actual wooden safety rail installed complete in place.

BASIS OF PAYMENT

Item 655.3 will be paid for at the Contract unit bid price per Foot, which price shall include all labor, tools, equipment and materials, including all required excavation, backfill, fasteners, bolts, nuts, fine grading and compacting and washers and all incidental costs required to complete the work.

ITEM 655.4**WOOD RAIL FENCE WITH GUARDRAIL****FOOT**

The work under this item shall conform to the relevant provisions of Section 600 of the Standard Specifications and the following:

The Contractor shall submit to the Engineer for approval, complete sets of shop drawings for materials. No materials shall be fabricated or shipped prior to approval of the shop drawings by the Engineer.

A Certificate of wood treatment shall be furnished to the Engineer upon delivery of the treated wood products. Treated wood shall bear the appropriate American Wood Preserves Bureau (AWPB) quality mark for the treatment employed. The certificate shall indicate acceptability of treated wood to receive field-applied stain.

Posts and offset blocks that contain unsound knots and shakes, excessive checking or other defects that may be detrimental to the structural integrity of the posts and offset blocks will be rejected and shall not be used in the proposed work.

Existing utility locations shall be verified in the field prior to starting this work. The Contractor shall provide the Engineer with a plan showing existing utility locations and elevations prior to undertaking this work. Post holes located within 24 inches of an underground utility measure from the bottom of post embedment shall be hand dug.

MATERIALS**Wood Guardrail**

Rails and posts shall be of the same timber species as the post, and shall be stress grade 1,000 psi or more.

Work under these items consist of constructing a timber post guardrail at the locations specified on the drawings and as directed by the Engineer. Posts and rails shall be #2 southern yellow pine sawn lumber, cut to the dimensions shown on the drawings. Lumber shall be pretreated with the combination of ACQ preservative treatment and a built-in water repellent. (Pretreatment with 0.40 CCA Salt Treatment will not be an acceptable pretreatment.) Hot-Dip Galvanized requirements for use with treated wood shall conform to the following ASTM Standards: ASTM-A153 (for Hot-Dip fastener products) and ASTM-A653 (Coating Designation G-185 for Hot-Dip connector and sheet products). Stainless steel hardware may be used in lieu of hot-dipped galvanized hardware.

Posts and rails shall be predrilled and cut to the required dimensions prior to treatment.

Bolt holes shall be 1/16 inch larger than bolt thread diameter.

ITEM 655.4 (Continued)

All treated posts shall be marked in accordance with AWPAs Standards M1 and M6. The posts shall also be stamped with the Inspector's identification in accordance with AWPAs Standard M2.

CONSTRUCTION METHODS**Installation**

Posts shall be set in excavated holes at the required spacing. The spacing of posts shall be laid out in the field prior to excavating post holes. End and closure posts at bends shall be spaced a maximum distance of eight feet and a minimum of four feet.

The bottom of post holes shall be tamped to grade. Post shall be set plumb at the required location.

Post holes shall be backfilled with suitable material placed in layers and compacted.

Wood rails shall be erected to form a smooth continuous rail conforming to the required line and grade. Butt adjoining rail sections with a maximum separation between adjoining rail section of 1/4 inch.

Rails shall be butt jointed at alternate posts or as directed, and shall be securely attached with galvanized carriage bolts, at least two per rail per post, of sufficient length to secure with washer and nut. Hammering or other forceful method of inserting bolt shall not be used. Rail splices and terminal section connections shall occur only at posts.

Wood surfaces, cut or injured, and field boxed in wood posts or rails shall be brush treated with two applications of wood preservative using material of the same specifications as that used in the preservative treatment.

METHOD OF MEASUREMENT

Item 655.4 will be measured for payment by the Foot along the top rail from center to center of end posts, complete in place.

BASIS OF PAYMENT

Item 655.4 will be paid for at the Contract unit price per Foot, which price shall include all labor, materials, equipment and incidental costs required to complete the work.

No separate payment will be paid for guardrail constructed on a radius, short guardrail post concrete anchors or terminal section concrete anchors, but all costs in connection therewith shall be included in the price bid.

ITEM 657. **TEMPORARY FENCE** **FOOT**

ITEM 657.5 **TEMPORARY FENCE REMOVED AND RESET** **FOOT**

The work under these Items shall conform to the relevant provisions of Section 600 of the Standard Specifications and includes installation of a chain link fence shown on the plans and the following:

The temporary 6 foot high chain link fence shall be placed around the work area to protect areas with excavations as required by the Engineer and shall meet the requirements of the Standard Specifications and the Construction Standards, except the material need not be in new condition. Gates shall be used at all locations that are to be opened on a regular basis.

Temporary fence shall be reset as often as required by Contractor activities to meet the project schedule and to stage the construction, as required by the Engineer. The Contractor shall submit a plan to the Engineer indicating the locations and the lengths of each of these Items that he/she anticipates he/she will provide for the project. The methods of installation(s) and fence detail(s) shall also be submitted for approval by the Engineer.

The Contractor shall inspect the condition of temporary fence on a daily basis. Temporary fence that is damaged shall be promptly replaced.

METHOD OF MEASUREMENT

Items 657. will be measured for payment by the Foot of temporary fence installed, complete in place.

Item 657.5 will be measured for payment by the Foot of temporary fence removed and reset, complete in place.

BASIS OF PAYMENT

Item 657. and Item 657.5 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 including posts, fence fabric, gates, bracing, and footings. No payment will be made for the final removal of the temporary fence.

ITEM 665. **CHAIN LINK FENCE REMOVED AND STACKED** **FOOT**

The work under this item shall conform to the relevant provisions of Section 600 of the Standard Specifications and includes removing and stacking of a chain link fence as shown on the plans and the following:

Privately owned chain link fence encroaching on the MBTA corridor shall be removed and stacked on the owners property adjacent to the limits of work as required by the Engineer.

Fence removed but not required to be stacked will become the property of the Contractor and shall be properly discarded by the Contractor.

METHOD OF MEASUREMENT

Item 665. Will be measured for payment by the Foot of chain link fence removed and stacked.

BASIS OF PAYMENT

Item 665. will be paid for at the Contract unit price per Foot; which price shall include all labor, materials, equipment, and incidental costs required to complete the work. No additional payment will be made for the discarding of fence not required to be stacked.

ITEM 690.01**REPOINTING MORTAR JOINTS****FOOT**

The work under this Item shall conform to the relevant provisions of Section 690 of the Standard Specifications, and the following.

DESCRIPTION

Deteriorated mortar joints in the existing stone masonry work shall be identified and quantified with the Engineer before commencement of cleaning and repointing. Cleaning of existing stonework under this Item shall include removal of algae and vegetation (including vines, brush, and small trees) that may be attached to or growing out of the stonework or joints.

QUALIFICATIONS

Cleaning and repointing work shall be performed by skilled masons with a minimum of five years of experience restoring historic masonry structures. The Contractor shall provide the Engineer with specific documentation of each mason's experience.

MATERIALS

Pointing mortar shall consist of 1 part Portland cement, 2 parts lime, and 8 parts sand. An acceptable alternate mortar mix may conform to the relevant provisions of Section M4.04.0, which specifies a cement and sand mortar mix consisting of 1 part Portland cement and 2 parts sand. The Engineer may require the use of the alternate cement-sand mortar mix if the cement-lime-sand mortar mix proves unsatisfactory, in the Engineer's opinion, in the initial mock-up sample.

Dry ingredients shall be measured by volume and thoroughly mixed prior to the addition of any water. Add sufficient water to the dry ingredients to produce a mortar that retains its form when hand-squeezed and released. Mix for approximately 5 minutes. Allow this mortar to stand covered for not less than 1 hour nor more than 1.5 hours for pre-hydration. Add additional water in small portions until a stiff, but workable, consistency is reached. The use of pigments or other mortar additives will not be permitted unless approved in writing by the Engineer and demonstrated as being acceptable by a suitable mock-up sample. Mortar shall be used within 30 minutes of final mixing. Re-tempering of mortar will not be permitted.

Where small chinking stones (6" maximum thickness or width, and 12" maximum length) are required to complete a joint repair, the provision and installation of the chinking stones shall be included in this Item. Chinking stones shall match the type and appearance of the surrounding existing stonework and be subject to the Engineer's approval.

ITEM 690.01 (Continued)**MOCKUP**

The Contractor shall prepare a masonry repointing mock-up sample at a representative location selected by the Engineer. The sample area shall measure at least 1 square yard. The repointing shall be completed in accordance with the plans and specifications. The completed sample shall be subject to approval by the Engineer in writing, prior to commencing repointing work throughout the structure. The approved sample will be the standard by which completed repointing work will be accepted. If the repointing sample is not approved, a new sample shall be prepared at a new location selected by the Engineer. The rejected sample areas shall be cleaned and repointed as required by the Engineer.

CONSTRUCTION METHODS

At locations identified with the Engineer, all existing pointing mortar that is damaged, deteriorated, or loose shall be removed a minimum uniform depth of 1.5 inches or 2.5 times the joint width, whichever is greater. Existing sound mortar shall not be removed. Any loose or disintegrated mortar beyond this minimum depth shall also be removed as required by the Engineer. Removal of mortar from joints shall be accomplished using hand tools or low-pressure-water tools. Pneumatically and electrically powered tools shall not be used without the Engineer's written approval. All tools shall be subject to approval by the Engineer prior to commencing work. If, in the opinion of the Engineer, the Contractor's methods of mortar removal are found to be damaging to the masonry, work shall be stopped until acceptable corrective action is taken.

After mortar removal work is complete, the joints shall be rinsed with water and brushed out to removal any loose particles and dust. The rinsing action should not scour additional bedding mortar material out of the joint. Loose stones shall be carefully removed, cleaned, and reset in their original position. Bedding mortar for resetting stones shall be proportioned and mixed as specified for pointing mortar.

Repointing shall not be done when the ambient temperature is 40° F or below, nor when the stone contains frost. At the time of pointing, the joints shall be damp, but with no standing water present. All pointing mortar shall be placed by hand. Where the existing mortar has been removed to a depth greater than 2 inches, these deeper areas shall be filled first, compacting mortar to fill all voids. Once a uniform joint depth is attained, the joint shall be filled by applying several layers of mortar, packing it well into the back corners. The thickness of individual layers shall not exceed ½ inch and each successive lift of mortar shall be permitted to reach thumb-print hardness before application of the next layer. The final lift of mortar shall be recessed slightly behind the face of the stones, and finished with an approved flat pointing tool. Feathered edges shall be avoided. After the mortar has dried, but before it is initially set (usually 1 to 2 hours), excess mortar shall be removed from the edge of the joint by brushing with a natural bristle or nylon brush.

ITEM 690.01 (Continued)

Repointed surfaces shall be kept moist by water-misting at least three times a day, or as required by the Engineer, and protected from extreme heat, freezing, high winds, and direct sunlight for 72 hours after finishing. Repointed areas shall be protected from rain for at least 12 hours after finishing. At the completion of the project, repointed masonry surfaces shall be cleaned using plain water and natural bristle or nylon brushes as required by the Engineer. Use of chemical detergents will not be permitted for cleaning masonry.

METHOD OF MEASUREMENT

Item 690.01 will be measured for payment by the foot of repointed joints in the existing stone masonry, complete in place as required by the Engineer.

BASIS OF PAYMENT

Item 690.01 will be paid for at the Contract unit bid price per Foot. Which price shall include all labor, materials, equipment, and incidental costs, including any related water control, to complete the work.

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

COMPENSATION

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.

<u>ITEM 698.1</u>	<u>GEOTEXTILE FABRIC FOR STABILIZATION</u>	<u>SQUARE YARD</u>
<u>ITEM 698.3</u>	<u>GEOTEXTILE FABRIC FOR SEPARATION</u>	<u>SQUARE YARD</u>

The work under these items shall conform to the relevant provisions of Section M9.50.0 of the Standard Specifications and the following:

The work under Geotextile Fabric for Stabilization includes the furnishing and installation of geotextile fabric to be placed below the 12" of crushed stone for bridge foundations in accordance with the details shown on the Plans at the locations shown on the Plans, and as required by the Engineer.

The work under Geotextile Fabric for Separation includes the furnishing and installation of geotextile fabric to be placed in the proposed bioretention basins, below proposed stone for pipe ends, and below proposed lightweight aggregate fill in accordance with the details shown on the Plans at the locations shown on the Plans, and as required by the Engineer.

The geotextile fabric used below lightweight aggregate fill shall conform to the provisions of M9-50.0, Type I Geotextile Fabric for Separation. The selected fabric shall be non-woven.

Geotextile fabrics shall be handled and installed per the manufacturer's recommendations and shall be from the MassDOT Qualified Construction Materials List.

At locations of fabric installations, the subgrade shall first be graded and compacted. All rocks, vegetation, and other obstructions shall be removed before placement of fabric. The fabric shall be installed and fastened in place in conformance with the manufacturer's recommendations for each type of condition listed above. Fabric for areas under stone for pipe ends shall conform to the requirements of AASHTO M288 for Separation. Excavation and embankment construction shall conform to the relevant provisions of Sections 120 and 150.

If during construction, including any time prior to final acceptance of the project, the slope exhibits signs of failure, the slope shall be repaired and the geotextile fabric reinstalled or replaced by the Contractor, as required by the Engineer, at no additional compensation.

METHOD OF MEASUREMENT

Items 698.1 and 698.3 will be measured for payment respectively by the Square Yard of materials placed, complete in place. Measurement shall not include overlapping fabric.

BASIS OF PAYMENT

Items 698.1 and 698.3 will be paid for at the respective Contract unit prices per Square Yard, which prices shall include all labor, materials, equipment and incidental costs required to complete the work. Any required excavation, embankment construction and loam/topsoil spreading will be paid for under the applicable contract bid Items.

ITEM 703.1

CONCRETE WHEEL STOP

EACH

The work under this Item shall conform to the relevant provisions of Section 700 and the following:

The work associated with this item shall include the installation of concrete wheel stops as shown on the plans.

METHOD OF MEASUREMENT

Item 703.1 will be measured for payment by EACH wheel stop furnished and installed, complete in place.

BASIS OF PAYMENT

Item 703.1 will be paid for the Contract unit price per EACH, which price shall include all labor, materials, tools, equipment, and all incidental costs required to complete the work.

ITEM 704.3 **SPECIAL CONCRETE SEAT WALLS – PRECAST** **EACH**
WITH TIMBER SEAT

The work under this item shall conform to the relevant provisions of Sections 700 and 900 of the Standard Specifications and the following.

The work under these items shall consist of fabricating, furnishing and installing architectural precast elements and all of each item's components. Refer to drawings for locations of each element type. Coordinate all supporting fabrication and installation of trades associated with completion of each item.

The work of this Section consists of providing all design services, equipment, and materials and do all work necessary to design and fabricate Architectural Precast Concrete as indicated on the Contract Documents and as defined in this Section. The Work of this Section shall include, but not be limited to, the following new types of precast concrete:

1. Precast Concrete Units:
 - a. Special Concrete Seat Walls – Precast with Timber Seat

The following references are incorporated into these Specifications. These written Specifications take precedence over incorporated references. The Contractor shall have the following references at the project site at all times and shall be familiar with the reference contents.

1. ACI 301 – ACI Specifications for Structural Concrete.
2. PCI MNL 117 – Manual for Quality Control for Plants and Production of Architectural Precast Concrete Products.

PERFORMANCE REQUIREMENTS

Design Standards: Comply with ACI 318 and design recommendations of PCI MNL 120, "PCI Design Handbook - Precast and Prestressed Concrete," applicable to types of architectural precast concrete units indicated on the Contract Drawings.

Structural Performance: Structural design of all architectural precast concrete units shall be by Manufacturer. Provide architectural precast concrete units and connections capable of withstanding the applicable Building Codes and Standards and the following design loads within limits and under conditions indicated below:

1. Precast Concrete Units (typical):
 - a. Pedestrian Load: 100 psf.
 - b. Construction Load Downward: 20 psf.
 - c. Wind Loads: As required by Code.

ITEM 704.3 (Continued)

2. Precast Bench Units (additional loads):
 - a. Pedestrian load, 100 psf or 300 lbs concentrated loads spaced at 3 feet on center at the edge of the bench.
3. Unbalanced loading condition of applying 100 psf at one side.

Submittals: Provide full shop drawings for all precast concrete components, stainless steel frame assembly, hardware, attachment to timber seating members and bench top to precast concrete anchorage.

MATERIALS**MOLD MATERIALS**

Molds: Rigid, dimensionally stable, non-absorptive material, warp and buckle free, that will provide continuous and true precast concrete surfaces within fabrication tolerances indicated, nonreactive with concrete and suitable for producing required finishes.

1. Mold-Release Agent: Commercially produced liquid-release agent that will not bond with stain or adversely affect precast concrete surfaces and will not impair subsequent surface or joint treatments of precast concrete.
2. Form Liners: Units of face design, texture, arrangement, and configuration indicated. Furnish with manufacturer's recommended liquid-release agent that will not bond with, stain, or adversely affect precast concrete surfaces and will not impair subsequent surface or joint treatments of precast concrete.

CONCRETE MATERIALS

Portland Cement: ASTM C150, Type I or Type III, gray and/or white, unless otherwise indicated.

Fly Ash: ASTM C618, Class F.

Slag: ASTM C989, Grade 100 or 120.

Normal-Weight Aggregates: Except as modified by PCI MNL 117, ASTM C33, with coarse aggregates complying with Class 5S. Stockpile fine and coarse aggregates for each type of exposed finish from a single source (pit or quarry) for Project.

1. Coarse Aggregates: Selected, hard, and durable; free of material that reacts with cement or causes staining; to match selected finish sample.
 - a. Gradation: To match design reference sample.
2. Fine Aggregates: Selected, natural or manufactured sand of same material as coarse aggregate, unless otherwise approved by the Engineer.
3. All aggregate shall be certified by the supplier as being nonreactive in accordance with ASTM C1260, ASTM C1567, and/or ASTM C1293 or shall have a demonstrated satisfactory performance history.

ITEM 704.3 (Continued)

Water: Potable; free from deleterious material that may affect color stability, setting, or strength of concrete and complying with chemical limits of PCI MNL 117.

Coloring Admixture: ASTM C979, synthetic or natural mineral-oxide pigments or colored water-reducing admixtures, temperature stable, and nonfading.

Admixtures: Provide admixtures that are certified by the manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete, with written documentation. Do not use calcium chloride or admixtures containing calcium chloride. All admixtures must be approved in writing by the Engineer prior to use. Manufacturer(s) approval for the use of all admixtures in combination must be submitted to the Engineer prior to use.

1. Air-Entraining Admixture: ASTM C260.
2. Water-Reducing Admixture: ASTM C494, Type A.
3. Retarding Admixture: ASTM C494, Type B.
4. Accelerating: ASTM C494, Type C.
5. Water-Reducing and Retarding Admixture: ASTM C494, Type D.
6. Water-Reducing and Accelerating Admixture: ASTM C494, Type E.
7. High-Range Water-Reducing Admixture: ASTM C494, Type F.
8. High-Range Water-Reducing and Retarding Admixture: ASTM C494, Type G.
9. Plasticizing and Retarding Admixture: ASTM C1017, Type II.
10. Shrinkage-Reducing Admixture: ASTM C494, Type S, such as the following:
 - a. Eucon SRA+ by Euclid Chemical Co.
 - b. Sika Control 40 by Sika.
 - c. Eclipse 4500 by W.R. Grace.
 - d. Approved equivalent.
11. Shrinkage-Reducing/Compensating Admixture:
 - a. PREVent-C500®* manufactured by Premier CPG (www.premiercpg.com)
 - b. Eclipse 4500 manufactured by GCP (www.gcpat.com)
 - c. MasterLife SRA 035 manufactured by Master Builders Solutions (www.master-builder-solutions.com)
 - d. Or approved equal

Corrosion Inhibitor Admixture: ASTM C494 Type C.

STAINLESS-STEEL CONNECTION MATERIALS

Stainless-Steel Plate: ASTM A666, Type 306L.

Stainless-Steel Bolts and Studs: ASTM F593, Alloy 316L, hex-head bolts and studs; stainless-steel nuts; and flat, stainless-steel washers.

1. Lubricate threaded parts of stainless-steel bolts with an antiseize thread lubricant during assembly. C. Stainless-Steel-Headed Studs: ASTM A276, with minimum mechanical properties of PCI MNL 117, Table 3.2.3.

ITEM 704.3 (Continued)**TIMBER SEAT MATERIAL**

Wood Species: Ipe - Handroanthus spp.

1. Average Dried Weight: 69 lbs/ft³ (1100 kg/m³)
2. Janka Hardness: 3,510 lbf (15,620 N)
3. Smooth Finish

Stainless Steel Seat Frame and Hardware – 316 Stainless Steel

ACCESSORIES

Precast Accessories: Provide clips, hangers, plastic or steel shims, and other accessories required to install architectural precast concrete units.

GROUT MATERIALS

Nonmetallic, Nonshrink Grout: Premixed, nonmetallic, noncorrosive, nonstaining grout containing selected silica sands, portland cement, shrinkage-compensating agents, plasticizing and water-reducing agents, complying with ASTM C1107, Grade A for drypack and Grades B and C for flowable grout and of consistency suitable for application within a 30 min. working time.

CONCRETE MIXTURES

Prepare design mixtures for each type of precast concrete required.

Design mixtures may be prepared by a qualified independent testing agency or by qualified precast plant personnel at architectural precast concrete fabricator's option.

Limit water-soluble chloride ions to maximum percentage by weight of cement permitted by ACI 318 or PCI MNL 117 when tested according to ASTM C1218/C1218M. D. Normal-Weight Concrete Mixtures: Proportion mixtures by either laboratory trial batch or field test data methods according to ACI 211.1, with materials to be used on Project, to provide normal-weight concrete with the following properties:

1. Compressive Strength (28 Days): 5,000 psi minimum.
2. Maximum Water-Cementitious-Materials Ratio: 0.45.
3. Water Absorption: 6% by weight or 14% by volume, tested according to PCI MNL 117
4. Air Content: Total 6-1/2% with a tolerance of $\pm 1-1/2\%$ (5% to 8%) based on 3/4 in. aggregate. If other coarse-aggregate size is used, the air content will need to be adjusted to meet minimum air contents as identified in ACI 318 for severe exposure.
5. When included in design mixtures, add other admixtures to concrete mixtures according to manufacturer's written instructions.
6. All concrete shall contain a corrosion-inhibiting admixture at a dosage of 1 gallon per cubic yard of calcium nitrate or equivalent.

ITEM 704.3 (Continued)**COLOR AND FINISH**

Color shall be selected by Engineer from samples submitted by the Contractor.

Exposed surfaces, unless otherwise specified, shall exhibit an exposed aggregate texture similar to what currently exists on site, including such variations based on exposure, use, location, and type.

Surface Texture: Matching approved samples.

Variation in Color – ASTM D2244:

1. Must match color and finish of approved samples when viewed in direct daylight at a 10-foot distance.
2. Total color difference – not greater than four units
3. Total hue difference – not greater than two units.

Minor chipping resulting from shipment and delivery shall be grounds for rejection. Minor chips shall not be obvious to the Engineer under direct daylight illumination from a distance of 10 feet

Crazing, cracking, and efflorescence shall constitute grounds for rejection.

MOLD FABRICATION

Molds: Accurately construct molds, mortar tight, of sufficient strength to withstand pressures due to concrete-placement operations and temperature changes. Coat contact surfaces of molds with release agent before reinforcement is placed. Avoid contamination of reinforcement by release agent.

1. If applicable, place form liners accurately to provide finished surface texture indicated. Provide solid backing and supports to maintain stability of liners during concrete placement. Coat form liner with form-release agent.

Maintain molds to provide completed architectural precast concrete units of shapes, lines, and dimensions indicated, within fabrication tolerances specified.

1. Form joints are not permitted on faces exposed to view in the finished work.
2. Edge and Corner Treatment: Uniformly chamfered.

FABRICATION

Cast-in Anchors, Inserts, Plates, Angles, and Other Anchorage Hardware: Fabricate anchorage hardware with sufficient anchorage and embedment to comply with design requirements. Accurately position for attachment of loose hardware, and secure in place during precasting operations. Locate anchorage hardware where it does not affect position of main reinforcement or concrete placement.

ITEM 704.3 (Continued)

Weld-headed studs and deformed bar anchors used for anchorage according to AWS D1.1/D1.1M and AWS C5.4, "Recommended Practices for Stud Welding."

Furnish loose hardware items including steel plates, clip angles, seat angles, anchors, dowels, cramps, hangers, and other hardware shapes for securing architectural precast concrete units to supporting and adjacent construction.

Cast-in reglets, slots, holes, and other accessories in architectural precast concrete units as indicated on the Contract Drawings.

Reinforcement: Comply with recommendations in PCI MNL 117 for fabricating, placing, and supporting reinforcement.

1. Clean reinforcement of loose rust and mill scale, earth, and other materials that reduce or destroy the bond with concrete. When damage to epoxy-coated reinforcing exceeds limits specified in ASTM A775/A775M, repair with patching material compatible with coating material and epoxy coat bar ends after cutting.
2. Accurately position, support, and secure reinforcement against displacement during concrete-placement and consolidation operations. Completely conceal support devices to prevent exposure on finished surfaces.
3. Place reinforcement to maintain at least 3/4 inch minimum coverage. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position while placing concrete. Direct wire tie ends away from finished, exposed concrete surfaces.
4. Place reinforcing steel to maintain at least 3/4 inch minimum concrete cover. Increase cover requirements for reinforcing steel to 1-1/2 inch when units are exposed to corrosive environment or severe exposure conditions. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position while placing concrete. Direct wire tie ends away from finished, exposed concrete surfaces.
5. Install welded wire fabric in lengths as long as practicable. Lap adjoining pieces at least one full mesh spacing and wire tie laps, where required by design. Offset laps of adjoining widths to prevent continuous laps in either direction.

Reinforce architectural precast concrete units to resist handling, transportation, and erection stresses.

Comply with requirements in PCI MNL 117 and requirements in this Section for measuring, mixing, transporting, and placing concrete. After concrete batching, no additional water may be added.

Place face mixture to a minimum thickness after consolidation of the greater of 1 inch or 1.5 times the maximum aggregate size, but not less than the minimum reinforcing cover specified.

ITEM 704.3 (Continued)

Place concrete in a continuous operation to prevent seams or planes of weakness from forming in precast concrete units.

Place backup concrete mixture to ensure bond with face-mixture concrete.

Thoroughly consolidate placed concrete by internal and external vibration without dislocating or damaging reinforcement and built-in items, and minimize pour lines, honeycombing, or entrapped air on surfaces. Use equipment and procedures complying with PCI MNL 117.

Place self-consolidating concrete without vibration according to PCI TR-6, "Interim Guidelines for the Use of Self-Consolidating Concrete in Precast/Prestressed Concrete Institute Member Plants."

Comply with PCI MNL 117 for hot- and cold-weather concrete placement.

Identify pickup points of architectural precast concrete units and orientation in structure with permanent markings, complying with markings indicated on Shop Drawings. Imprint or permanently mark casting date on each architectural precast concrete unit on a surface that will not show in finished structure.

Initially cure concrete, according to requirements in PCI MNL 117, by moisture retention without heat or by accelerated heat curing using low-pressure live steam or radiant heat and moisture. Initially cure units until compressive strength is high enough to ensure that stripping does not have an effect on performance or appearance of final product. Maintain concrete above 50°F throughout entire initial curing period.

Continue curing using moisture retention, curing compound, or water curing until concrete reaches the design compressive strength. Demonstrate that design strength has been reached by using match-cured or field-cured cylinders.

Discard and replace architectural precast concrete units that do not comply with requirements, including structural, manufacturing tolerance, and appearance, unless repairs meet requirements in PCI MNL 117 and Engineer's approval.

FABRICATION TOLERANCES

Fabricate architectural precast concrete units straight and true to size and shape with exposed edges and corners precise and true so that each finished panel complies with PCI MNL 117 product tolerances as well as position tolerances for cast-in items.

ITEM 704.3 (Continued)

Fabricate architectural precast concrete units straight and true to size and shape with exposed edges and corners precise and true so that each finished panel complies with the following product tolerances:

1. Overall Height and Width of Units, Measured at the Face Exposed to View: As follows:
 - a. 10 feet or under, plus or minus 1/8 inch.
 - b. 10 to 20 feet, plus 1/8 inch, minus 3/16 inch.
 - c. 20 to 40 feet, plus or minus 1/4 inch.
 - d. Each additional 10 feet, plus or minus 1/16 inch.
2. Overall Height and Width of Units, Measured at the Face Not Exposed to View: As follows:
 - a. 10 feet or under, plus or minus 1/4 inch.
 - b. 10 to 20 feet, plus 1/4 in., minus 3/8 inch.
 - c. 20 to 40 feet, plus or minus 3/8 inch.
 - d. Each additional 10 feet, plus or minus 1/8 inch.
3. Total Thickness or Flange Thickness: Plus 1/4 inch, minus 1/8 inch.
4. Rib Thickness: Plus or minus 1/8 inch.
5. Rib to Edge of Flange: Plus or minus 1/8 inch.
6. Distance between Ribs: Plus or minus 1/8 inch.
7. Variation from Square or Designated Skew (Difference in Length of the Two Diagonal Measurements): Plus or minus 1/8 inch per 72 inch or 1/2 inch total, whichever is greater.
8. Length and Width of Block-outs and Openings within One Unit: Plus or minus 1/4 inch.
9. Location and Dimension of Block-outs Hidden from View and Used for HVAC and Utility Penetrations: Plus or minus 3/4 inch.
10. Dimensions of Haunches: Plus or minus 1/4 inch.
11. Haunch Bearing Surface Deviation from Specified Plane: Plus or minus 1/8 inch.
12. Difference in Relative Position of Adjacent Haunch Bearing Surfaces from Specified Relative Position: Plus or minus 1/4 inch.
13. Bowing: Plus or minus L/360, maximum 1 inch.
14. Local Smoothness: 1/4 inch per 10 feet.
15. Warping: 1/16 inch per 12 inch of distance from nearest adjacent corner.
16. Tipping and Flushness of Plates: Plus or minus 1/4 inch.
17. Dimensions of Architectural Features and Rustications: Plus or minus 1/8 inch.

ITEM 704.3 (Continued)

Position Tolerances: For cast-in items measured from datum line location, as indicated on Shop Drawings.

1. Weld Plates: Plus or minus 1 inch.
2. Inserts: Plus or minus 1/2 inch.
3. Handling Devices: Plus or minus 3 inch.
4. Reinforcing Steel and Welded Wire Fabric: Plus or minus 1/4 inch where position has structural implications or affects concrete cover; otherwise, plus or minus 1/2 inch.
5. Reinforcing Steel Extending out of Member: Plus or minus 1/2 inch of plan dimensions.
6. Tendons: Plus or minus 1/4 inch, vertical; plus or minus 1 inch, horizontal.
7. Location of Rustication Joints: Plus or minus 1/8 inch.
8. Location of Opening within Panel: Plus or minus 1/4 inch.
9. Location of Flashing Reglets: Plus or minus 1/4 inch.
10. Location of Flashing Reglets at Edge of Panel: Plus or minus 1/8 inch.
11. Reglets for Glazing Gaskets: Plus or minus 1/8 inch.
12. Electrical Outlets, Hose Bibs: Plus or minus 1/2 inch.
13. Location of Bearing Surface from End of Member: Plus or minus 1/4 inch.
14. Allowable Rotation of Plate, Channel Inserts, and Electrical Boxes: 2° rotation or 1/4 inch maximum over the full dimension of unit.
15. Position of Sleeve: Plus or minus 1/2 inch
16. Location of Window Washer Track or Buttons: Plus or minus 1/8 inch.

FINISHES

Panel faces shall be free of joint marks, grain, and other obvious defects. Corners, including false joints shall be uniform, straight, and sharp. Finish exposed-face surfaces of architectural precast concrete units with the texture and uniform color to match approved sample panels and as acceptable to Engineer and the City of Lawrence per approved samples.

Finish exposed top and bottom surfaces of architectural precast concrete units to match face-surface finish.

Finish exposed back surfaces of architectural precast concrete units by smooth, steel trowel finish.

ITEM 704.3 (Continued)**SOURCE QUALITY CONTROL**

Quality-Control Testing: Test and inspect precast concrete according to PCI MNL 117 requirements. If using self-consolidating concrete, also test and inspect according to PCI TR-6, "Interim Guidelines for the Use of Self-Consolidating Concrete in Precast/Prestressed Concrete Institute Member Plants."

Contractor will employ an independent testing agency to evaluate architectural precast concrete fabricator's quality-control and testing methods.

1. Allow testing agency access to material storage areas, concrete production equipment, concrete placement, and curing facilities. Cooperate with testing agency and provide samples of materials and concrete mixtures as may be requested for additional testing and evaluation.

Strength of precast concrete units will be considered deficient if units fail to comply with ACI 318 requirements for concrete strength.

Testing: If there is evidence that strength of precast concrete units may be deficient or may not comply with ACI 318 requirements, precaster will employ an independent testing agency to obtain, prepare, and test cores drilled from hardened concrete to determine compressive strength according to ASTM C42/C42M.

1. A minimum of three representative cores will be taken from units of suspect strength, from locations directed by Engineer.
2. Cores will be tested in an air-dry condition.
 - a. Strength of concrete for each series of three cores will be considered satisfactory if average compressive strength is equal to at least 85% of twenty-eight-day design compressive strength and no single core is less than 75-percent of twenty-eight-day design compressive strength.
3. Test results will be made in writing on same day that tests are performed, with copies to Engineer, Contractor, and precast concrete fabricator. Test reports will include the following:
 - a. Project identification name and number.
 - b. Date when tests were performed.
 - c. Name of precast concrete fabricator.
 - d. Name of concrete testing agency.

ITEM 704.3 (Continued)

Special Testing: Perform the following special tests:

1. Hardened Air Void Parameters: Test air content and spacing factor, in accordance with ASTM C457.
2. Acceptance Criteria:
 - a. Spacing Factor Average ≤ 0.008 inch with no individual measurement > 0.010 inch.
 - b. Air Content: Total 6-1/2-percent with a tolerance of ± 1 -1/2-percent (5-percent to 8-percent) based on 3/4 inch aggregate. If other coarse-aggregate size is used, the air content will need to be adjusted to meet minimum air contents as identified in ACI 318 for severe exposure.
3. Frequency of Testing:
 - a. One specimen from each day of concrete production for each mixture.
 - b. If nine of ten consecutive tests are within tolerance (per Table 2.3), the frequency of special testing shall be reduced to once per week.

Patching: If core test results are satisfactory and precast concrete units comply with requirements, clean and dampen core holes and solidly fill with precast concrete mixture that has no coarse aggregate, and finish to match adjacent precast concrete surfaces.

CONSTRUCTION METHODS

CAST-IN-PLACE CONCRETE: installed in accordance with Item 904 and 910.1 requirements.

EXAMINATION - GENERAL

Verify that field conditions are acceptable and are ready to receive unit masonry work.

Verify built-in and other items provided by separate Sections of the work are properly sized and located.

Verify field measurements are as shown on shop drawings.

Beginning of installation means acceptance of field conditions.

ITEM 704.3 (Continued)**PREPARATION FOR INSTALLING UNIT MASONRY**

Advise installers of other work about specific requirements relating to placement of inserts, flashing, piping, channels, reglets, stainless steel anchor pins and similar items which will be used by stonework Installer for anchoring and supporting unit masonry. Furnish installers of other work with drawings or templates showing locations of these items. Coordinate with the work of other trades relative to drawings to locate weld-plates and embeds for connection of masonry skin or its system.

Protect surrounding work from damage or disfiguration, by the exercise of reasonable care and precautions. Repair or replace any work so damaged and soiled.

Establish lines, levels, and coursing. Protect from disturbance.

Direct and coordinate placement of metal anchors supplied to other Sections.

Provide temporary bracing during installation of unit masonry. Maintain in place until pieces are fully anchored.

Scaffolding: Where required for safety and access. Provide, erect, maintain, move, and finally remove scaffolding and staging required for masonry installation. Construct and maintain scaffolding in compliance with applicable ordinances, laws, rules and regulations. Scaffolding shall be sufficiently substantial to support workmen, and necessary materials and equipment. Provide adequate guard rails for protection of property, workmen, and passerby.

Clean all unit masonry pieces prior to erection. Do not use wire brushes or implements that will mark or damage exposed surfaces.

MORTAR BEDDING

Set unit masonry on concrete footing in full bed of mortar with all vertical joints slushed full.

Install all unit masonry complete and in place with specified stainless steel anchor pins in accordance with the detail drawings and as directed by the Engineer. Coordinate with requirements for installation of grout so specified in this Section.

Apply enough mortar at bed and end joints to allow mortar to be forced out both sides of the face shell. Wet unit masonry joint surfaces thoroughly before setting. For unit masonry surfaces that are soiled, clean bedding and exposed surfaces with fiber brush and soap powder and rinse thoroughly with clear water.

Fully bond intersections, and external and internal corners as shown on the Detailed Drawings.

Install specified weeps and netting in base courses of unit masonry as required. Provide mortar back up as required. Set weeps in base stones at grades as required by field conditions.

Do not shift, or tap masonry units after mortar has taken initial set. Where adjustment must be made, remove mortar and replace.

ITEM 704.3 (Continued)

Remove excess mortar on surface and in cavities.

Perform job site saw cutting with proper tools to provide straight unchipped edges. Take care to prevent breaking masonry unit corners or edges.

MORTAR PROPORTIONING AND MIXING

Except as otherwise specified in this Section, conform to the property and proportion requirements of ASTM C270 for all mortar.

Mixing: Mortars shall be machine-mixed in an approved type of mixer in which the quantity of water can be accurately and uniformly controlled. Where hydrated limes are used for mortars requiring a lime content, the materials for each batch shall be well-raked and turned over together before the water is added until the even color of the mixed materials indicates that the cement materials have been thoroughly distributed throughout the mass, after which the water shall be gradually added until a thoroughly mixed mortar of the required plasticity is obtained. The same mortar mixture shall be used for all similar work.

The color of mortar shall be strictly controlled to assure uniformity of color through the work.

The method of measuring materials shall be such that the specified proportions of the materials can be controlled and accurately maintained. Shovel measurement will not be allowed.

All cement materials and aggregates shall be mixed at least 3 minutes in the mixer with the minimum amount of water required to produce a workable consistency. Hand mixing shall not be used unless specifically approved.

Mortar that has begun to set or which is not used within 2-1/2 hours after initial mixing shall be discarded. Mortar that has stiffened due to evaporation within the 2-1/2 hour period shall be re-tempered to restore its workability. Re-tempering mortar that has partially hardened without additional cement aggregate or water, will not be permitted.

Mortar boxes and all tools shall be thoroughly cleaned at the end of each day's work, and between batches.

GROUTING EMBEDDED ITEMS

Grout metal items embedded or built into unit masonry work solidly with grout.

Grout around sleeves, pipes, and all other items that pass through walls solidly with mortar materials. Place grouting to be air tight and to prevent air leakage.

Grout stainless steel anchor pins fully into place to anchor unit masonry to concrete, placing grouting air tight and to prevent air and water leakage and penetration.

ITEM 704.3 (Continued)**UNIT MASONRY WALLS – GENERAL WORKMANSHIP**

Exact alignment of walls shall be staked by the Contractor and approved by the Engineer prior to commencement of unit masonry wall work.

Clean unit masonry before setting by scrubbing with fiber brushes followed by a thorough drenching with clear water. Use only mild cleaning compounds that contain no caustic or harsh fillers or abrasives.

Set unit masonry in accordance with and to the elevations noted on the Drawings and approved final Shop Drawings. Provide fasteners and other attachments shown, specified or necessary to secure unit masonry work in place in accordance with the best practices of the trade. Shim and adjust accessories as required for proper setting of unit masonry. Completely fill holes, slots and other sinkages for anchors, dowels, fasteners, and supports with non-shrinking, non-staining mortar during setting of stone.

Erect all unit masonry work in compliance with line and level tolerances specified in this Section. Correct or replace, as directed by the Engineer, non-conforming unit masonry work at no additional cost to the Owner.

Lay no exposed unit masonry having chipped edges or face defects. Remove any such piece, if installed, and replace with undamaged unit masonry, and bear all costs of this Work.

Examine all Contract Documents as to requirements for the accommodation of work of other trades and Contractors. Take every precaution to minimize cutting and patching. Deliver inserts and other anchorage items required to be cast into concrete in sufficient time to prevent any delay in such work. Closely coordinate the location and placement of such items.

Provide protection against breakage and weather damage to all unit masonry work, including coverings over the tops of walls and wherever necessary to protect work at all stages of completion. Protect unit masonry at all times when masons are not working on the walls. Apply tarpaulins or waterproof paper properly weighted or nailed to assure their remaining in place to protect masonry.

Take special care to avoid soiling or staining unit masonry that is to remain exposed in finish work. Do not allow any petroleum-based fillers or sealants to come into contact with unit masonry work.

ITEM 704.3 (Continued)**REINFORCEMENT AND ANCHORAGES**

Attach wall ties to concrete surfaces for veneer construction to insure no less than 8 anchor connects per stone for vertical and two anchor connections per unit masonry for capstones.

Anchorage:

1. Install stainless steel anchors to prevent unit masonry from moving in any direction, including forward away from the concrete core wall, inward toward the concrete wall and laterally toward adjacent veneer stones.
2. Install stainless steel anchor pins to prevent unit masonry from moving in any direction.

WEEPS AND VENTS

Install weep holes in veneer in locations shown on the Contract Documents.

Weep holes and mortar netting at Veneer Walls:

1. In accordance herein and as follows:
2. Installation of netting and weeps shall be accordance with manufacturer's recommendations, as directed by the Engineer and as noted herein.
3. Install rainscreens and weeps in stone veneer base courses in locations as directed but no less than every third vertical joint for veneer walls. Set bottom of weeps as shown. Contractor to note the base course stone veneer pieces are set below adjacent pavement grades.
4. Install weeps, netting and latex modified mortar backing as an integrated system. Before proceeding with installation of successive courses of stone veneer, demonstrate to the Engineer the netting and weep system drains quickly and effectively. Test weep holes with a 5 gallon pour of water to demonstrate all weep holes drain without clogging and with water backing up behind the veneer system.

TOLERANCES FOR INSTALLATION OF UNIT MASONRY

Variation from Plumb: Do not exceed 1/8 inch in 10 feet or 1/4 inch in 20 feet or more.

Variation from Level: Do not exceed 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 3/8 inch maximum.

Cross Slope of Wall Caps: Slope the top of walls 1/8 inch per foot as shown on the Contract Documents.

Variation in Plane between Adjacent Surfaces (Lipping): Do not exceed 1/16-inch difference between planes of adjacent units or adjacent surfaces indicated to be flush with units.

ITEM 704.3 (Continued)**JOINT SEALANT**

Inspection

1. The Installer shall examine substrates and conditions under which this work is to be performed and notify Contractor, in writing, of conditions detrimental to proper completion of work. Do not proceed with work until unsatisfactory conditions are corrected. Beginning of sealant work means Installer's acceptance of joint surfaces and conditions.

Preparation

1. Strictly comply with manufacturers' instructions and recommendations, except where more restrictive requirements are specified in this Section.
2. Clean joint surfaces immediately before installation of sealants, primers, tapes and fillers. Remove substances that could interfere with bond. Etch or roughen joint surfaces to improve bond. Surfaces which have been given protective coatings and those that contain oil or grease shall be thoroughly cleaned with xylol or MEK solvent, with due precautions taken to minimize hazards.
3. Unless otherwise indicated, use of sealants shall conform to ASTM C 1193.
4. Tape or mask adjoining surfaces to prevent spillage and migration problems.
5. Prime surfaces as recommended by sealant manufacturer.

Installation

1. Provide backer rods for joint sealants except where specifically recommended against by sealant manufacturers.
2. Prevent three-sided adhesion by use of bond breaker tapes or backer rods.
3. Force sealant into joints to provide uniform, dense, continuous ribbons free from gaps and air pockets. Completely wet both joint surfaces equally on opposite sides.
4. Except in hot weather, make sealant surface slightly concave. Install sealants so that compressed sealants do not protrude from joints. Dry tool sealants to form a smooth dense surface. At horizontal joints form a slight cove to prevent trapping water.
5. Provide sealants to depths indicated, or if not indicated, follow manufacturer's recommendations.

Extent of Sealant Work

1. General Extent: Seal joints indicated, and all exterior joints, seams, and intersections between dissimilar materials. Provide elastomeric sealant installation with backer rod in all exterior expansion joints.
2. Exterior Sealing: Without limitation, the work of this Section includes sealing the following:
 - a. Concrete-to-concrete joints, both horizontal and vertical.
 - b. Stone-to-stone joints, both horizontal and vertical.
 - c. Miscellaneous joints shown on the drawings and details.

ITEM 704.3 (Continued)

Curing

1. Cure sealants in strict compliance with manufacturers' instructions and recommendations to obtain highest quality surface and maximum adhesion. Make every effort to minimize accelerated aging effects and increase in modulus of elasticity.

Cleaning and Protection

1. Remove smears from adjacent surfaces immediately, as the work progresses. Exercise particular care to prevent smearing or staining of surrounding surfaces which will be exposed in the finished work, and repair any damage done to same as result of this work without additional cost.
2. Clean adjacent surfaces using materials and methods recommended by sealant manufacturer. Where required, high-pressure washing or the use of chemical cleaners shall be employed to clean adjacent surfaces.
3. Remove and replace work that cannot be successfully cleaned or work that is damaged or deteriorated.

CLEANING OF WORK

During the progress of the Work, keep the exposed surfaces of unit masonry clean at all times and protected against damage.

Prior to final cleaning work, examine all faces of walls to locate cracks, holes or other defects. Remove and replace any joint work that cannot be successfully cleaned or repaired. Remove and replace unit masonry that are chipped, broken, stained, or otherwise damaged.

Provide polyethylene coverings or other temporary protection approved by the Engineer for all planting and other non-working areas or improvements adjacent to unit masonry cleaning zone. Plant beds shall be further protected from foot traffic and the associated soil compaction by the placement of planking wherever foot traffic is anticipated. Remove protective coverings from planting areas immediately following completion of cleaning operations.

ITEM 704.3 (Continued)

Final Cleaning: After joints are thoroughly set and cured and before Final Completion at a time approved by the Engineer, clean exposed wall faces as follows:

1. Remove excess mortar or joint sealer particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
2. Submit proposed cleaning procedures and cleaning materials to the Engineer for approval before commencing work. Test cleaning methods on sample wall panel; leave 1/2 panel uncleaned for comparison purposes. Obtain the Engineer approval of sample cleaning before proceeding with cleaning of masonry. General cleaning shall not commence until the Engineer has approved the test area.
3. Protect adjacent unit masonry surfaces from contact with cleaner by covering them with liquid strippable masking agent, polyethylene film, or waterproof masking tape.
4. All cleaning operations shall proceed from the top down.

Final cleaning work shall be performed only when atmospheric temperature is above 40 degrees Fahrenheit and rising.

1. Use of wire brushes or other abrasive tools for cleaning will not be permitted.
2. Provide suitable protective coverings for all other surfaces and materials during the final cleaning procedures, and bear full responsibility for correcting any damaged caused by these operations, to the satisfaction of the Engineer.
3. Remove from the site and legally dispose of all cartons, rubbish and debris resulting from work under this Section not less often than once per week.

PROTECTION

Maintain protective boards at exposed external corners which may be damaged by construction activities.

Provide protection without damaging completed work.

Keep expansion joint voids clear of mortar.

METHOD OF MEASUREMENT

Item 704.3 will be premeasured for payment by Each Precast Concrete Seat Wall with Timber Seat, complete in place.

BASIS OF PAYMENT

ITEM 704.3 will be paid for at the Contract unit price per Each, which price shall include labor, materials, equipment, steel and wood shop drawings and coordination, engineering, precast fabrication, steel and wood fabrication, surface finish of all exposed materials, coring, subslab foundation, aggregate base, grouting seat top assembly, and all incidental costs required to complete the work.

<u>ITEM 706.31</u>	<u>CONCRETE UNIT PAVER ON GRADE – LARGE PAVERS</u>	<u>SQUARE YARD</u>
<u>ITEM 706.32</u>	<u>CONCRETE UNIT PAVER ON GRADE – SMALL PAVERS</u>	<u>SQUARE YARD</u>
<u>ITEM 706.33</u>	<u>CONCRETE UNIT PAVER ON STRUCTURE – LARGE PAVERS</u>	<u>SQUARE YARD</u>
<u>ITEM 706.34</u>	<u>CONCRETE UNIT PAVER ON STRUCTURE – SMALL PAVERS</u>	<u>SQUARE YARD</u>

The work under these items shall conform to the relevant provisions of Subsections 150 and 170 of the Standard Specifications and the following:

Work under these items shall include furnishing and installing concrete unit pavers, sand/asphalt setting bed and concrete base course over gravel borrow bases and installing concrete unit pavers over sand bedding on bridge structure.

REFERENCES

The following standards shall apply to the work of this Section.

1. American Association of State Highway and transportation Officials (AASHTO).
M43 Standard Size of Coarse Aggregate for Highway Construction
M140 Emulsified Asphalt
M208 Cationic Emulsified Asphalt
2. American Society for Testing and materials (ASTM)
C33 Specification for Concrete Aggregates.
C136 test Method for Sieve Analysis of Fine and Coarse Aggregates.
C936 Specification for Solid Concrete Interlocking Paving Units.
D36 Test Method for Softening Point of Bitumen (Ring-and-Ball Apparatus).
D113 Test Method for Ductility of Bituminous Materials.
D1557 Test method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³).
D3381 Specification for Viscosity- Graded Asphalt Cement for Use in Pavement Construction.

SUBMITTALS

Submit the following for review:

1. Manufacturer's Product Data: Manufacturer's product data shall be submitted for the following items:
 - a. Concrete Unit Pavers
2. Neoprene modified asphalt adhesive
3. Asphaltic primer
4. Polymeric Sand Joint Filler

ITEMS 706.31, 706.32, 706.33 and 706.34 (Continued)

5. Masonry Sand Bedding
6. Metal Edge Restraint

Samples: Samples shall be submitted for the following items:

1. Furnish not less than two individual Concrete Pavers of each type, size, and finish required for the Engineer's approval. Samples shall exhibit the full color range of pavers to be provided.
2. Submit a physical color samples of polymeric sand for joint filler to Engineer for approval.
3. Submit a 10-pound sample of masonry sand for setting bed on structure to Engineer for approval.
4. Aluminum edging: 24-inch length
5. Galvanized steel nail: one nail

Design Mix Submittals: Submit design mix submittals including description of materials, proportions, and mechanical sieve sizes of aggregates for the following:

1. Certified sieve analysis for masonry sand.
2. Bituminous concrete setting bed mix.
3. Neoprene modified asphalt adhesive

Shop Drawings: Submit shop drawings for layout, illustrating paver layout at typical intersections, typical banding and paving pattern, for approval by the Engineer prior to installation.

Test Report: Test report of precast Concrete Paver shall be submitted.

Testing shall be done by an independent testing laboratory. Test procedures shall conform to ASTM C 936 methods, where applicable.

Test reports shall indicate, as a minimum, the following:

1. Compressive strength, pounds per square inch.
2. Absorption, 5 hr. submersion in cold water.
3. Absorption, 24 hr. submersion in cold water.
4. Maximum saturation coefficient.
5. Initial rate of absorption (suction).
6. Abrasion index.
7. Freeze-thaw.

ITEMS 706.31, 706.32, 706.33 and 706.34 (Continued)

Sample Panel: Construct a sample panel of Concrete Pavers on the specified base and setting bed before start of any precast concrete paving. Sample panels shall exhibit proposed color range, texture, bond, jointing, pattern, finish, paver size, and workmanship. Unless otherwise indicated, size of panel shall be 8 feet x 8 feet minimum.

1. The sample panels may not be part of the finished work.
2. The quality of workmanship, paver jointing and cleanliness of pavers after installation must be approved by the Engineer before permanent paving is started.
3. If the original sample is not approved, the Contractor shall provide additional samples, as required, at no cost to the Engineer, until an approved sample is obtained.
4. The approved sample shall become the standard for unit paving for the work of this Section. Panel shall remain undisturbed until all paving is completed. Remove panel from the site upon completion of paving.

QUALITY ASSURANCE

Installer must review installation procedures of all precast concrete paving and sequence of work with General Contractor to insure proper coordination with other subcontractors and suppliers whose work is affected by the delivery schedule and installation of paving work.

DELIVERY, STORAGE AND HANDLING

Concrete Paver units shall be packaged by strapping to manufacturer's standard and delivered on pallets. Pavers damaged in any manner will be rejected and shall be replaced with new material at no additional cost to the The City of Lawrence.

Store all paving units on raised platforms. Storage piles or stacks shall be located to avoid or be protected from heavy or unnecessary traffic. Store paving units on wood skids or pallets. Place and stack skids and units to distribute weight evenly and to prevent breakage or cracking of units. Materials shall be stored under an approved roof or covered with non-staining waterproof tarpaulins, at all times, except when materials are being installed. Protect paving units during storage and construction against moisture, soiling, staining and physical damage.

Handle paving units to prevent chipping, breakage, soiling or other damage. Do not use pinch or wrecking bars without protecting edges of units with wood or other rigid materials. Lift with wide-belt type slings or vacuum lifts wherever possible; do not use wire cable or ropes containing tar or other substances which might cause staining. If required, use wood rollers and provide cushion at end of wood slides. Any paving unit chipped during delivery, storage, or handling will be rejected and replaced by the Contractor at no additional cost to the Engineer.

Deliver cement in manufacturer's original water-resistant bags, labeled with manufacturer's name and product brand, with seals unbroken and full weight. Damaged and fractional packages will be rejected.

ITEMS 706.31, 706.32, 706.33 and 706.34 (Continued)**PROTECTION OF ADJACENT SURFACES**

Finished surfaces adjacent to the concrete unit paving shall be adequately protected from soiling, staining, and other damage during construction.

MATERIALS**Concrete Unit Paver**

Concrete Pavers shall conform to ASTM C936-82, Standard Specifications for Solid Concrete Interlocking Paving Units. The minimum compressive strength shall not be less than 7,200 pounds per square inch with the average compressive strength not less than 8,000 pounds per square inch. Maximum absorption shall be 5 percent or less at 50 cycles of freeze-thaw testing per section ASTM C67. Submit paver tests for freeze thaw and abrasion resistance to be approved by the Engineer.

Concrete Unit Pavers shall have a non-slip finish.

Concrete Unit Pavers shall be in a range of sizes with quantities necessary to install the patterns designated in the Contract Drawings. Concrete Unit Paver sizes shall be as indicated on the Contract Documents and as indicated below:

1. Type 1 - 36 inches long by 8 inches wide by 3 inches deep
2. Type 2 - 18 inches long by 4 inches wide by 3 inches deep
3. Type 3 - 36 inches long by 8 inches wide by 3 inches deep (set on sand over structure)
4. Type 4 - 18 inches long by 4 inches wide by 3 inches deep (set on sand over structure)
5. Design intent is for the two sizes of pavers to be interchangeable in width and length to allow for blending while maintaining pattern and joint spacing.
6. All dimensions are nominal sizes.

Concrete Unit Pavers shall be provided in a blend and range of colors from grey to beige. Samples are required for selection and approval by the Engineer.

All joints shall be hand tight, butt joints swept with stone dust, unless indicated otherwise.

Concrete Unit Pavers shall be installed in pattern shown on the Contract Documents.

Compacted Aggregate Base Course

Base materials shall consist of compacted gravel borrow, M1.03.0, Type b.

Concrete Setting Slab

Concrete shall be 4000 psi, 3/4 inches high early strength wet placed concrete conforming to Section M4 and constructed as shown on the Contract Documents.

The dimensions of the lumber used to form concrete pavements shall not be less than 2 inches nominal thickness by the required pavement depth of 4 inches.

ITEMS 706.31, 706.32, 706.33 and 706.34 (Continued)

Welded wire mesh (WWM) reinforcement shall conform to the applicable requirements of ASTM A 185. Fabric reinforcement shall be furnished in flat sheets. Fabric reinforcement in rolls will not be permitted.

Provide 6 inches x 6 inches W1.4 x W1.4 welded wire mesh for concrete base. Steel expansion dowels shall be hot-rolled plain steel rounds conforming to the requirements of AASHTO M31, Grade 60 and consisting of a 1/2 inches by 24 inches smooth steel dowel and compatible waxed tube sleeve, by 12 inches in length.

Cast-in-place concrete shall be air-entrained concrete with minimum 28-day compressive strength of 4,000 pounds per square inch, conforming to the requirements and applicable provisions of M4.02. Concrete shall be air-entrained 7 percent minimum +/-1 percent, by volume. Concrete shall have a slump of 2 inches to 4 inches slump. Maximum Aggregate Size: Aggregate size shall be a maximum of 3/4 inches. Thickness of Concrete: Depths shall be as noted on the Contract Documents.

The finish for the concrete base shall be roller bug or rough screeded; no sealant required.

Bituminous Setting Bed

Asphalt cement to be used in the bituminous setting bed shall conform to ASTM D 3381. Viscosity grade shall be A.C. 10 or A.C. 20.

Fine aggregate to be used in the bituminous setting bed shall be clean, hard sand with durable particles and free from adherent coating, lumps of clay, alkali salts, and organic matter. Aggregate shall be uniformly graded from "coarse" to "fine" with 100 percent by weight passing the No. 4 sieve and shall meet the gradation requirements when tested in accordance with ASTM C 136.

Fine aggregate shall be dried and shall be combined with hot asphalt cement, and the mix shall be heated to approximately 300 degrees Fahrenheit at an asphalt plant. The approximate proportion of materials shall be 7 percent cement asphalt and 93 percent fine aggregate. Each ton of material shall be apportioned by weight in the approximate ratio of 145 pounds asphalt to 1,855 pounds sand. The Contractor shall determine the exact proportions to produce the best possible mixture for construction of the bituminous setting bed to meet specified requirements.

Neoprene modified asphalt adhesive

Neoprene modified asphalt adhesive shall meet the following requirements:

1. Mastic (asphalt adhesive)
 - a. Solids (base) content by volume = 75±1 percent
 - b. Weight= 8.0 to 8.5 pounds/gallon
 - c. Solvent vehicle = Varsol (over 100°F flash)
2. Base (2 percent neoprene, 10 percent fibers, 88 percent asphalt)
 - a. Melting point (ASTM D 36) = 200°F minimum.
 - b. Penetration at 77°F 100 gram load 5 second = 23 to 27.
 - c. Ductility (ASTM D 113 at 77°F, 5 cm/minute)=125 cm, minimum.

ITEMS 706.31, 706.32, 706.33 and 706.34 (Continued)Asphaltic Primer

Primer for base beneath bituminous setting bed and Concrete Unit Pavers shall be an emulsified asphalt rapid setting type conforming to AASHTO M 140, Grade RS-1, or AASHTO M 208, Grade

Polymeric Sand for Pavement Joint Filler in Concrete Unit Pavers

1. Joint filler between unit pavers shall be Polymeric Jointing Sand.
 - i. Techni-Seal, Inc., www.techniseal.com;
 - ii. Gator Supersand Bond by Alliance, www.supersandbond.com,
 - iii. Pavermate Z3 by SRW Products, www.srwproducts.com
 - iv. or approved equal.

Color of polymeric sand material shall be selected from a range of manufacturer's standard colors by the Owner's Representative.

Aluminum Edge Restraint

Product shall be .210 inch (5.33 mm) thick exposed top lip x 2.5-inch x 8 feet long, extruded aluminum, alloy 6005, T-5 hardness. Horizontal base to have upward facing angle profile designed to integrate restraint for straight-line and curvilinear applications. Section shall have holes in base spaced 4 inches apart along length to receive anchors.

Connection Method: Section ends shall splice together with horizontal 0.060 inch thick x 1 inch wide, or .530 inch wide for 1 inch high edging x 4 inches long aluminum sliding connector.

Anchors: 3/8 inch x 10 inches bright spiral steel spike, 3/16 inch x 1-1/2 inches or longer concrete nail, or drive pin fastener.

1. Finish: Black

Masonry Sand for Setting Bed on Bridge Structure

Mason sand for bedding under concrete unit pavers on bridge structure shall be shovel ready without large pieces of crushed stone, cobbles or boulders that would impede use of a hand shovel, consist of clean, inert, hard, durable grains of quartz or other hard, durable rock, free from trash, ice, snow, tree stumps, roots, organic materials, and other deleterious matter. The allowable amount of material passing a No. 200 sieve shall not exceed 10 percent by weight. The maximum particle size shall be 1/4 inch (i.e., 100 percent passing the No. 4 sieve).

ITEMS 706.31, 706.32, 706.33 and 706.34 (Continued)**Surface Sealant For Concrete Unit Pavers**

Surface sealant for all unit paver pavement shall be a non-yellowing, non-tacky acrylic copolymer sealant.

1. Sure Klean Weatherseal SLX 100 Water and Oil Repellent, manufactured by ProSoCo Company, Inc.
2. Intraguard™, manufactured by W.R. Meadows, York, PA 17404
3. Paver Seal – SB, manufactured by Addiment, Inc., Atlanta, GA 30362
4. Or approved equal

Water

Water shall be potable and shall be free of injurious contaminants.

CONSTRUCTION METHODS**Examination**

Inspect all surfaces and verify that they are in proper condition to receive the work of this Section. Verify that prepared openings are ready to receive the work of this Section and opening dimensions are as indicated on the shop drawings. Verify that all blocking is set in place and secure.

Beginning of installation means acceptance of existing project conditions.

Installation

Install in accordance with manufacturer's instructions and direction from authorities having jurisdiction.

Base Course

Base course shall be spread in layers from self-spreading vehicles equipped with automated grade controlled equipment for cross sections greater than 10 feet in width and by hand for cross sections less than or equal to 10 feet in width. Power graders or conventional self-spreading vehicles may be used only with prior written approval of the Engineer. Base course shall be compacted until the surface is even and true to the required lines and grades within a tolerance of 3/8 inch above or below the required cross-sectional elevations and to a maximum irregularity not exceeding 3/8 inch under a 10-foot line longitudinally.

Any specific area of base course which, after being rolled, does not form a satisfactory, solid, stable foundation shall be removed, replaced and re-compacted by the Contractor at no additional cost to the The City of Lawrence.

Compaction of base course shall be to 95 percent of maximum density as determined by ASTM D 1557.

Width of base course shall be greater than or equal to the width of stone dust surface, if continuous lateral support is provided during rolling, and shall extend at least 2 x base thickness beyond edge of the course above, if not so supported.

ITEMS 706.31, 706.32, 706.33 and 706.34 (Continued)

Material shall be applied in lifts less than or equal to 3 inches thick, compacted measure. Each lift shall be separately compacted to specified density. Rolling shall begin at sides and progress to center of crowned areas, and shall begin on low side and progress toward high side of sloped areas. Rolling shall continue until material does not creep or wave ahead of roller wheels.

Sub-grade and base course shall be kept clean and uncontaminated. Less select materials shall not be permitted to become mixed with base course. Materials spilled outside stone dust surfacing lines shall be removed and area repaired.

Portions of sub-grade or of construction above which become contaminated, softened, or dislodged by passing of traffic, or otherwise injured, shall be cleaned, replaced, re-compacted, or otherwise repaired to conform to the requirements of this specification before proceeding with next operation.

Acceptability of Concrete Base

Contractor shall verify that the concrete base provided, to determine that it has been placed accurately to meet the line and grading requirements for the pavers and to verify its adequacy to receive Concrete Unit Pavers and setting bed. Concrete shall have fully cured prior to the work of installing Concrete Unit Pavers. Evidence of inadequate base shall be brought to the immediate attention of the Engineer and shall be corrected by the Contractor as directed by the Engineer at no additional cost to the The City of Lawrence.

Bituminous Setting Bed Installation

The surface of the concrete base shall receive an asphalt prime coat before laying bituminous setting bed.

Prime coat shall be applied at rate that will leave bituminous residue of 5 to 7 gallons per 100 square yards after evaporation of vehicle. Base surface shall be dry and clean when prime coat is applied. Bituminous setting bed shall not be placed until vehicle has completely evaporated from prime coat.

Bituminous setting bed shall be installed over the concrete base. Control bars 3/4 inch deep shall be placed directly over the base. If grades must be adjusted, wood chocks under depth control bars shall be set to proper grade. Set two bars parallel to each other to serve as guides for the striking board. The depth control bars must be set carefully to bring the pavers, when laid, to proper grade.

While still hot (not less than 250 degrees Fahrenheit some of the bituminous bed material shall be placed between the parallel depth control bars. This bed shall be pulled with the striking board over the control bars several times. After each passage, low porous spots shall be showered with fresh bituminous material to produce a smooth, firm, and even setting bed. As soon as this initial panel is completed, advance the first bar to the next position in readiness for striking the next panel. After the depth control bars and wood chocks have been removed, carefully fill any depressions that remain.

ITEMS 706.31, 706.32, 706.33 and 706.34 (Continued)

The setting bed shall be rolled with a power roller to a nominal depth of 3/4 inch while still hot. The setting bed thickness shall be adjusted so that when the Concrete Pavers are placed and rolled, the top surface of the pavers will be at the required finished grade.

A coating of neoprene-modified asphalt adhesive shall be applied by mopping, squeegeeing, or troweling over the top surface of the bituminous setting bed so as to provide continuous bond under the pavers.

If adhesive is trowel-applied, trowel shall be serrated type with serrations not to exceed 1/16 inch.

Aluminum Edging

Aluminum edging strips shall be installed at locations indicated on the Contract Documents. Install aluminum edging, connections and corners per manufacturer's recommended installation guidelines. Set edging to the required alignment as shown on the Contract Documents and to the required elevation to ensure full paver restraint.

Set edging plumb and vertical at required line and grade. Straight sections shall not be way, curved sections shall be smooth and shall have no kinks or sharp bends.

Install edge restraints to comply with manufacturer's written instructions in locations shown on the Drawings. Install powder fired nails at 12-inch intervals 3-inches from edge of concrete base to hold edge restraints in place during and after unit paver installation.

Setting Concrete Pavers

Concrete Pavers shall be set on a bituminous setting bed over a prepared concrete base, unless indicated otherwise in the Contract Documents. Setting bed shall be protected from damage prior to setting pavers.

Concrete Pavers with chips, cracks, stains, or other structural or aesthetic defects shall not be used.

Only competent workmen under adequate supervision shall perform the work of setting Concrete Pavers. Set pavers in accordance with manufacturer's recommendations. Concrete Pavers shall be set true to the required lines and grades in the pattern detailed on the Contract Documents.

After the modified asphalt adhesive is applied, pavers shall be carefully placed by hand, set true to the required lines and grades in the pattern shown on the Contract Documents. Accurate alignment shall be maintained. The Engineer's Representative will approve the start of paving layouts. Paving layouts shall always begin at building entries.

Pavers shall be neatly cut and fitted at all perimeters and closures to fit neatly and closely. Pavers shall be tightly butted. Joints between pavers shall be uniform and shall not exceed 1/8 inch in width. Joints greater than 1/8 inch in width will not be accepted. Surface edge of one paver shall be level with the next adjacent pavers so that no voids, rocking motions, or tripping hazards are encountered. There shall be no deviation from a true grade greater than 1/4 inch in 10 feet. All finish paved areas shall slope to drain at a minimum of 1/8 inch in 1 foot.

ITEMS 706.31, 706.32, 706.33 and 706.34 (Continued)

All cutting and patching required to complete the work shall be done (including the filling and closing of all openings) with water-cooled radial cut-off type masonry saws with diamond-tipped blade for a sharp, straight edge. Cut edges shall be plumb and straight. Scoring and breaking will not be acceptable.

After a sufficient area of pavers has been installed, joints of pavers shall be filled by sweeping stone dust into the joints, as specified.

Completed surface shall be compacted by running a medium plate vibrator across the top of the pavers. Additional joint filler material shall be swept in the joints during vibration to completely fill joint space.

Newly laid pavers shall be protected at all times by panels of plywood. These panels may be advanced as work progresses; however, the plywood protection shall be kept in areas which will be subjected to continued movement of materials and equipment. All necessary precautions shall be taken in order to avoid depressions and protect paver alignment.

Joint Treatment

Paver joints shall be butt tight joints. Polymeric joint filler shall be swept dry into the joints between pavers until the joints are completely filled. Surface shall be swept clean. Swept surface shall then be thoroughly dampened with a low-volume fine spray of water.

Temperatures shall be 40 degrees Fahrenheit and rising.

Surface shall be completely dry.

Spread the polymeric sand uniformly over the surfaced of the unit pavers.

Using a push broom, sweep the polymeric sand to fill joints completely, down to full depth. Do not sweep polymeric sand over distances greater than 3 feet.

Completed surface shall be compacted by running a medium plate vibrator across the top of the pavers. Additional polymeric sand shall be swept in the joints during vibration to completely fill joint space.

Sweep the surface with a fine bristle brush and remove all residues with a leaf blower.

Do not allow polymeric sand residue to become activated with water and stick to the surface of the pavers or the underlying slab.

Wet finished paver surfaces in a systematic manner, ensuring that the wetting of one section is finished before another section is started.

Wetting of the entire project should proceed without interruptions.

Allow polymeric sand to dry completely after initial wetting.

ITEMS 706.31, 706.32, 706.33 and 706.34 (Continued)

Prior to acceptance, the paved area shall be flooded with water to assure that there are no depressions. Pavers with top surfaces greater than 1/16th inch above or below adjacent pavers shall be removed and reset. Remove and reset pavers as required until surface is true to line and grade. Refill sand joints as necessary until all joints are filled to finish grade.

Concrete paving shall be kept damp by intermittent spraying for three days, minimum, to effectively cure the joints.

Cleaning of Concrete unit Paver Surfaces

After completion of concrete paving, surfaces shall be carefully cleaned, removing all dirt, excess filler, and stains. Clean pavers using an approved masonry cleaner and soft bristle brush.

Application Of Surface Sealant of Unit Paver Surfaces

Apply surface sealer to installed, thoroughly cleaned paved areas using a low-pressure airless sprayer, brush or roller in compliance with manufacturer's recommendations. Apply material in quantities sufficient to saturate the surface pavement and not less than 1 gallon per 400 square feet.

Contractor shall take safety precautions in order to avoid all skin contact with the sealer, keep the sealer away from all heat sources or flames, and maintain adequate ventilation to avoid any concentration of sealer vapors in the work area. Vapors may ignite explosively and may travel along the ground by ventilation to ignition sources far from the product.

Sealed, paved surfaces shall display no color difference from the unsealed surface and no surface sheen. Paved areas that do exhibit these qualities after sealant installation shall be removed and replaced at no additional cost to the Owner.

METHOD OF MEASUREMENT

Items 706.31, 706.32, 706.33 and 706.34 will be measured for payment respectively by the Square Yard of Concrete unit paver installed, complete in place.

BASIS OF PAYMENT

Items 706.31, 706.32, 706.33 and 706.34 will be paid for at the respective Contract unit prices per square yard, which prices shall include all labor, material, equipment, submittal, and all incidental costs required to complete the work.

No separate payment will be made for excavation, unit pavers, bituminous setting bed, asphalt adhesive, asphaltic primer, concrete setting slab, welded wire mesh, crushed stone base, sand setting bed for on bridge structure, water, polymeric sand sweep or fine grading and compacting, but all costs in connection therewith shall be included in the unit price bid.

<u>ITEM 706.65</u>	<u>GRANITE PAVER BAND – ON GRADE</u>	<u>SQUARE YARD</u>
<u>ITEM 706.66</u>	<u>GRANITE PAVER BAND – ON STRUCTURE</u>	<u>SQUARE YARD</u>

The work under these items shall conform to the relevant provisions of Subsections 150 and 170 of the Standard Specifications and the following:

The work of this section consists of providing all labor, equipment, materials, incidental work, and construction methods necessary to reinstall the granite pavers both on-grade and on-structure as indicated on the Contract Documents and as specified herein.

REFERENCES AND STANDARDS

The following standards shall apply to the work of this Section.

American Society for Testing and Materials (ASTM):

- C 91 Specification for Masonry Cement
- C 97 Test Methods for Absorption and Bulk Specific Gravity of Dimension Stone
- C 99 Test Methods for Modulus of Rupture of Dimension Stone
- C 144 Specification for Aggregate for Masonry Mortar
- C 150 Specification for Portland Cement
- C 170 Test Method for Compressive Strength of Dimension Stone
- C 207 Specification for Hydrated Lime for Masonry Purposes
- C 241 Test Method for Abrasion Resistance of Stone Subjected to Foot Traffic
- C 270 Specification for Mortar for Unit Masonry
- C 615 Specification for Granite Dimension Stone
- C 780 Test Method for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry
- C 880 Test Method for Flexural Strength of Dimension Stone
- C 1028 Static Coefficient of Friction of Ceramic Tile and Other Like Surfaces by the Horizontal Dynamometer Pull-Meter Method

American National Standards

ANSI A118.4 Specification for Latex Portland Cement Mortar

National Building Granite Quarries Association, Inc. (NBGQA): Specifications for Architectural Granite

ITEMS 706.65 and 706.66 (Continued)**SUBMITTALS**

Samples: Samples of the following shall be submitted:

<u>Item</u>	<u>Quantity and Size</u>
Granite pavers	6 required, full size, full thickness
Mortar grout	Cured sample, 2 inch x 2 inch, of selected color(s).

Granite sample shall fully demonstrate color, shade, veining, texture, anticipated range of color, and finish.

Manufacturer's Product Data: Manufacturer's product data shall be submitted for the following items:

1. Mortar Grout materials, bond coats, including additives.
2. Granite paver band.

Test Data: Provide test data, from independent testing agency, for all granite furnished under this Section indicating compliance with the specified properties.

Shop Drawings: Shop drawings of granite pieces specified in this Section shall be submitted. Shop Drawings shall indicate sizes, dimensions, layout, finishes, and relationship to adjacent items.

Contractor's Review: Before commencing work, submit written statement signed by the Contractor stating that the Contract Documents have been reviewed with a qualified representative of the granite supplier, and that he/she is in agreement that the selected materials and construction are proper, compatible, and adequate for the application shown.

Submit documentation demonstrating that granite setters have the required experience noted in Paragraph, Quality Assurance, in this Item. Submit a list of projects completed within the last 5 years that are comparable in size and complexity to the work of the Contract Documents.

Construct a sample panel of granite paving on the specified base before start of any granite paving. Sample panel shall exhibit granite pavers, grain and grain direction, and required jointing. Unless otherwise indicated, size of panel shall be 2 feet x 2 feet minimum. Engineer will inspect and accept sample panel. If the original sample is not acceptable, construct additional panels at no cost to the The City of Lawrence until an acceptable panel is constructed. The acceptable panel shall become the standard for the entire job, and shall remain undisturbed until completion of all granite paving. Remove panel from the site upon completion of paving.

Quality Assurance

Granite shall be salvaged or supplied by a source approved by the Engineer.

Granite shall conform to the requirements of ASTM C 615, Architectural Grade and NBGQA Specifications, except as modified in this Section.

ITEMS 706.65 and 706.66 (Continued)

Granite setters shall have a minimum of 5 years experience in the setting of granite paver work of the type for this project.

Contractor shall arrange and pay for concrete tests to be made by an independent testing laboratory acceptable to the Engineer. Laboratory shall take, prepare, and cure samples, and do all field and laboratory testing. Promptly submit five copies of test reports to the Engineer. Testing shall comply with ASTM C94-90.

Strength Tests: Strength tests shall be made from each 100 cubic yards of concrete or fraction thereof each day. For each test, three cylinders shall be molded, one to be used for a 7-day test.

Air Content and Slump Tests: At the time samples are taken for strength tests, the laboratory shall make slump and air content tests.

Layout

The granite paver layout indicated on the Contract Documents is approximate. The final configuration of the paving will be determined in the field by the Engineer. Do not start paving until said determination is made.

Delivery, Handling, And Storage

Granite shall be carefully packed and banded by the supplier for shipment. Following shipping, granite shall be stored on wood skids or pallets, covered with non-staining, waterproof membrane and protected from the weather. Skids shall be placed and stacked in such a manner as to evenly distribute the weight of the granite materials and to prevent breakage, cracking, and damage to granite pieces. Granite materials shall be stored in such a manner as to allow air to circulate around the granite material. Granite shall not be permitted to be in direct contact with the ground at any time during storage.

Granite shall be carefully handled to prevent chipping, breakage, soiling, or other damage. Pinch or wrecking bars shall not be used without protecting edges of granite with wood or other rigid materials. Granite units shall be lifted with wide-belt type slings wherever possible; wire rope or ropes containing tar or other substances that might cause staining or damage to granite finish shall not be used.

Granite damaged in any manner will be rejected and shall be replaced with new materials at no additional cost to the The City of Lawrence.

Protection Of Finished Surfaces

Finished surfaces adjacent to the paving work shall be adequately protected from soiling, staining, and other damage.

Job Conditions

Cold Weather Protection:

Remove any ice or snow formed on granite or concrete bed by carefully applying heat until top surface is dry to touch. Remove granite paver work that is determined by the Engineer to be damaged by freezing conditions. Perform the following construction procedures while granite paver work is progressing:

ITEMS 706.65 and 706.66 (Continued)

Air Temperature Procedures

40° - 32°F.	Heat sand to produce mortar temperatures between 40 degrees Fahrenheit and 120 degrees Fahrenheit.
32° - 25°F.	Heat sand to produce mortar temperatures between 40 degrees Fahrenheit and 120 degrees Fahrenheit. Maintain temperature of mortar on boards above freezing.
25° - 20°F.	Heat sand to produce mortar temperatures between 40 degrees Fahrenheit and 120 degrees Fahrenheit.. Maintain temperature of mortar on boards above freezing. Use wind breaks when wind is in excess of 15 miles per hour.
20°F. - below	Heat sand to produce mortar temperatures between 40 degrees Fahrenheit and 120 degrees Fahrenheit. Provide enclosures and auxiliary heat to maintain air temperature above 32 degrees Fahrenheit. Do not lay units that have a surface temperature below 20 degrees Fahrenheit.

Latex admixture shall be kept at 40 degrees Fahrenheit minimum. Cold Weather Protection for Completed Granite Paving Work:

Mean Daily
Air Temperatures Procedures

40° - 32°F.	Protect granite paving work from rain or snow for at least 24 hours by covering with weather-resistive membrane.
32° - 25°F.	Completely cover granite paving work with weather-resistive membrane for at least 24 hours.
25° - 20°F.	Completely cover granite paving work with insulating blankets or similar protection for at least 24 hours.
20°F. - below	Maintain granite paver work at temperature above 32 degrees Fahrenheit for 24 hours using enclosures and supplementary heat.

Do not use frozen materials or materials mixed or coated with ice or frost. Do not lower the freezing point of mortar by use of admixtures or antifreeze agents, and do not use calcium chloride in mortar or grout. Do not build on frozen work; remove and replace granite paver work damaged by frost or freezing. During all seasons, protect partially completed granite paver work against weather when work is not in progress.

Testing And Inspection

The Contractor shall have tests made of mortar as the job progresses, as specified in this Section. Tests shall be performed by a recognized testing laboratory, selected by and paid for by the Contractor. The Contractor shall agree to abide by the results of the tests; he/she shall make all replacements, adjustments and changes to granite, mortar and mortar materials to meet the specification requirements at no additional cost.

ITEMS 706.65 and 706.66 (Continued)

Test mortar for properties indicated below:

1. Mortar properties will be tested per property specification of ASTM C 270.
2. Mortar composition and properties will be evaluated per ASTM C 780.
3. Grout compressive strength will be tested per ASTM C 1019.

MATERIALS**Compacted Aggregate Base Course**

Base materials shall consist of compacted gravel borrow (M1.03.0, Type C) as shown on Drawings.

Concrete Pavement

Concrete shall be 4000 psi, 3/4 inches high early strength wet placed concrete conforming to Section M4 and constructed as shown on the Contract Documents.

The dimensions of the lumber used to form concrete pavements shall not be less than 2 inches nominal thickness by the required pavement depth of 4 inches.

Welded wire mesh (WWM) reinforcement shall conform to the applicable requirements of ASTM A 185. Fabric reinforcement shall be furnished in flat sheets. Fabric reinforcement in rolls will not be permitted.

Provide 6 inches x 6 inches W1.4 x W1.4 welded wire mesh for concrete base. Steel expansion dowels shall be hot-rolled plain steel rounds conforming to the requirements of AASHTO M31, Grade 60 and consisting of a 1/2 inches by 24 inches smooth steel dowel and compatible waxed tube sleeve, by 12 inches in length.

Cast-in-place concrete shall be air-entrained concrete with minimum 28-day compressive strength of 4,000 pounds per square inch, conforming to the requirements and applicable provisions of M4.02. Concrete shall be air-entrained 7 percent minimum +/-1 percent, by volume. Concrete shall have a slump of 2 inches to 4 inches slump. Maximum Aggregate Size: Aggregate size shall be a maximum of 3/4 inches. Thickness of Concrete: Depths shall be as noted on the Contract Documents.

The finish for the concrete base shall be roller bug or rough screeded; no sealant required.

Stone

Granite shall be a fine grained light gray granite as seen in New England, equivalent to Chelmsford Gray, Swenson Gray, Barre Gray or Woodbury Gray granite. It shall be standard grade, sound and uniform in quality, texture, and strength, and shall be free of flaws, reeds, rifts, laminations, cracks, seams, starts, or other defects that may impair its strength, durability, function, or appearance. Exposed surfaces shall be free from spots, spalls, chips, stains, discoloration, or other defects that would affect its appearance.

Color, shade, veining, texture and finish shall be within the range of samples approved by the Engineer.

ITEMS 706.65 and 706.66 (Continued)

Granite shall have the following properties:

1. Bulk Density (ASTM C 97): 167.1 pcf, minimum.
2. Absorption (ASTM C 97): 0.16 percent, minimum.
3. Compressive Strength (ASTM C 170): 17750 pounds per square inch, minimum.
4. Modulus of Rupture (ASTM C 99): 1540 pounds per square inch, minimum.

All granite shall be obtained from quarries having adequate capacity and facilities to meet the requirements noted in this Section. Cutting and finishing shall be done by a firm equipped to process the material promptly on order and in strict accord with this Section and the requirements of the NBGQA.

Use only one source for each type of granite throughout the entire Project.

Granite Paver Bands

Granite Paver Bands shall be 36 inch x 36 inch x 3 inch thick or as indicated on the Contract Documents; sawn all sides, top surface shall have a thermal finish.

Latex Modified Mortar Setting Bed

Mortar setting bed shall be a dense, durable grout for setting pavers, consisting of latex acrylic modified Portland cement and graded aggregate grout designed for exterior wet and dry application. It shall achieve a minimum compressive strength of 3500 psi per ANSI A118.7.N-

3.5 and with water absorption of 6 – 7% per ANSI A118.7 N-3.4.

Mortar Grout For Pointing

Mortar grout for pointing of joints shall be a dense, durable grout for joints between 1/8 inch and 1/2 inch width, consisting of latex acrylic modified Portland cement and graded aggregate grout designed for exterior wet and dry application. It shall achieve a minimum compressive strength of 3500 psi per ANSI A118.7.N-3.5 and with water absorption of 6 – 7% per ANSI A118.7 N- 3.4.

Masonry Cleaner

Masonry cleaner shall be a product specifically designed to remove excess mortar and grout, rust, job dirt, and all construction stains during a final clean-down of new granite surfaces and leave those granite surfaces uniformly clean. Masonry cleaner shall be formulated to avoid damaging or staining of granite surfaces, damage to mortar joints, and alteration of the color of the mortar joints. Masonry cleaner shall be an environmentally safe product that can be flushed into a storm sewer system without damage to that system.

ITEMS 706.65 and 706.66 (Continued)**CONSTRUCTION METHODS****Compacted Aggregate Base**

Contractor shall excavate, place compacted aggregate base and backfill materials in accordance with compacted gravel borrow (M1.03.0, Type C) of the Standard Specification for Highways and Bridges.

Acceptability Of Concrete Base

Contractor shall verify that the concrete base provided, to determine that it has been placed accurately to meet the line and grading requirements for the pavers and to verify its adequacy to receive Granite Paver Bands and setting bed. Concrete shall have fully cured prior to the work of installing Granite Paver Bands. Evidence of inadequate base shall be brought to the immediate attention of the Engineer and shall be corrected by the Contractor as directed by the Engineer at no additional cost.

Granite Paver Band Setting

Granite pavers shall be set on a mortar setting bed over a prepared concrete setting slab. Do any cleaning necessary to cement concrete base to provide a clean base surface, free from dust, oil, grease, other impurities, or loose or friable particles.

Damp the surface immediately before placing the mortar setting bed, but do not allow free water to remain on the surface.

Granite pavers with chips, cracks, stains, or other defects that might be visible in the finished work shall not be used.

Bond coat shall be applied to concrete base slab as a slurry by using flat side of a trowel. Thickness of bond coat shall be approximately 1/16 inch. Press bond coat firmly into the base slab. Apply as much bond coat as can be covered with mortar setting bed in 15 to 20 minutes.

Mortar bed shall be spread evenly over the troweled bond coat. Mortar setting shall be 1/2-inch thick, minimum. Screed mortar setting bed to a smooth and constant surface. Let mortar bed harden sufficiently to walk upon, typically 24 hours. A second application of the bond coat mixture shall be applied to mortar setting bed using flat trowel to thickness of 1/16 inch. Comb on additional bond coat with notched sides of trowel. Back butter pavers with bond coat to ensure a full bond between pavers and setting bed.

Before setting, the back of each piece of granite shall be dampened. Each piece shall be carefully bedded into a wet, sticky bond coat mixture and tapped home to a full and solid bearing. Particular care shall be exercised to equalize bed and joint openings and eliminate the need for redressing of exposed surfaces.

ITEMS 706.65 and 706.66 (Continued)

Granite pavers shall be set true to the required lines and grades in the pattern detailed on the Contract Documents. Granite pavers shall be neatly cut and fitted at all perimeters and closures to fit neatly and closely, with joints uniform in thickness. Pavers shall be cut with a water-cooled, cut-off wheel masonry saw using a diamond carbide blade. In no case shall granite pavers less than 2 inch x 2 inch in face dimension be installed; suitable adjustments shall be made in layout, subject to review and approval of the Engineer, to ensure all installed pavers are at least 2 inch x 2 inch in face dimension.

Exposed surfaces of pavement pavers shall be kept free from bed mortar at all times. Any bed mortar smears shall be immediately removed with a clean sponge and clean water before latex modified mortar can set.

After pavers have been placed level the pavers with a suitable straight edge in a circular motion over the pavers to confirm that there is a continuous and even alignment between pavers. If pavers are not in the required alignment, remove and reset as required to bring them to the required lines and grades. Leveling of the pavers shall be done as the setting operation proceeds so that it is not necessary to disturb the pavers set earlier.

Joint Treatment for Granite Pavers

All joints shall be uniform.

Granite Paver Bands: Unless otherwise indicated, joints between granite pavers shall be 1/4 inch wide plus or minus 1/8 inch.

Initial grout placement shall occur after bond coat has substantially set, typically no sooner than 24 hours after placement of brick on bond coat. Joints shall be dry and free of standing water. Joints shall be free of dust and debris. If joints have collected dust or debris between placement of bricks and installation of grout, blow joints free with compressed air system approved by the Engineer.

Dry sweep joints full with dry mortar grout and follow by spraying with water to compact mortar in joints. Final grouting of joints as specified shall be done in accordance with the following paragraph.

Grout Mix — Mix mortar grout to the standard stiff, workable grout (a slurry of medium consistency). With a rigid squeegee or trowel, spread joint filler back and forth across the paver faces until the joints are filled and firmly packed. Rake joints back ¼ inch. Raked joints shall be brushed clean and pointed with colored mortar to a flat cut joint. Minimum one week later, clean with approved acid-free masonry cleaner. Dilute and apply masonry cleaner per manufacturer's instructions.

Upon completion of Granite Paver Bands work, surfaces shall be left in a clean, unsoiled condition, acceptable to the Engineer. Cure joints for at least 7 days after installing by covering with curing paper or other non-staining material approved by the Engineer.

ITEMS 706.65 and 706.66 (Continued)**Adjust and Clean**

Remove and replace Granite Paver Bands that have been broken, chipped, stained, or otherwise damaged. Remove and replace units which are misaligned or not to grade or do not match adjoining granite work. Provide new matching units, install as specified and fill joints to eliminate evidence of replacement. Repair defective and unsatisfactory joints as required to provide a neat, uniform appearance.

After completion of Granite Paver Bands paving, surfaces shall be carefully cleaned, removing all dirt, excess mortar, filler, and stains using the approved masonry cleaner. Follow the manufacturer's directions for use. Apply masonry cleaner within the time frame noted in the manufacturer's literature.

Test suitability of masonry cleaner on a test area for approval by the Engineer. All test area to dry for the appropriate time period as described by Manufacturer's product literature.

Protect all adjacent structures, pavement, lawns and planting from damage by masonry cleaner. Employ waterproof tarps and other appropriate barriers to prevent damage to adjacent materials.

After cleaning, rinse thoroughly with clean water per manufacturer's written directions.

METHOD OF MEASUREMENT

Item 706.65 and Item 706.656 will be measured for payment respectively by the Square Yard of granite paver band installed, complete in place.

BASIS OF PAYMENT

Item 706.65 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 including excavation, compacted aggregate base, concrete setting subslab, latex modified mortar setting bed, bonding coats and grout joints and sealants.

Item 706.656 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 including latex modified mortar setting bed, bonding coats and grout joints and sealants.

<u>ITEM 707.11</u>	<u>TIMBER BENCH</u>	<u>EACH</u>
<u>ITEM 707.18</u>	<u>STACKED TIMBER SEATING STRUCTURE</u>	<u>EACH</u>
<u>ITEM 707.2</u>	<u>TRASH RECEPTACLE</u>	<u>EACH</u>
<u>ITEM 707.62</u>	<u>GAMING TABLE AND CHAIRS (FIXED)</u>	<u>EACH</u>
<u>ITEM 707.622</u>	<u>TABLE AND CHAIRS (FIXED)</u>	<u>EACH</u>
<u>ITEM 707.9</u>	<u>BICYCLE RACK</u>	<u>EACH</u>

The work under these items shall conform to the relevant provisions of Section 700 of the Standard Specifications and the following.

The work under these items shall consist of providing all labor, equipment, materials, incidental work, and construction methods necessary to furnish and install designated Site Improvements and related items as indicated on the Contract Documents, as specified in this Section, and includes, but is not limited to, the following items. Refer to manufacturer's product literature for detailed installation instructions and product care.

1. Timber Bench
2. Stacked Timber Seating Structure
3. Trash Receptacle
4. Gaming Table and Chairs (Fixed)
5. Table and Chairs (Fixed)
6. Bike Rack

RELATED WORK UNDER OTHER SECTIONS

The following items of related work are specified and included in other Sections of the Specifications:

1. Section 450: HOT MIX ASPHALT PAVEMENT
2. Section 476., CEMENT CONCRETE PAVEMENT
3. Section 751., LOAM
4. Section 751.010, PLANTING SOILS
5. Section 765, SEEDING

REFERENCES

The following standards shall apply to the work of this Section:

1. Massachusetts Department of Transportation-Highway Division (MassDOT): Standard Specifications for Highways and Bridges
2. ASTM: American Society for Testing and Materials

ITEMS 707.11 through 707.9 (Continued)**SUBMITTALS**

Manufacturer's Literature: Submit copies of each of manufacturer's material descriptions, color charts and color samples, and installation instructions, including all anchoring and fastening devices, for the following:

1. Timber Bench
2. Stacked Timber Seating Structure
3. Trash Receptacle
4. Gaming Table and Chairs (Fixed)
5. Table and Chairs (Fixed)
6. Bike Rack

Shop Drawings: Submit complete shop drawings for items required under this Section. Drawings shall include details, plans and elevations including dimensions and finishes of all components, accessories and post foundations.

STANDARDS AND QUALIFICATIONS

Workmanship and finish shall be equal to the best practice of modern shops for each item of work. Metal fabrication shall be accomplished using the highest standards of workmanship. All work shall be executed by experienced mechanics, shall conform to the requirements of the Contract Documents, and meet the following requirements.

1. Individual metal pieces shall be saw cut and carefully fitted together.
2. Sections shall be well formed to shape and size with sharp lines and angles; curved work shall be sprung evenly to curves.
3. Exposed surfaces shall have a smooth finish and sharp, well-defined lines and arrises.
4. Grind all edges of bars and plates completely free from nicks and machine marks, prior to galvanizing, shop priming, or finishing.
5. All surfaces and connections of metal items shall be without visible grinding marks, surface differentiation or variation.
6. All fabricated metal items shall be fine sanded throughout to produce a high standard of surface smoothness.
7. Castings shall have sharp corners and edges and shall be clean, smooth and true to pattern.
8. Welding shall be continuous and shall extend for the entire length of the joints except where specifically indicated on the Contract Documents. All exposed welds shall be ground smooth.
9. The use of gas cutting torch in the field for correcting fabrication errors will be permitted only when the prior written approval of the Engineer has been obtained for each specific condition.
10. Weld with uncoated wire to prevent flux deposits. If coated wire is used, all flux residue shall be thoroughly removed and bare white metal exposed, prior to galvanization, if applicable. Where overlapping surfaces are welded, seal off contact area by welding all edges around contact area.
11. All welds shall be watertight.

ITEMS 707.11 through 707.9 (Continued)

12. All shop connections shall be full seam welded and ground flush and smooth. Field connections bolted unless otherwise permitted as indicated in this Section. Draw up all threaded connections tightly, after buttering same with pipe joint compound, to exclude water. Deform threads to prevent loosening for all exposed connections subject to vandalism.

Where work fabricated under other Sections has been delivered to the site and has dimensions or fabricated construction that does not fit the field conditions, notify the Engineer of the discrepancy immediately. Follow up voice communication with a written correspondence detailing the discrepancy between delivered work and constructed condition.

DELIVERY, STORAGE AND HANDLING

Store delivered items under this Section, in a manner to prevent wracking or stress of components, and to prevent mechanical damage or damage by the elements. All stored materials and items shall be protected from weather, careless handling and vandalism.

Items which become rusted or damaged will be rejected and shall be replaced at no additional compensation.

GENERAL INSTALLATION

Where anchors, bolts or fasteners are exposed, they shall be configured or secured in such a way as to prevent their casual removal by use of vandal-proof heads or fastenings unless otherwise specified on Drawings.

Provision and delivery of all metal inserts, anchor slots, anchors, anchor bolts, fastenings, and other fastening devices, for attachment of site improvement items to concrete and masonry, except as otherwise specified under other Sections of this Specification, shall be provided, delivered, installed and paid for under the Contract unit prices for which they are a part in this Section.

Unless specifically called out in the Contract Documents, galvanized steel or cast iron sections to be joined shall not be welded after galvanizing but shall be mechanically attached by means of unexposed sleeves and fasteners sufficient to provide secure attachment under normal usage.

Free-standing site improvement items shall be set plumb and horizontal regardless of the pitch of the finished surrounding grade unless otherwise shown on the Contract Documents.

The Contractor shall be responsible for timing the delivery of site improvement items so as to minimize the on-site storage time prior to installation. All stored materials shall be protected from weather, careless handling and vandalism.

Contractor shall be responsible for the correct location of site improvement items. Take particular care to maintain shapes, plumb and level during the pouring of concrete.

ITEMS 707.11 through 707.9 (Continued)

All Work shall be accurately set to established lines and elevations and rigidly set in place to supporting construction.

COORDINATION

The work of this Section, shall be completely coordinated with the work of other Sections. Verify dimensions and work of other trades that adjoin materials of this Section, before installing items specified.

Obtain all necessary templates and patterns required from other trades for proper execution of work of this Section. Coordinate the delivery of items, templates, and patterns manufactured by other trades to maintain construction schedule. Receive from other trades items to be installed under this Section.

GUARANTEE

The Contractor shall furnish and deliver standard written manufacturer's guarantee in The City of Lawrence's name covering all materials and workmanship under this Section, in addition to, and not in lieu of, guarantee requirements set forth under GENERAL REQUIREMENTS and other liabilities which the Contractor may have by law or other provisions of the Contract Documents.

Supplier shall pay for repairs of any damage to any part of the project caused by defects in his work and for any repair to the materials or equipment caused by replacement. All repairs are to be done to the satisfaction of the Engineer.

Any part of the work installed under this contract requiring excessive maintenance shall be considered as being defective, and shall be replaced by the Supplier during the one year guarantee period at no additional cost.

All wood used for bench slats shall bear an "Association Inspection Certificate" furnished by the Contractor at his own expense, certifying that the grade and quality is fully in accordance with the requirements of the specifications. This certificate shall be issued by the association whose grading rules govern this particular class of wood. Wood that is "Grade marked" by an accredited association will be accepted in lieu of the "Association Inspection Certificate."

ITEMS 707.11 through 707.9 (Continued)**MATERIALS****Timber Bench**

Basis of Design: Provide industrial timber bench as manufactured by STREETLIFE America LLC, Philadelphia, PA, p 215-247-0148, usa@streetlife.com; or approved equal.

Model: L2 Drifter Bench with backrest and armrests
DB-L2-118-L2-CT
71" long Hardwood Backrest
Weathering Steel Armrests (3 per bench)
Weathering Steel Supports with Hardwood Timbers
Provide Lengths per Contract Documents
Provide stainless steel hardware and insulating washers to anchor to foundations.

Stacked Timber Seating Structure

Basis of Design: Provide stacked timber seating structure as manufactured by STREETLIFE America LLC, Philadelphia, PA, p 215-247-0148, usa@streetlife.com; or approved equal.

Model: DB-STR-H3-800-250-CT
Weathering Steel Supports with Hardwood Timbers
Provide Custom Lengths per Contract Documents
Provide stainless steel hardware and insulating washers to anchor to foundations.

Trash Receptacle

Trash receptacles shall meet the requirements and be of the design shown on the Contract Drawings, and of the quality, sustainable materials, manufacturing processes of Receptacle 157-32 by Dumor, Inc, P.O. Box 142, Mifflintown, PA 17059, p. 800-598-4018, sales@dumor.com, or comparable, compatible, performance and color-matched equals approved by the Landscape Architect.

Comparable approved equals shall be:

Receptacle SD-42 by Victor Stanley, 2103 Brickhouse Rd, Dunkirk, MD, 20754, 301-855-8300, www.victorstanley.com

Chase Park Litter Receptacle produced by Landscape Forms, 431 Lawndale Avenue, Kalamazoo MI, 49048, phone 800-521-2546, www.landscapeforms.com.

Gaming Table and Chairs (Fixed)

Basis of Design: Provide gaming tables and chairs without backrests but with chessboard manufactured by MMCite USA LLC, 2905 Westinghouse Blvd, Suite 100, Charlotte, NC 28273, p 704-995-1942, info@mmcite.com; or approved equal.

Model: Rautster RTS157t with tropical wood table and seat topper.

ITEMS 707.11 through 707.9 (Continued)**Table and Chairs (Fixed)**

Basis of Design: Provide gaming tables and chairs without backrests but with chessboard manufactured by MMCite USA LLC, 2905 Westinghouse Blvd, Suite 100, Charlotte, NC 28273, p 704-995-1942, info@mmcite.com; or approved equal.

Model: Rautster RTS252 steel table and chairs with perforated coated steel area.

Bike Rack

Bike Racks shall meet the requirements and be of the design shown on the Contract Drawings, and of the quality, sustainable materials, manufacturing processes of Swerve Rack manufactured by DERO BIKE RACK CO., 5522 Lakeland Avenue N., Minneapolis, MN 55429, 1-888-337-6729. Fax: 612-331-2731 Website: www.dero.com; or approved equal.

Model: Swerve Rack

- a. 2" schedule 40, uncoated pipe.
- b. 2 bike capacity
- c. Installation Methods: In-ground mount is embedded into concrete base as shown on the Contract Documents.
- d. Finish
 1. Hot-dipped galvanized finish performed after fabrication.
 2. Followed by a TGIC powdercoat finish.
 3. For powder coated/ painted racks, the following specifications are required: Part is prepared for painting with hard sandblasting. An epoxy primer is electrostatically applied. A final TGIC, UV resistant polyester powder coat is applied. Final coating mil thickness shall be no less than 6 mils.
 4. Submit color chart for color selection and approval.

Comparable approved equals shall be:

Bike Rack 292 produced by DuMor, P.O. Box 141, Mifflintown PA 17059, phone 800-598-4018, www.dumor.com

Ring Bike Rack produced by Landscape Forms, 431 Lawnale Avenue, Kalamazoo, MI, 49048, phone 800-521-2546.

Earthwork Materials

All backfill materials, including base and subbase materials, ordinary borrow, drainage fill and structural fill shall be as specified under the Section 120., EXCAVATION of this Specification.

Concrete

Concrete footings shall be as specified in Section 904.

ITEMS 707.11 through 707.9 (Continued)**Grout**

Grout as required for anchoring shall be a pourable, quick setting, non-metallic and non-shrinking hydraulic cement grout equal to the following:

1. Five Star Grout
U.S. Grout
Corporation 425
Stillson Road
Fairfield, CT 06430
(800) 243-2206
2. Sika Grout 212
Sika Corporation
Lyndhurst, NJ 07071
(201) 933-8800
3. Harris
Construction Grout
AH Harris & Sons
10 West Mill St.
Medfield, MA 02052
(508) 359-7321

Sealants

Joint sealant and primer shall be polyurethane-based, one component, elastomeric sealants, complying with Fed. Spec. TT-S-00230C, Class A Type 1. Color shall be as selected by the Engineer. Sealants shall be self-leveling pour grade type.

1. Provide only materials which are known to be fully compatible with the actual installation condition, as shown by the manufacturer's published data or certification. Use manufacturer's recommended joint primer.
 - a. Vulkem 45, as manufactured by Mameko International, 4475 East 175th Street, Cleveland Ohio 44182, (800) 321-6412.
 - b. Urexpam NR-210, as manufactured by Pecora Corporation, 165 Wambold Road, Harleysville, PA 10348, (215) 723-6051
 - c. PSI 951, as manufactured by Polymeric Systems Inc., Phoenixville, PA, (800) 228-5548
 - d. Or approved equal

ITEMS 707.11 through 707.9 (Continued)**CONSTRUCTION METHODS**General

The Contractor shall verify that finished grades and other operations affecting mounting surfaces have been completed prior to the installation of site furnishings. Site furnishings shall be installed plumb and true, at locations indicated in accordance with the approved manufacturer's instructions.

Assembly And Erection of Components

Items shall be shipped knocked-down (KD) ready for site assembly. Packaged components shall be complete including all accessories and hardware. New parts shall be acquired from the manufacturer; substitute parts will not be accepted unless approved by the manufacturer. When the inspection of parts has been completed, the site furnishings shall be assembled and anchored according to manufacturer's instructions or as indicated. When site furnishings are assembled at the site, assembly shall not interfere with other operations or pedestrian and vehicular circulation.

Anchorage, Fastenings and Connections

Furnish metal work, mounting bolts or hardware in ample time for securing into concrete or masonry as the work progresses. Provide anchorage where necessary for fastening furniture or furnishings securely in place. Provide, for anchorage not otherwise specified or indicated, slotted inserts, expansion shields, and power-driven fasteners, when approved for concrete; toggle bolts and through bolts for masonry; machine and carriage bolts for steel; through bolts, lag bolts, and screws for wood. Do not use wood plugs in any material. Provide non-ferrous attachments for non-ferrous metal. Make exposed fastenings of compatible materials, generally matching in color and finish the fastenings to which they are applied. Conceal fastenings where practicable.

Testing

Each site furnishing shall be tested to determine a secure and correct installation. A correct installation shall be according to the manufacturer's recommendations and by the following procedure: The Contractor shall measure the physical dimensions and clearance of each installed site furnishing for compliance with manufacturer's recommendations and as indicated. Site furnishings which do not comply shall be reinstalled. Fasteners and anchors determined to be non-compliant shall be replaced. A written report describing the results of the testing shall be provided.

Earthwork

All excavation, filling, compacting and grading of backfill materials, including base and subbase materials, ordinary borrow, drainage fill and structural associated with and used in the installation of the items of this Section, shall be as specified under the Section 120, EARTH EXCAVATION, and performed and paid for under the work of this Section.

ITEMS 707.11 through 707.9 (Continued)**Concrete**

Concrete footing placement, protection and formwork shall be as specified in Section 904. and installed and paid for under the work of this Section. Concrete footings shall be to the sizes noted on the Contract Documents. No calcium chloride will be permitted.

ACCEPTANCE STANDARDS

Site Improvement items fabricated, provided, delivered, installed and paid for under this Section, will be rejected by the Engineer for the following reasons and as determined by the Engineer:

1. Upon installation horizontal or vertical curves do not meet the shapes and profiles shown on the Contract Documents. Curves that have broken backs, sags, saddles, tangents or kinks will be rejected.
2. Posts are not plumb. Rails do not follow grade as noted on the Contract Documents.
3. Indications of field welding or cutting.
4. Threaded connections are not drawn up tightly. Threads have not been deformed to prevent loosening.
5. Anchorage into concrete or masonry is not solid but is perceptibly loose. Anchorage does not meet the requirements of the Contract Drawings.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Measurement and Payment for Timber Bench will be at the Contract unit price for each of bench assembly including backrest and armrest, which will be full compensation for setting materials, grouting materials, installation, anchoring devices, and all related materials and labor required for the installation complete in place.

Measurement and Payment for Stacked Timber Seating Structure will be at the Contract unit price for each of bench structure assembly, which will be full compensation for setting materials, grouting materials, installation, anchoring devices, and all related materials and labor required for the installation complete in place.

Measurement and Payment for Trash Receptacle will be at the Contract unit price for each trash receptacle, which will be full compensation for excavation and backfill, backfill support, compaction, steel reinforced concrete base, steel, including all components and finishes, setting materials, grouting materials, installation, anchoring devices, and all related materials and labor required for the installation complete in place.

ITEMS 707.11 through 707.9 (Continued)

Measurement and Payment for Gaming Table and Chairs (Fixed) will be at the Contract unit price for each gaming table and chairs (fixed), which will be full compensation for excavation and backfill, backfill support, compaction, steel reinforced concrete base, steel, including all components and finishes, setting materials, grouting materials, installation, anchoring devices, and all related materials and labor required for the installation complete in place.

Measurement and Payment for Table and Chairs (Fixed) will be at the Contract unit price for each table and chairs (fixed), which will be full compensation for excavation and backfill, backfill support, compaction, steel reinforced concrete base, steel, including all components and finishes, setting materials, grouting materials, installation, anchoring devices, and all related materials and labor required for the installation complete in place.

Measurement and Payment for Bike Rack will be at the Contract unit price for each bike rack, which will be full compensation for excavation and backfill, backfill support, compaction, steel reinforced concrete base, steel, including all components and finishes, setting materials, grouting materials, installation, anchoring devices, and all related materials and labor required for the installation complete in place.

ITEM 740. ENGINEER'S FIELD OFFICE AND EQUIPMENT (TYPE A) MONTH

The work under this Item shall conform to the relevant provisions of Subsection 740 of the Standard Specifications and the following:

Three computer systems and printer system meeting minimum 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 systems, and printer 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.

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, 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 M1.06.0 Compost 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. Vender certification that material delivered meets the test results shall be submitted if requested.

Compost shall meet the requirements for M1.06.0: Compost, Type 2, as referenced in the MassDOT- Highway Division Standard Specifications for Highways and Bridges, Division III: Materials Specifications, latest edition.

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.

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.

ITEM 751.7 (Continued)

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, sand, ordinary borrow, wetland soil, topsoil rehandled and spread, tilled existing soil, or other specified substrate.

Seeding, if utilized, will be compensated for under the appropriate seeding items.

ITEM 751.999

BIORETENTION SOIL MIX

CUBIC YARD

This identifies the composition of bioretention soil to be used as shown on the Plans. This material can be either purchased pre-blended and brought on-site or organic compost can be blended with offsite stockpiled soils provided by the contractor.

As native hydric soils are not anticipated to be available for use, a soil mixture will be used for bioretention soil. Bioretention soil that is not purchased pre-blended shall consist of a 1:1 mixture (or equal volumes) of organic and mineral soil material (loam, loamy sand to silt loam range) that contains 7-12 percent organic matter content by weight. Clean leaf or commercially available compost is the preferred amendment to achieve this standard, though other materials may be used if approved by the wetland scientist. Pre-blended bioretention soil shall also contain 7-12 percent organic matter content by weight.

MATERIALS

Compost shall meet the requirements for M1.06.0: Compost, Type 2, as referenced in the Standard Specifications

METHOD OF MEASUREMENT

Item 751.999 will be measured for payment by the Cubic yard of bioretention soil mix, placed, complete in place.

BASIS OF PAYMENT

Item 751.999 will be paid for at the Contract unit price per Cubic Yard based on a field measured area over the bottom of the stormwater swale and wetland seeding area as shown on the plan and multiplied by a depth of 12 inches, with additional volume factored in to allow for 20% compaction.

The Contract price shall include material, verification and documentation of organic matter content, compaction, transport, site preparation, and all incidental costs required to placement of bioretention soil and complete the work.

ITEM 752.2**PLANTING SOIL****CUBIC YARD**

The work under this item shall conform to the relevant provisions of Subsections 150, 170, 751 and 770 of the Standard Specifications and the following:

The work shall include planting soil and related items as indicated on the Drawings or specified herein, but is not limited to, testing, placing, spreading and grading planting media and related items.

REFERENCES AND STANDARDS

The following related terms are used herein and shall mean:

1. AOAC: Association of Official Agricultural Chemists.

SUBMITTALS

At least 30 days prior to ordering the below listed materials, submit certified testing results and representative samples to Engineer for selection. No materials shall be ordered or delivered until required samples, certifications, manufacturer's literature and test results have been reviewed by Engineer. Delivered materials shall closely match the approved samples. The Engineer reserves the right to reject, on or after delivery, any material that does not meet these Specifications.

The Contractor shall perform testing in two stages.

The Contractor shall sample and test Base Loam and Sand for mechanical gradation, percent organics and chemical analysis as follows:

The Contractor shall provide one cubic foot representative samples from each proposed source of Base Loam and Sand for testing and analysis at the Contractor's own expense. Contractor shall deliver samples to testing laboratories and shall have the testing report sent directly to the Engineer. Tests for gradation and organics shall be performed by a private testing laboratory approved by the Engineer. Tests for soil chemistry and pH may be performed by a public agricultural extension service agency. All tests shall be performed in accordance with the current standards of the Association of Official Agricultural Chemists. See Soil Testing requirements in this Section for required tests and recommendations.

In addition to soil testing of Base Loam and Sand, submit the following:

Compost: Submit a one quart-size sample.

Contractor shall provide a written certification from the supplier that compost contents shall meet all requirement of the specification.

Limestone: Submit supplier's certification that the limestone being supplied conforms to these Specifications

Acidulant: Submit supplier's certification that the acidulant being supplied conforms to these Specifications

ITEM 752.2 (Continued)**Soil Testing**

Mechanical gradation (sieve analysis) shall be performed and compared to the USDA Soil Classification System. Sieve analysis shall be by combined hydrometer and wet sieving using sodium hexametaphosphate as a dispersant in compliance with ASTM D 422 after destruction of organic matter by H₂O₂. To facilitate review and approval of sieve analysis, provide a computer-generated gradation curve from UMASS Soil & Plant Tissue Laboratory.

Percent of organic matter shall be determined by the loss on ignition of oven-dried samples. Test Samples shall be oven-dried to a constant weight at a temperature of 230 degrees Fahrenheit, plus or minus 9 degrees F.

Chemical analysis shall be undertaken for Nitrate Nitrogen, Ammonium Nitrogen, Phosphorus, Potassium, Calcium, Iron, Manganese, Copper, Zinc, extractable Aluminum, Soluble Salts, and acidity (pH) and buffer (pH). Nutrient levels shall be measured in parts per million (PPM). Cation Exchange Capacity shall be measured.

Soil analysis tests shall show recommendations for fertilizers to nutrient deficiencies as necessary for (species of plants) (and) (lawn planting) on the construction site. Recommendations for fertilization shall indicate NPK proportions, secondary and micro-nutrients and rates of application in either gallons or pounds per 1,000 square feet.

MATERIALS**General**

The planting soil mix shall be manufactured from three base components: Base Loam, Sand and Compost, in proportions to meet the requirements specified herein.

Base Loam

Base Loam shall be existing topsoil stripped and stockpiled at the site or shall be imported. Stripped topsoil shall be sampled and tested for grain size distribution and organic content according to tests as specified. Test results shall be reported to the Engineer, who may recommend minor adjustments to specified approximate mixing ratios and mix requirements for each mix type. Stripped topsoil which has been contaminated by incorporation of subsoil shall not be acceptable for use and shall be replaced with imported topsoil meeting specification requirements at no additional cost.

Base Loam as required for the work shall be free of subsoil, large stones, earth clods, sticks, stumps, clay lumps, roots or other objectionable, extraneous matter or debris. Base Loam shall also be free of quack-grass rhizomes, Agropyron Repens, and the nut-like tubers of nutgrass, Cyperus Esculentus, and all other primary noxious weeds. Base Loam shall not be delivered or used for planting while in a frozen or muddy condition. Base Loam for mixing shall conform to the following grain size distribution for material passing the #10 sieve:

ITEM 752.2 (Continued)Percent PassingU.S. Sieve

<u>Size Number</u>	<u>Minimum</u>	<u>Maximum</u>
10	---	100
18	85	100
35	70	95
60	50	85
140	36	53
270	32	42
0.002mm	3	6

The ratio of the particle size for 80% passing (D80) to the particle size for 30% passing (D30) shall be 8 or less. ($D80/D30 < 8$)

Maximum size shall be one-inch largest dimension. The maximum retained on the #10 sieve shall be 20% byweight of the total sample.

The organic content shall be between 4.0 and 8.0 percent

Sand

Sand: for mixing with base loam to meet specification requirements shall be uniformly graded coarse sand consisting of clean, inert, rounded grains of quartz or other durable rock and free from loam or clay, surface coatings, mica, other deleterious materials with the following gradation.

Percent PassingU.S. Sieve

<u>Size Number</u>	<u>Minimum</u>	<u>Maximum</u>
10	100	---
18	65	90
35	35	60
60	15	30
140	0	8
270	0	3
0.002mm	0	0.5

Maximum size shall be one inch largest dimension. The maximum retained on the #10 sieve shall be 20% by weight of the total sample.

The ratio of the particle size for 70% passing (D70) to the particle size for 20% passing (D20) shall be 3.0 or less. ($D70/D20 < 3.0$)

Compost

Compost materials shall consist of compost as specified in the Standard Specification under Organic Soil Additives, M1.06.0.

ITEM 752.2 (Continued)

Planting Soil Mix - General

Planting soil mixes shall be free of plants and their roots, debris and other extraneous matter. They shall be uncontaminated by salt water, foreign matter and substances harmful to plant growth. The electrical conductivity (EC2) of a 1:2 soil-water suspension shall be equal to or less than 1.0 millimhos/cm. (Test minus sieve #4 material).

Loam Borrow

Loam borrow shall be a blended mix of base loam, sand and compost to create a planting soil medium for use in for seeding areas and planting beds and as specified herein.

Base Loam, Sand and Compost, each as specified above, shall be combined in an approximate mix ratio of two parts by volume Sand to one and one half parts by volume Base Loam to one part by volume Compost (2S:1.5L:1C) to create a uniform blend which meets the following requirements.

Gradation for Material Passing the Number 10 Sieve:

Percent Passing U.S. Sieve Size Number	Minimum	Maximum
10	100	---
18	70	90
35	45	72
60	26	40
140	15	22
270	11	14
0.002mm	2	5

Maximum size shall be one inch largest dimension. The maximum retained on the #10 sieve shall be 20% by weight of the total sample.

Ratio of the particle size for 80% passing (D80) to the particle size for 30% passing (D30) shall be 5.5 or less. (D80/D30 <5.5)

Saturated hydraulic conductivity of the mix: not less than 3 inches per hour according to ASTM D5856-95 (2000) when compacted to a minimum of 88% Standard Proctor, ASTM 698

Organic content: between 4 and 5.5 percent by

weight. Amendments to Modify pH of Planting Soil

Mixes

Ground limestone for adjustment of loam pH shall be in accordance with the requirements of Section M6.01.0 of the Standard Specifications.

Sulphur for adjustment of loam pH shall be commercial or flour sulphur, unadulterated, and shall be delivered in containers with the name of manufacturer, material analysis, and net weight appearing on each container.

ITEM 752.2 (Continued)**CONSTRUCTION METHODS**General

All areas to receive Planting Soil shall be inspected by the Contractor before starting work and any defect such as incorrect grading shall be reported to the Engineer prior to beginning this work.

Amendments

Incorporate amendments to modify pH, per recommendations of test reports, to meet the requirements of this Specification. Soil amendments shall be spread and thoroughly incorporated into the layer of planting soil media by harrowing or other methods reviewed by the Engineer.

Filling and Compacting Planting Soil Mix

Perform percolation tests on existing, in place sub-soils or placed fill prior to placing and spreading planting soil media. Testing shall be conducted after the requirements of Item 120 Earth Excavation have been met.

1. Perform percolation testing of subsoil or placed fills to determine whether or not the sub-grade, sub-soils, and placed fills drain properly. Perform percolation tests for each lift as specified in herein.
2. In the event that percolation testing indicates that the sub-grade, subsoil, placed fills have been over compacted and do not drain, the contractor shall loosen up the top sixteen (16") inches of the compacted layers by ripping or other mechanical means. Re-compact the borrow by driving a small, tracked bulldozer over the area at low speeds so that the tracks of the bulldozer pass over the affected area and the soil is compacted to a density that shall percolate as specified under the work herein. Under no circumstances shall wheeled vehicles be driven over subsoil, placed fills or ordinary borrow that have been shown to percolate or subsoil, placed fills or ordinary borrow that has been loosened and shown to percolate. The work of loosening the top sixteen (16") inches of soil and re-compacting the soil shall be as specified, performed and paid for under Item 120 Earth Excavation.
3. Perform sufficient percolation tests in areas of poorly draining or compacted subsoil or compacted placed fills as required by the Engineer to ensure that these underlying soils drain. Likewise, perform sufficient percolation tests after ripping and loosening to ensure that the soils are no longer too compact to drain.

All areas to be spread with any of the three planting soil media shall be free of construction debris, refuse, compressible or decayable materials and standing water. Do not place planting soil media when soil materials are frozen. No soil material containing ice or frozen lumps shall be used.

Protect existing trees in areas to be spread with planting soil media. Avoid compacting any existing soil, subsoil, subgrade or planting soil media in the vicinity of existing tree roots and do not use heavy equipment within the drip line of existing trees. Placement of lifts of any of the three planting soil media shall not exceed 6 inches in depth over existing tree roots and no fill shall come in contact with existing tree trunks. Filled areas around existing trees shall be graded to drain away from existing trees at a minimum slope of 2percent.

ITEM 752.2 (Continued)

The Contractor shall notify the Engineer when areas to be filled are ready for formal inspection. Placement of fill material shall not begin until Engineer has approved sub-grade.

The Engineer shall reject the use of the Contractor's compaction equipment if, in the opinion of the Engineer, the equipment is unsuited to or inadequate for compacting materials to the specified densities within a reasonable length of time, or if equipment or procedures are likely to damage underlying materials.

All fill material is to be placed "in-the-dry" to which dewatering may be required. Spreading and drying of each layer may also be required.

Conversely, if the testing laboratory determines that the fill material is too dry for proper compaction, water shall be added to provide the specified optimum moisture content, as necessary for proper compaction.

Compaction of each lift shall be done with hand-operated equipment, as specified herein and as determined by ASTM Test, D1556. Fill shall be placed in successive horizontal lifts no thicker 6 inches and compacted to required density as specified herein. Maximum dry density shall be determined in accordance with ASTM D1557, Method D. Maximum dry densities for planting soil media shall be between 86 and 88 percent.

In planting areas, compaction requirements for planting soil media shall be considered minimums and maximums within the density percentages called for, and any over-compaction of existing soils or fills which would be detrimental to planting objectives shall be corrected by tilling or other means and re-compacting to specified compaction limits at no additional cost.

Fine Grading

Planting soil media shall be spread in accordance with these specifications over approved areas to a depth sufficiently greater than shown on the drawings so that after required compaction, the planting soil media depth shall equal that which is required by the Drawings.

Select equipment and otherwise phase the installation of the planting soil media to ensure that wheeled equipment does not travel over subsoil, placed fills or ordinary borrow or already installed planting soil media. Movement of tracked equipment over said soils shall be reviewed and considered for approval by the Engineer. If it is determined by the Engineer that wheeled equipment must travel over already installed soil, provide a written description of sequencing of work that ensures that compacted soil is loosened and recompacted as the work progresses. Alternatively, place one-inch thick steel plate ballast (or equivalent ballast approved by the Engineer) over the length and width of any travel way to protect planting soils from compaction.

After initial filling, Contractor shall request approval of rough grading by Engineer.

Following approval of rough grading, Contractor shall supply additional planting soil media as necessary so that following finish grading and compaction, the depth of the planting soil media fill shall conform to the depth required.

No soil shall be placed in a wet or frozen condition.

ITEM 752.2 (Continued)

Sufficient grade stakes shall be set for checking the finished grades. Deviation from elevations shown on Drawings that are greater than one-tenth of a foot shall not be permitted. Connect contours and spot elevations with an even slope. Finish grades shall be smooth and continuous with no abrupt changes at the top or bottom of slopes.

After seeding and planting media has been spread, it shall be carefully prepared by hand raking.

Contractor shall obtain Engineer's written approval of fine grading and bed preparation before doing any planting.

METHOD OF MEASUREMENT

Item 752.2 will be measured for payment by the Cubic Yard of planting soil placed, complete in place.

BASIS OF PAYMENT

Item 752.2 will be paid for at the Contract unit price per Cubic Yard, which price shall include all labor, materials, equipment and incidental cost required to complete the work.

No separate payment will be made for filling operations to establish sub-grade or subsoil elevations or fine grading and compacting, but all costs in connection therewith shall be included in the Contract unit price bid.

ITEM 755.35**INLAND WETLAND REPLICATION AREA****LUMP SUM**

The work under this item shall conform to the relevant provisions of Sections 120, 770, 771 of the Standard Specifications and the following:

Work under this item shall include furnishing material and the construction and maintenance of inland wetland replication areas as shown on the drawings and as required by the Engineer. Inland Wetland Replication Area shall hereafter be referred to as Replication Area. All work shall be in coordination with an approved Wetland Specialist as specified under that item.

Wetland Restoration work shall be as specified and compensated under that item.

The Replication Area shall be constructed prior to wetland impacts unless otherwise approved by the Engineer, specified herein, or specified in permit conditions and approvals. Construction schedule shall be appropriate to planting and seeding season (see below). Changes to this schedule will require written approval from the Engineer.

DESCRIPTION OF WORK

Construction of the Replication Area shall be completed as shown on the drawings at the following location(s):

- Area A: Station 43+00 to 44+10, approximate area: 380 SF
- Area B: Station 44+10 to 45+90, approximate area: 1,240 SF
- Area C: Station 45+90 to 47+27, approximate area: 360 SF
- Area D: Station 47+30 to 48+34, approximate area: 1,420 SF

Replication Area shall be constructed to meet the requirements of all associated permits and certifications, including relevant performance standards of the Massachusetts Wetlands Protection Act (MGL C. 131, s40), Section 401 Water Quality Certification, and Section 404 - U.S. Army Corps of Engineers Permit.

The Contractor is responsible for protection and preservation of natural areas adjacent to the Replication Area both within and outside the project limits and for the duration of the Contract; including but not limited to damage to soils or vegetation due to erosion, sedimentation, compaction, trampling, vehicles, storage of materials, or other negligence shall be repaired to the satisfaction of the Engineer and at the Contractor's expense.

The Wetland Specialist overseeing the Wetland Replication construction work shall not be from the same company as that which is performing planting, seeding, or participating in any aspect of the Wetland Replication construction.

ITEM 755.35 (Continued)**SUBMITTALS - DOCUMENTS**

Request for Conditional Acceptance: As specified below, a letter requesting Conditional Acceptance of the work and the site conditions shall be submitted to the Engineer.

Request for Certificate of Compliance (Partial or Full): As specified below, shall be submitted to the Engineer for distribution to appropriate regulatory agencies.

Request for Final Acceptance: As specified below, a letter requesting Final Acceptance of the work and the site conditions shall be submitted to the Engineer.

Monitoring Reports: Reports shall be submitted to the Engineer as specified below. Reports shall be compensated under Item 755.75 and 755.76.

SUBMITTALS - MATERIAL**Soil and Amendments**

No soil, compost, or other soil amendment imported to the work site shall contain seeds, roots, stems, or other viable parts of invasive plants or other noxious plants.

At least sixty (60) days prior to installation and prior to ordering, the Contractor shall submit for approval sources of soil, compost, and amendments. Submittal shall include the supplier and location of the source. Off-site sources shall be identified and available for inspection by the Wetland Specialist prior to transport of material to the site to verify that they are likely to be free of invasive plant species, including all viable plant parts.

Samples of tested and approved wetland soil and soil amendments for soil texture, organic carbon content or other routine soil analysis parameters (e.g., pH, Cation Exchange Capacity, Percent Base Saturation) and Soil Organic Matter Analysis will be required if requested by the Engineer. The grab samples shall be collected by the Contractor or Wetland Specialist from multiple representative locations in the wetland topsoil mix following the "UMass Soil and Plant Tissue Testing Laboratory Sampling and Collection Protocols" (or equivalent certification paperwork provided by the soil supplier). The lab analysis shall be provided to the Engineer along with written certification from the Contractor or Wetland Specialist that the wetland topsoil was collected per the referenced protocol and meets the desired specification. The analysis and written certification of same shall be provided to the Engineer prior to placing the wetland topsoil in the Replication Area.

Seed Mix

Certificate of Materials from the supplier shall be submitted 30 days prior to seeding and must be approved prior to ordering materials. Seed species listed on the certificate shall include ecotype region (i.e., *Asclepias incarnata*, PA Ecotype).

ITEM 755.35 (Continued)

Seed tag from the bag of seed used shall be submitted to the Engineer at the time of seeding. Seed tag shall include ecotype region and species, guaranteed percentages of purity, weed content and germination of the seed, and the net weight. Seed tag shall match the Certificate of Materials, include the name of the supplier, and date material was sent.

Bill of lading or notarized Certificate of Compliance from the Supplier serving as proof of purchase shall be submitted if requested by the Engineer. Document shall include date of sale, quantity, lot number, and address of Supplier. This shall match the seed tag. Notary shall not work for either the contractor or seed supplier.

Other Material: Submittals shall be per the respective item.

MATERIALS**Sediment Control Barrier and Erosion Prevention Measures**

Sediment control barriers shall be per Item 767.121.

Erosion prevention measures for disturbed areas adjacent to the Replication Area shall include but not necessarily be limited to compost blankets, jute mesh, seeding, and/or combinations thereof as approved by the Engineer.

Sediment controls and erosion prevention devices and measures shall be compensated under the respective items.

Wetland Soil

Soil appropriate for the Replication Area may be either hydric soil excavated from the impacted wetland, a manufactured mix of compost and on-site borrow, or a combination thereof, as approved by the Engineer.

Hydric soil from the impacted wetland area may be spread on the surface of the constructed Replication Area as an inoculant or can be placed in a bulk fashion in a roughly 1:1 ratio of area and depth. Soil shall be handled such that the original soil structure is preserved and shall not be compacted, screened, or otherwise processed.

Hydric soil from the impacted wetland that is infested with invasive plant species identified on the Massachusetts Invasive Plant Advisory Group (MIPAG) shall not be used in the Replication Area unless approved by the Wetland Specialist and Engineer. To the extent possible, infested soil shall be disposed of within the project limits in an upland area outside of regulated areas and as approved by the Invasive Plant Management Strategy item (if in the contract) or by the Engineer.

ITEM 755.35 (Continued)

A manufactured mix suitable for wetlands shall consist of on-site borrow from the proposed Replication Area (if approved by the Wetland Specialist and Engineer) thoroughly mixed with compost to achieve a target organic carbon content of 10-12% (up to 21% percent organic matter) by dry weight. The organic material used for mixing shall be well or partially decomposed. Clean leaf compost is the preferred soil amendment to achieve these standards though other materials may be used if approved by the Wetland Specialist and Engineer. Note that “clean” refers both to a negligible amount (<1%) of physical contaminants such as plastic and to the lack of chemical contaminants that might pose a hazard to plants or animals. Off-site borrow may be used for mixing if approved in advance by the Engineer.

No soil or soil amendment shall be brought on site without approval of the material source by the Wetland Specialist and the Engineer. Soils used in the replacement area shall be free of rocks greater than 4 inches in diameter.

Seed Mix

Seeding shall conform to the Standard Specifications Section M6, ROADSIDE DEVELOPMENT MATERIALS.

Wetland Seed Mix shall be per Item 765.552 (20lbs/acre)

Fertilizers shall not be used.

Water

The Contractor shall provide water and all equipment required at no extra cost. Water shall be suitable for irrigation and free from ingredients harmful to plants and wildlife. Water from the adjacent water bodies or waterways shall not be utilized. It is the Contractor's responsibility to correct injury or damage due to the lack of water, too much water, or use of contaminated water.

Mulch/Compost Blanket for Seeding

Hydromulch shall be per the manufacturer's recommendations and shall be wood fiber or straw mulch only. Mulch shall be incidental to seeding.

Compost Blanket may be used in lieu of mulch for seeding. Compost Blanket shall meet the material and submittal requirements of that Item and shall be applied as specified below. Compost Blanket shall be compensated under that item.

CONSTRUCTION METHODS & SEQUENCE

ITEM 755.35 (Continued)**SITE PROTECTION MEASURES****Minimizing Damage**

The Contractor shall plan and execute operations in a manner minimizing the amount of excavated and exposed fill or other foreign materials that could be washed or otherwise carried into Replication Area and nearby resource areas.

Construction of and access to the Replication Area shall minimize damage to existing vegetation and soils as specified herein. Damage to soils or vegetation shall be repaired to the satisfaction of the Engineer and at the Contractor's expense. If required for soil remediation, tilling and the addition of compost shall be at the Contractor's expense.

Wetland topsoil shall be deposited and graded in the Replication Area in a manner that minimizes travel and subsequent compaction of the subgrade (including any specified pit and mound topography) to the extent practicable, including use of track mounted excavators as appropriate. Should soils be compacted, they shall be loosened by a method such as disking, spring-tooth harrowing and/or rototilling. The Contractor shall use boards, timber or composite mats, or other approved materials as necessary, to protect existing and/or new wetlands from compaction due to heavy foot traffic or if equipment is required to travel over wetland soil. All labor and materials required for protection and preservation of site shall be incidental to this item.

Stockpiling of Soil

Stockpiling of soil, including hydric soil for replication, shall be at least 100 feet from the edge of the bordering and isolated vegetated wetlands and inland banks, unless approved otherwise by the Engineer. Stockpiled soils shall be securely stabilized and contained. Any areas of exposed soil or stockpiles within and adjacent to the Replication Area that will remain inactive for more than 7 calendar days shall be sown with a mix of rapid germinating annual grasses (e.g., annual rye) covered with a layer of straw mulch applied at a rate of 90 pounds per 1,000 square feet. As necessary, the mulch shall be anchored with a tacking coat (non-tar) applied by a hydro seeder or other method recommended by the Wetland Specialist in consultation with the Engineer. In the event that there is excess borrow, it shall be disposed of under Excavation, Item 120.

Sediment Barriers

Placement: Sediment barriers shall be installed along the downslope perimeter of the Replication Area beginning and ending in the surrounding upland so that no excavated material or disturbed soil can enter adjacent wetlands or waters. Where construction work is immediately upgradient of the wetland, barriers shall be located so as to protect the Replication Area until slopes are stabilized. Sediment barriers shall be in place and approved by the Engineer prior to excavation work. No work shall take place outside the barriers.

Maintenance: The Contractor shall ensure that all sediment barriers function as intended and at all times per the specifications of those respective items.

ITEM 755.35 (Continued)**Existing Trees to Remain**

Tree protection shall be per the relevant specifications and as shown on the plans or as required by the Engineer. To protect root systems of existing trees to remain, the limits of the Replication Area may be adjusted, but, the total area of replication required by the permits shall not be reduced. Access route may be adjusted as required.

Trees to be retained as snags (upright dead or dying trees left for wildlife habitat) within or adjacent to the Replication Area shall be as shown on the plans or as directed by the Wetland Specialist or Landscape Architect during the initial site walk. Trees to remain as snags shall be clearly marked prior to clearing. Trees that pose a potential fall hazard (i.e., are near a roadway) should have limbs and trunk cut such that the tree does not pose a fall hazard.

Coarse woody debris in the form of cut trees, stumps, logs, and brush shall be incorporated as shown on the plans or as directed by the Wetland Specialist or Landscape Architect. On site material shall be selected and marked by the Wetland Specialist, retained on the project site, and placed as specified below under Placement of Coarse Woody Debris.

All trees, stumps, or brush not specified to remain shall be removed and shall not be stockpiled in the wetland resource areas while awaiting disposal.

Work shall be coordinated with Clearing or Tree Removal Item and compensated under that Item.

PRE-WETLAND CONSTRUCTION SITE WALK

Delineating the Replication Area and Access Route. The Contractor shall stake out the Replication Area boundaries and the intended access route and set grade stakes for approval by the Wetland Specialist and Engineer. Following staking and demarcation of areas, the Engineer and Wetland Specialist shall approve or modify as necessary the limits of work, the access route, final location and configuration of replication, grade stake elevations, proposed location of sediment barriers, and review proposed construction methods.

As part of the delineation and approval process, the Wetland Specialist shall mark trees to be converted to snags, select course woody debris to be retained for re-use, and select rocks or other elements to be used for habitat features.

Invasive Plants: As part of the initial site walk, the wetland to be impacted and the proposed replication site shall be inspected for the presence of invasive plants. If invasive plants are found they shall be addressed as described herein under Invasive Plants.

ITEM 755.35 (Continued)**SOIL WORK**

Final grades in the Replication Area shall meet the target elevations as shown on the Plans or as adjusted by the Wetland Specialist to achieve the desired hydrology and micro-habitat. If adjustments are required, a Request for Information (RFI) shall be submitted to the Engineer for approval. Adjustments shall be documented and included in the As-Built plans (if required) and/or other applicable required documents.

Excavation & Grading

When required by permits, the Wetland Specialist shall notify MADEP and the ACOE (as applicable) at least 72 hours prior to excavation.

Soil in the proposed wetland areas that must be removed for grades to conform to the proposed elevations shall be stripped and disposed of, or, if suitable for reuse, be stockpiled in an approved location. Stockpiled soils shall be kept wet and not allowed to dry out. Procedures for maintaining appropriate moisture levels shall be documented by the Wetland Specialist and provided to the Engineer and the Contractor.

Replication area shall be excavated as shown on the drawings. Where replication area is adjacent to existing reference wetland, finish grade of replication shall generally match existing grades and micro-topography, notwithstanding any deviations that are necessary to achieve the desired hydrology and habitat in the Replication Area.

Prior to placement of backfill, scarify subgrade to a depth of 4 to 6 inches.

The Contractor shall survey cross sections of the excavation prior to backfill and prepare an interim as-built plan, certified by a Massachusetts Registered Professional Land Surveyor, depicting sub-grade contours (1-foot intervals with representative spot elevations in plan view and section views), and limits of grading. The interim as-built shall include a calculation confirming that sufficient surface area has been provided (excluding side slopes), as per environmental permit requirements. Locations of cross-sections should be indicated on the plan view.

Placement of Wetland Soil

Following excavation, scarification, and grading of sub-grade, and after the sub-grade elevations are approved by the Wetland Specialist, suitable soil previously removed or an evenly mixed organic/mineral soil created on-site shall be spread to the design depth and thickness over the proposed wetland areas as shown on the plans and as directed by the Wetland Specialist.

Vehicles used to transport soil from offsite shall be washed or cleaned with air pressure to prevent exotic or invasive seeds or root fragments from contaminating the Replication Area.

ITEM 755.35 (Continued)**Final Grading**

The finished grade of the Replication Area shall be at an elevation that will provide an unrestricted hydrologic connection between the Replication Area and adjacent resource areas. The hydrologic connection should be in keeping with restoring the intended function of the replacement wetland relative to the impacted reference wetland. The Contractor shall verify that this elevation is not at a level that could negatively alter the hydrology of an adjacent wetland. Microtopography in the form of hummocks, pits and mounds shall be as shown on the plans or as adjusted by the Wetland Specialist. Final elevations and grading of wetland soil shall be approved by the Wetland Specialist and the Engineer.

To avoid compaction once soil has been placed, no heavy equipment shall travel across placed soil and no work shall occur in wet or moist soil. Soil that is compacted due to construction activities shall be replaced with soil as specified herein and at the Contractor's expense.

The finished surface shall be surveyed by a registered surveyor prior to planting and a plan of the surveyed subgrades and final grades submitted to MADEP and other regulatory agencies as appropriate (e.g., Corps), within 30 days of final soil placement, to ensure that the correct topography and hydrology are met.

Cross sections shall also be submitted of sufficient number to represent the proposed locations of each different plant community, estimated seasonal average, high, and low groundwater elevations provided with the variance documents or observed prior to soil placement. The Wetland Specialist shall assist with the establishment of these elevations and shall certify that the excavated elevations are suitable for success of the proposed plant species.

Installation of Monitoring Wells in Replication Area

For a constructed Replication Area over 1,000 square feet, a representative number of monitoring wells shall be installed in locations as shown on the Plans. Monitoring wells shall include data loggers. For purposes of this specification, a data logger refers to a battery powered device that records groundwater level. Data shall be collected by the Wetland Specialist and submitted with Monitoring Reports and as required by applicable permits. Wells shall be installed immediately following completion of construction of the Wetland Replication Area. Wells shall be installed in accordance with USDA/NRCS technical report entitled: "Sprecher, S.W. 2008. Installing monitoring wells in soils (Version 1.0). National Soil Survey Center, Natural Resources Conservation Service, USDA, Lincoln, NE." or equivalent methodology approved by Engineer.

ITEM 755.35 (Continued)**RESTORING VEGETATION****Placement of Coarse Woody Material**

If specified within this Contract or if directed by the Wetland Specialist or Landscape Architect during the initial site walk, woody debris shall be placed in the Replication Area and/or adjacent upland buffer. Material shall be placed as shown on the plans or as directed following placement of wetland soil and prior to application of compost and/or seed. Woody material shall cover a minimum of 5-20 percent of the Replication Area, depending on whether it is a meadow or woodland wetland and how much wood is available from construction clearing. Where trees are cut for construction purposes, logs of a minimum length of 8 feet must comprise a minimum of 50% of the woody material left on site. Brush shall be included along with logs and stumps as directed. Woody material shall be placed in a deliberate and naturalistic manner.

Seeding

Following placement of wetland soil and planting (if included), the Replication Area shall be seeded using one of the following methods:

- Broadcast by hand or with a hand-held spreader followed by application of straw mulch. If necessary, seed shall be lightly raked to insure good seed-to-soil contact.
- Hydro-seeded with hydro mulch per the Standard Specifications and per the manufacturer's directions.
- Hand broadcast seed with Compost Blanket pneumatically applied at the same time to ensure light cover of soil topdressing over seed.

If spring conditions are drier than usual, supplemental watering may be required. If sowing during the summer months, supplemental watering will likely be required until germination.

If required, seeding limits for different seed mixes shall be determined by the Wetland Specialist.

PLANT ESTABLISHMENT AND INVASIVE MANAGEMENT

Seeding that fails to established according to the conditions of acceptance below shall be over-seeded as required by the Engineer. Washouts and channels shall be repaired and stabilized prior to overseeding. Excessive weed growth shall be pulled out by the roots or, with approval from the Engineer, cut prior to over-seeding. Soil repair and weed control are incidental to this item.

Invasive Plants: Corrective measures shall be taken to remove or treat invasive plant species in the Replication Areas. Invasive plants shall include those listed as invasive by Massachusetts Invasive Plant Advisory Group (MIPAG) and the US Army Corp of Engineer's New England District's Compensatory Mitigation Guidance

ITEM 755.35 (Continued)

If chemical treatment of invasive plants is necessary, the strategy for treatment shall be as determined under Item 102.3 Invasive Plant Management Strategy. That strategy shall be coordinated with the Wetland Specialist and all applicable permits and permitting agencies. Chemical application under 102.33 Invasive Plant Management On-site shall be compensated under that item and shall be for the duration of the contract only.

CONDITIONAL ACCEPTANCE OF WORK

Conditional Acceptance shall indicate approval of the wetland construction work and agreement that work has been done according to plan or modified as approved.

Upon completion of construction, the Contractor shall submit a Request for Conditional Acceptance that includes a brief narrative from the Wetland Specialist demonstrating that the wetland replication construction work was done according to plans (or how modified) and meets required permit conditions. The narrative shall include photo-documentation of pre-construction conditions as well as soil work, planting, and seeding. Seed tags shall be submitted as part of the Request for Conditional Acceptance.

Upon receipt of a Request for Conditional Acceptance, the Engineer, the Wetland Specialist, and regulatory representative (if required) shall assess the Replication Area and surrounding areas. At a minimum, the following conditions shall be included in the narrative and reviewed as part of the on-site assessment of whether:

- The final finished target elevations have been met and maintained relative to the approved plans and reference wetland. Areas that are too high or too low should be identified along with suggested corrective measures.
- Hydrology meets performance standards.
- Specified seed mix has been seeded. If inspected 30 or more days after seeding, seeded species in the wetland and adjacent upland shall show signs of good germination and healthy growth.
- Planted woody and herbaceous species meet specifications and are establishing well.
- Soils are stabilized and there is no sediment in the wetland and no channeling of slopes.
- There are no invasive plants visible in the replication area.

Upon approval that the work meets the above conditions, MassDOT will issue a letter of Conditional Acceptance. If the Wetland Replication work is not approved, MassDOT will issue a rejection letter requiring corrective actions. The Wetland Specialist shall recommend corrective actions. Work not approved shall be addressed by the Contractor at no extra cost.

Wetland Specialist shall be compensated under Item 755.75.

Erosion of adjacent slopes or the flow of sediments into the wetland between Conditional and Final Acceptance shall be immediately addressed by the Contractor.

ITEM 755.35 (Continued)**REQUEST FOR CERTIFICATE OF COMPLIANCE**

If required, a request for a Certificate of Compliance (Partial or Full) pursuant to the Massachusetts Wetlands Protection Act regulations shall be prepared and submitted to MassDOT within 30 days following Conditional Acceptance.

The Request for Certificate of Compliance shall include the following:

- A brief narrative of the work on company letterhead signed by the Wetland Specialist. Narrative shall be prepared as a MS Word document and shall include substantive explanation that demonstrates compliance with EACH relevant permit condition. Narrative shall note variations from the originally permitted design.
- As-built Drawings signed by the Contractor's PE registered in the Commonwealth of Massachusetts. As-built drawings shall show hydrologic conditions, status of plantings and seeding, and shall include a narrative and minimum of 4 photographs documenting site conditions. Plans should note variations from the originally permitted design.

When required, drawings shall meet the Army Corp of Engineer's New England District's Compensatory Replication Guidance, including: scale in the range of 1"=20' to 1" = 100', contours at 1' intervals, spot elevations for intermediate elevations, and polygons outlining each Replication Area, and, as applicable, plant community types. The As-built Drawings shall be provided to the Engineer electronically in Portable Document Format (PDF). If requested by the Engineer, the Drawings shall be provided in printed paper format (11" x 17" sheets, unless otherwise directed). Drawings must be scalable.

- Other documents as required.

FINAL ACCEPTANCE OF WORK

Following one full growing season, the Contractor shall submit a Request for Final Acceptance. Submittal shall include a brief narrative of conditions. Upon receiving the Request, the Engineer, Contractor, Wetland Specialist and regulatory representative (if required) shall assess the Replication Area. Final Acceptance will initiate the start of the Wetland Monitoring Period.

The following conditions shall be inspected and approved for acceptance and payment.

- Hydrology is functioning as intended.
- The desired seeded species are establishing well and cover at least 95 percent of the Replication Area, excluding areas of open water areas or planned bare soil.
- No sediments have entered the wetland.
- Adjacent slopes are stabilized with desirable vegetation.
- All planted species (if included) are living and establishing well.
- There are no visible invasive plants.
- Silt fence and non-biodegradable sediment barrier materials have been removed.

ITEM 755.35 (Continued)

If the mitigation work does not meet the above condition and is not approved, MassDOT will issue a rejection letter requiring corrective action. The Wetland Specialist shall recommend corrective actions. Work not approved will be addressed by the Contractor at no extra cost.

Wetland Specialist shall be compensated under Item 755.75.

MONITORING REPORTS FOR REGULATORY COMPLIANCE

Post wetland construction Monitoring Reports shall be completed and submitted by the Wetland Specialist as specified and compensated under Item 755.76 Wetland Monitoring Reports.

Generally, the following conditions shall be met upon each inspection:

- Hydrology is functioning as intended.
- The desired seeded species are establishing well and cover 95 percent of the area, excluding areas of open water areas or planned bare soil.
- No sediments have entered into wetland.
- Adjacent slopes are stabilized with desirable vegetation.
- All planted species (if included) are living and establishing well.
- There are no visible invasive plants.

If, at the end of the required monitoring period, the requirements have not been met and success of the wetland replication area has not been achieved as determined by the Monitoring Reports, the Contractor shall provide corrective measures. All costs associated with corrective measures and plant replacement shall be incidental to this item with no additional compensation.

BASIS OF PAYMENT

Item 755.35 will be paid for at the Contract unit price per Lump Sum, which price shall include all labor, materials, equipment, submittals, maintenance, all required soil, site preparation, grading, wetland seeding, planting, mulching, watering, monitoring wells, registered surveyor, as-built plans, Request for Certificate of Compliance, and all incidental costs necessary to complete the work as required.

Payment shall be as follows:

- 60% upon Conditional Acceptance.
- 20% after receipt and acceptance of Certificate of Compliance by the Engineer and once all permit construction requirements have been met and approved.
- 20% upon Final Acceptance.

Excavation will be paid under Item 120.

Sediment Control Barrier will be paid under Item 767.121

Coir Logs will be paid under Item 767.122

Wetland Seed Mix will be paid under Item 765.552

Wetland Specialist will be paid under Item 755.75

Wetland Monitoring Reports for follow-up monitoring will be paid under Item 755.76

ITEM 755.45

WETLAND RESTORATION

SQUARE YARD

DESCRIPTION

The work under this item shall conform to the relevant provisions of Subsections 120, 751, 765, 767, and 771 of the Standard Specifications and the following:

The work under this item shall include all labor and furnishing of materials to complete the work specified herein to protect and restore existing inland wetland areas that will be temporarily impacted as shown on the drawings and as required by the Engineer.

Inland Wetland Replication work shall be as specified and compensated under that item. Tidal wetland mitigation shall be as specified under the appropriate item for tidal wetlands.

Restoration Area shall be constructed to meet the requirements of all associated permits and certifications, including relevant performance standards of the Massachusetts Wetlands Protection Act (MGL C. 131, s40), Section 401 Water Quality Certification, and Section 404, U.S. Army Corps of Engineers General Permit.

All work shall be in coordination with an approved Wetland Specialist. Wetland Specialist qualifications and requirements shall be per Item 755.75, Wetland Specialist.

SUBMITTALS – DOCUMENTS

Survey: To establish or confirm pre-construction baseline elevation of temporarily impacted area(s), a survey shall be submitted to the Engineer prior to any fill or other land disturbance.

Request for Conditional Acceptance: As specified below, a letter requesting Conditional Acceptance of the work and the site conditions shall be submitted to the Engineer.

Request for Final Acceptance: As specified below, a letter requesting Final Acceptance of the work and the site conditions shall be submitted to the Engineer.

Request for Certificate of Compliance (Partial or Full): If applicable, request for a Certificate of Compliance shall be submitted to the Engineer for distribution to appropriate regulatory agencies as specified below.

ITEM 755.45 (Continued)

Monitoring Reports: Reports shall be submitted to the Engineer as specified below. Reports shall be compensated under Item 755.76 Wetland Monitoring Reports.

ASSOCIATED ITEMS AND MATERIALS

Compost shall be in accordance with Subsection 751 and M1.06.0 Organic Soil Additives of the Standard Specifications. Compost shall not contain seeds, roots, stems, or other viable parts of invasive plants or other noxious plants. Off-site sources shall be identified and available for inspection prior to transport of material to the site to verify that they are likely to be free of invasive plant species, including all viable plant parts.

Compost Blanket shall be as specified under that item.

Seed Mix

Required submittals include:

- Certificate of Materials from the supplier shall be submitted and approved 30 days prior to ordering seed. Seed species listed on the certificate shall include ecotype region (i.e., *Asclepias incarnata*, PA Ecotype).
- Seed tag from the bag of seed used shall be submitted to the Engineer at the time of seeding. Seed tag shall include ecotype region and species, guaranteed percentages of purity, weed content and germination of the seed, and the net weight. Seed tag shall match the Certificate of Materials, include the name of the supplier, and date material was sent.
- Bill of lading or a notarized Certificate of Compliance from the Supplier serving as proof of purchase shall be submitted if requested by the Engineer. Document shall include date of sale, quantity, lot number, and address of Supplier. This shall match the seed tag. Notary shall not work for either the contractor or seed supplier.

Seed mix shall be:

WETLAND SEED – OBLIGATE MIX OR FACW MEADOW MIX

Seed mix shall be MassDOT “Wetland Seed – Obligate Mix – Item 765.552” or as determined by the Wetland Specialist at time of construction.

ITEM 755.45 (Continued)

Seeding Rate: for Item 765.552

Species ecotype shall be as native to New England region as possible. Apply this mix at 20 lbs PLS/acre.

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).

Fertilizers shall not be used.

Water

The Contractor shall provide water and all equipment required at no extra cost. Water shall be suitable for irrigation and free from ingredients harmful to plants and wildlife. Water from the adjacent water bodies or waterways shall not be utilized. It is the Contractor's responsibility to correct injury or damage due to the lack of water, too much water, or use of contaminated water.

CONSTRUCTION METHODS & SEQUENCE

Site Protection Prior to Impacts

Prior to any land work, as part of the initial site-walk, the Wetland Specialist shall photo-document the site and provide a summary report of existing conditions as outlined under Item 755.75 Wetland Specialist.

Where and as required vegetation shall be cut flush and area surveyed to establish pre-construction elevations.

ITEM 755.45 (Continued)**Restoration Upon Completion of Roadway Construction Work**Sediment Barriers

If required for sediment control during Restoration work (i.e, tilling is required to restore soil), sediment barriers shall be installed along the downslope perimeter of the Restoration Area beginning and ending in the surrounding upland so that no disturbed soil can enter adjacent wetlands or waters. Sediment barriers shall be in place and approved by the Engineer prior to any soil disturbance. No work shall take place outside the barriers.

Removal of Fill and Grading

Fill and temporary separation fabric or mats shall be removed and disposed of as specified under the respective items.

If required, grades shall be restored to pre-construction elevations as shown in the baseline survey or as required by the Engineer and Wetland Specialist to restore hydrologic functions. Final elevations shall be approved by the Engineer prior to soil preparation and seeding. Grading shall be incidental to this item.

Following approval of grading to elevations required, soil shall be prepared and seeded as follows.

Soil Scarification

(Recommended where impacts or area is minimal).

Compacted soil shall be scarified with equipment approved by the Engineer. Upon approval of soil scarification, the area shall *be seeded with Compost Blanket* as specified below. Seeding shall immediately follow soil preparation.

Seeding with Compost Blanket

Application of compost blanket and seed shall be done as one application and shall not begin until the Engineer has approved the site and soil conditions. The Contractor shall notify the Engineer when raked areas are ready for inspection and application of compost blanket and seed.

Compost shall be pneumatically applied (blown on) to a depth of one half to one inch at the same time that seed is broadcast such that seed is covered by a light application of compost.

Seed tags shall be submitted at time of seeding.

ITEM 755.45 (Continued)**SEED ESTABLISHMENT**

Seeding that fails to establish according to the conditions of acceptance below shall be overseeded as required by the Engineer. Washouts and channels shall be repaired and stabilized prior to overseeding. Excessive weed growth shall be pulled out by the roots or, with approval from the Engineer, cut prior to over-seeding. Soil repair and weed control are incidental to this item.

CONDITIONAL ACCEPTANCE OF WORK

Conditional Acceptance shall indicate approval of the wetland restoration work and agreement that work has been done according to plan or modified as approved.

Upon completion of construction, the Contractor shall submit a Request for Conditional Acceptance that includes a brief narrative from the Wetland Specialist (if applicable to project) demonstrating that the wetland restoration work was done according to plans (or how modified) and meets required permit conditions (if applicable). The narrative shall include photo-documentation of pre-construction conditions as well as soil work, planting, and seeding. Seed tags shall be submitted as part of the Request for Conditional Acceptance.

Upon receipt of a Request for Conditional Acceptance, the Engineer, the Wetland Specialist, and regulatory representative (if required) shall assess the Restoration Area and the surrounding areas. At a minimum, the following conditions shall be included in the narrative and reviewed as part of the on-site assessment of whether:

- The target elevations have been restored per the survey or adjusted per the Engineer. Areas that are too high or too low should be identified along with suggested corrective measures.
- Soil compaction has been mitigated.
- Soils are stabilized and there is no sediment in the wetland and no channeling of slopes.
- Hydrology meets performance standards and has been adequately restored.
- Specified seed mix has been seeded and seeded species in the wetland and adjacent upland show signs of good germination and healthy growth.
- There are no invasive plants visible in the restored wetland area.
- Silt fence and non-biodegradable sediment barrier materials have been removed.

Upon approval that the work meets the above conditions, MassDOT will issue a letter of Conditional Acceptance. If the Wetland Restoration work is not approved, MassDOT will issue a rejection letter requiring corrective actions. Work not approved shall be addressed by the Contractor at no extra cost.

Erosion of adjacent slopes or the flow of sediments into the wetland between Conditional and Final Acceptance shall be immediately addressed by the Contractor.

ITEM 755.45 (Continued)**FINAL ACCEPTANCE OF WORK**

Following one full growing season, the Contractor shall submit a Request for Final Acceptance. Submittal shall include a brief narrative of conditions. Upon receiving the Request, the Engineer, Wetland Specialist and regulatory representative (if required) shall assess the Restoration Area. Final Acceptance will initiate the start of the Monitoring Period (if required).

The following conditions shall be inspected and approved for acceptance and payment:

- Hydrology is functioning as intended.
- The desired seeded species are establishing well and cover 100 percent of the restoration area, excluding areas of open water, large boulders or planned bare soil.
- No sediments have entered the wetland.
- Adjacent slopes are stabilized with desirable vegetation.
- There are no visible invasive plants.

If the restoration work is not approved, MassDOT will issue a rejection letter requiring corrective action. All costs associated with corrective measures and plant replacement shall be incidental to this item with no additional compensation. Work not approved shall be addressed by the Contractor at no extra cost.

MONITORING REPORTS FOR REGULATORY COMPLIANCE

Post wetland construction Monitoring Reports shall be completed and submitted by the Wetland Specialist as specified and compensated under Item 755.76 Wetland Monitoring Reports.

Generally, the following conditions shall be met upon each inspection:

- Hydrology is functioning as intended, relative to the preexisting condition of the restored wetland.
- Seeded species are establishing well and cover 100 percent of the area, excluding areas of open water areas or planned bare soil.
- No sediments have entered into wetland.
- Adjacent slopes are stabilized with desirable vegetation.
- There are no visible invasive plants.

If, at the end of the required monitoring period, the requirements have not been met and success of the wetland replication area has not been achieved as determined by the Monitoring Reports, the Contractor shall provide corrective measures. All costs associated with corrective measures and plant replacement shall be incidental to this item with no additional compensation.

ITEM 755.45 (Continued)

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Item 755.45 will be paid for at the Contract unit price per Square Yard, which price shall include all labor, materials, compost and amendments, seed, mulch, equipment, submittals, maintenance, grading, and incidental costs necessary to complete the work as required.

Payment shall be as follows:

- 50% upon completion of soil preparation and seeding
- 25% upon Conditional Acceptance
- 25% upon Final Acceptance or approval of the Engineer

Excavation of temporary fill will be paid under Item 120.

Sediment Control Barrier will be paid under Item 767.121

Compost Blanket will be paid under Item 751.73

Wetland Specialist will be paid under Item 755.75

Wetland Monitoring Reports for follow-up monitoring will be paid under Item 755.76

ITEM 755.75**WETLAND SPECIALIST****HOUR**

Work under this Item shall be for services of a Wetland Scientist, Wetland Ecologist, Restoration Ecologist, or other professional with similar qualifications hereafter referred to as the “Wetland Specialist.”

“Wetland Mitigation” shall be used herein for applicable wetland work. For this project, applicable wetland work is for: Item 755.35: Inland Wetland Replication Area.

The Wetland Specialist shall demonstrate knowledge and expertise to coordinate and oversee all work associated with the Wetland Mitigation as defined herein, as shown on the Plans, as required by permits, and as specified under the relevant Wetland Mitigation items.

Regulatory monitoring reports following Final Acceptance of the Wetland Mitigation shall be per Item 755.76, Wetland Monitoring Reports.

For all onsite work, the Wetland Specialist shall sign in and sign out with the Engineer.

The Wetland Specialist shall not be from the same company as the company responsible for planting, seeding, and/or maintaining the wetland.

QUALIFICATIONS

The Wetland Specialist shall have a minimum of five (5) years of experience with construction and monitoring of wetland mitigation areas similar in size, type, and complexity to the Contract mitigation. When required by permits, at least ten (10) years of experience may be required. The Wetland Specialist shall be thoroughly versed in the Commonwealth of Massachusetts Wetlands Protection Act (MGL C.131, s.40), U.S. Army Corps of Engineers New England District Compensatory Mitigation Guidance, and all other relevant regulations of the Massachusetts Department of Environmental Protection and the U.S. Army Corps of Engineers New England District.

SUBMITTALS - QUALIFICATION

Within sixty (60) days following the Notice to Proceed, the Contractor shall provide proof of qualifications for the Wetland Specialist to the Engineer for approval. Submittals shall include, but not be limited to, the following:

- Resume of the individual on-site implementing the Wetland Specialist work. If the Wetland Specialist changes over the course of the project, the new individual shall submit resume and qualifications for approval 30 days prior to doing any work on-site.
- Resume of any personnel working on-site in place of the Wetland Specialist. Individual shall be approved prior to work on-site.
- Narrative describing the company, its expertise, technical qualifications and experience with wetland construction.
- At least three (3) references from prior work of a similar nature completed in the last five (5) years and by the individuals who will perform the work. Provide contact information for each reference including address, phone number and email.

ITEM 755.75 (Continued)

- A summary of each reference project including nature of the work, project size, dates, and period of construction and monitoring, methodologies used, and summary of success (or not) in terms of meeting performance objectives. Summary shall include a minimum of one before and one after photo for each project.

SUBMITTALS – DOCUMENTATION AND REPORTS

Wetland Construction Oversight

Wetland Specialist shall provide documentation of pre-existing conditions and wetland construction as specified below and as part of fulfilling the Scope of Work described below. Documentation shall include photos that are clear and legible. Photos are incidental to this item.

- ***Site Walk Prior to Disturbance and Construction of Wetlands:*** Provide brief assessment with photos, including documentation of the existing wetlands to be impacted (both permanent and temporary), proposed wetland replication area, and reference/model wetland areas (typically an adjacent undisturbed wetland or the existing wetland to be impacted). Photos of existing wetlands that will be temporarily impacted shall include a view from at least 3 angles.
- ***Excavation and Grading:*** Documentation shall include minimum of two photos of the excavated wetland and two photos after final grading prior to planting and seeding. For restoration areas, photos shall show soil preparation (i.e, tilling and grading), if applicable.
- ***Approval of Subgrades:*** The Wetland Specialist shall inspect the sub-grade of the Replication Area to ensure that proper hydrology is likely to be established and shall provide the Engineer with written confirmation and photographs upon completion of subgrade excavation work. Written confirmation shall include recommended field adjustments, based on field observations, to achieve the desired hydrology and designed wetland system.
- ***Planting and Seeding:*** Provide assessment and photos of vegetation upon completion of planting and seeding work.
- ***Data logger output from Monitoring Wells*** shall be submitted with reports, if applicable and requested.

Wetland construction documentation and reports shall be submitted with Request for Conditional Acceptance and for the Order of Conditions, Water Quality Certifications, and other regulatory permits as required.

Requests for Acceptance of Work & Regulatory Compliance

The Wetland Specialist shall submit the following documents if and as specified herein and under Item the relevant Wetland Mitigation items:

- Request for Conditional Acceptance.
- Request for Certificate of Compliance (Partial or Full) when applicable.
- Request for Final Acceptance.

ITEM 755.75 (Continued)**SCOPE OF WORK**

In the event of discrepancies with the applicable permits, the Wetland Specialist shall submit a Request for Information (RFI) to the Engineer.

General

The Wetland Specialist shall be responsible for the following:

- Review and have a comprehensive knowledge of the environmental permits relevant to the specific mitigation work being done so as to ensure compliance throughout the duration of the contract.
- Identify and inform the Contractor and Engineer of unique site conditions which may require adjustments to the schedule, design, or construction methods. For example, wildlife nesting, illegal dumping, or rare species.
- Identify and inform the Contractor and Engineer of any sediment or erosion control problems observed within mitigation areas.
- Advise so as to avoid impacts to adjacent areas and regulated wetland resources.
- Participate in necessary meetings as required by permits and when requested by the Engineer.

Inspections & Construction Oversight

The Wetland Specialist shall be responsible for, but not limited to, the following:

- Pre-Construction Site Walk
 - Following surveying, flagging, and staking of all relevant boundaries and elevations by the Contractor, the Wetland Specialist shall walk the site with the Engineer and the Contractor to review existing and proposed conditions, recommend changes if necessary, and approve the following: location and boundaries of the Mitigation Area, target elevations and grades, location of tree protection associated with the Mitigation Area, and final layout and limits of clearing for access route.
 - Select and mark snags, logs, and woody material to be retained for placement in the Wetland Mitigation, as appropriate.
 - Note invasive plants in and adjacent to Wetland Mitigation.
 - Provide summary report if and as specified under Wetland Mitigation items.
- Excavation, Soil Placement, Grading for Replication Areas
 - Approve excavated depth and grading for appropriate wetland hydrology, subsoil preparation, and finished grade of placed wetland soil.
 - Adjust grades as required and approve microtopography. If grades need to be adjusted, submit an RFI to the Engineer.
 - If requested by the Engineer, the Wetland Specialist shall inspect stockpiled wetland soil for moisture content and signs of undesirable weeds.
- Soil Protection and Restoration Measures for Restoration Areas
 - Review and approve methods of soil protection and restoration if required.
 - Confirm decompaction will adequately restore appropriate wetland hydrology. If decompaction measures need to be adjusted, submit an RFI to the Engineer.

ITEM 755.75 (Continued)

- Re-vegetation of Mitigation Area
 - Placement of woody material to be re-used.
 - Verify seed used complies with specifications and site conditions, determine limits for wetland seeding based on elevations, approve seeding and mulching methods, and collect seed tags to submit with Request for Conditional Acceptance.
 - Review planting methods (if applicable) prior to installation and oversee layout of wetland plants.

Conditional Acceptance

Upon completion of construction of the wetland, as part of the Request for Conditional Acceptance, the Wetland Specialist shall provide a brief narrative demonstrating that the wetland construction work was done according to plans (or how modified) and meets the conditions required for acceptance as specified under the Wetland Mitigation items. Submittal shall include a report and photo documentation of pre-construction conditions, construction work, seeding, planting, and other work as specified under the Wetland Mitigation items. Photos of completed Wetland Restoration areas shall include the same views as the pre-construction reference photos.

Upon receipt of a Request for Conditional Acceptance, the Engineer, the Wetland Specialist and regulatory representative (if required) shall assess the Wetland Mitigation and surrounding area to ensure that it meets the conditions specified under the Wetland Mitigation items.

Upon approval, MassDOT will issue a letter of Conditional Acceptance. If the Wetland Mitigation work is not approved, MassDOT will issue a rejection letter requiring corrective action. The Wetland Specialist shall recommend corrective actions.

Request for Certificate of Compliance

If required, a Request for Certificate of Compliance shall be prepared and submitted to the Engineer immediately following Conditional Acceptance. Request shall be as specified under the relevant Wetland Mitigation items.

Request for Final Acceptance

Following one full growing season, the Wetland Specialist shall provide a brief narrative of the status of the Wetland Mitigation to be submitted with the Request for Final Acceptance.

Upon receipt of the Request, the Engineer, the Wetland Specialist and regulatory representative (if required) shall assess the Wetland Mitigation and surrounding area to ensure that it meets the conditions specified under the relevant Wetland Mitigation items.

If the Wetland Mitigation is not approved, MassDOT will issue a rejection letter requiring corrective action. The Wetland Specialist shall recommend corrective actions.

ITEM 755.75 (Continued)

METHOD OF MEASUREMENT

Item 755.75 Wetland Specialist shall be measured per hour for on-site service provided by the Wetland Specialist.

Work shall include all inspections, photos, submittals, and associated tasks for construction and restoration oversight, narratives for Conditional and Final Acceptance, Request for Certificate of Compliance (Partial or Full) if required, documentation required for permits, and all other work specified above. Payment shall not include travel time or time spent off-site on reports. Decimal Pay Limits will be 0.25 hours.

BASIS OF PAYMENT

Item 755.75 Wetland Specialist shall be paid at the Contractor bid price for each hour, or fraction thereof, spent on-site to perform the work as described above. Reports and photo documentation are required for payment.

Post wetland construction reports shall be per Item 755.76, Wetland Monitoring Reports.

ITEM 755.76**WETLAND MONITORING REPORTS****LUMP SUM**

Work under this item shall be for the submittal of Wetland Monitoring Reports following the completion of wetland construction and shall include all inspections, photos, and other work required to complete those reports as specified herein.

“Wetland Mitigation” shall be used herein for applicable wetland work, whether Wetland Replication (creation of a new wetland) and/or Wetland Restoration (restoration after temporary impacts).

The Contractor shall retain the services of a Wetland Scientist, Wetland Ecologist, Restoration Ecologist, or other professional with similar qualifications, hereafter referred to as the “Wetland Specialist,” to complete the Wetland Monitoring reports. Wetland Specialist shall meet requirements specified under Item 755.75 Wetland Specialist.

All on-site Wetland Specialist services required to complete the construction and revegetation of the wetland replication, including preparation and submission of monitoring reports during construction, shall be per Item 755.75 Wetland Specialist.

SCOPE OF WORK**Post-Construction Wetland Monitoring Reports**

Final Acceptance of the wetland construction work as specified under item 755.35 shall initiate the beginning of the Monitoring Period.

Inspections and reports shall be performed to ensure compliance with mitigation requirements defined under the relevant Replication Area items and with all applicable environmental permits. Monitoring reports shall cover the following:

- Identification of all plant species present
- Percent cover for each plant species and overall percent surface area cover by indigenous wetland plant species for replication area and upland
- Description of the viability, health, and vigor of installed plants as well as volunteer plant species within the replication areas
- Description of remedial measures taken to ensure criteria are met
- Depth to apparent water table and/or depth of surface inundation, both as measured from the soil surface and data loggers, as appropriate.
- A conclusion regarding the success of the wetland mitigation area relative to the performance standards at 310 CMR 10.55(4)(b) (unless varied), the design plans, and performance criteria established by MADEP in the variance conditions (when applicable), and the reference wetland.
- Recommendation for a corrective plan of action if needed.

ITEM 755.76 (Continued)

Reports shall be submitted to the Engineer as a digital copy in Portable Document Format (PDF) unless otherwise requested. Hard copies shall be provided as requested by the Engineer. All reports shall be marked with the applicable permit numbers and identifying information as required in the permits. Reports shall include photo documentation of the wetland/s being monitored and shall include a minimum of 3 views from different orientations. Views shall be labeled.

Spring Reports, when required, shall be submitted to the Engineer by July 1 for dispersal to the appropriate permitting agencies.

End of Year Reports (which may serve as the Fall Report) shall be based on inspections that occur prior to October 15th. Reports shall be submitted to the Engineer no later than November 1 of each year.

Monitoring Reports shall be as follows for 2 years:

- MassDEP: 2 Reports – 1 spring and 1 end of year
- ACOE: 2 Reports – 1 spring and 1 end of year
- Conservation Commission: 2 Reports – 1 spring and 1 end of year

BASIS OF PAYMENT

Item 755.76 Wetland Monitoring Reports and associated inspections will be paid for at the Contract unit price per Lump Sum and shall include all labor, materials, equipment, and all incidental costs required to complete the work. Lump Sum will be paid in equal installments of the Lump Sum divided by the number of reports submitted. Payment shall be upon submittal and acceptance of each report, based on the following schedule:

- Year 1 = 2 Reports
- Year 2 = 2 Reports

ITEM 756. NPDES STORM WATER 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.

In addition to the CGP requirements for inspections, MassDOT requires inspection of all erosion controls and site conditions on a weekly basis. Inspections are also required at portions of sites that discharge to sediment or nutrient impaired or high quality waters per the CGP when each incidence of rainfall exceeding 0.25 inches in twenty-four hours or after snowmelt discharge from a storm event that produces 3.25 inches or more of snow within twenty-four hours occurs. 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 conditions 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.

Compensation

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 NPDES Stormwater Pollution Prevention plan. Payment of forty (40) % of the contract price shall be made in equal installments over the expected duration of stormwater pollution prevention measures. 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.

<u>ITEM 765.11</u>	<u>SEEDING TURF / LAWN MIX</u>	<u>SQUARE YARD</u>
<u>ITEM 765.411</u>	<u>SHORT GRASSLAND MIX</u>	<u>POUND</u>
<u>ITEM 765.414</u>	<u>LOW GROWING SHOWY UPLAND MIX</u>	<u>POUND</u>
<u>ITEM 765.552</u>	<u>WETLAND SEED – OBLIGATE MIX</u>	<u>POUND</u>
<u>ITEM 765.554</u>	<u>URBAN RAIN GARDEN MIX</u>	<u>POUND</u>

Work under these items 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 765.11 and 765.411 through 765.554 (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 MIXES**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

SEEDING – TURF LAWN MIX

Seed mix shall be MassDOT standard materials Table M6.03-1 from the latest edition and carried under this project as Item 765.11. Turf grass shall be fescues, blue grass and perennial ryes.

ITEMS 765.11 and 765.411 through 765.554 (Continued)

Native Seed Mixes shall be as listed below and as specified on the MassDOT website or as provided by the MassDOT Landscape Design Section.

- chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://www.mass.gov/doc/massdot-native-upland-mixes/download
- chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://www.mass.gov/doc/massdot-wetland-seed-mixes/download

SHORT GRASSLAND MIX

Seed mix shall be MassDOT “Short Grassland Mix – Item 765.411”

Seeding Rate: for Item 765.411

Species ecotype shall be as native to New England region as possible. Apply this mix at 15 lbs PLS/acre.

LOW GROWING SHOWY UPLAND MIX

Seed mix shall be MassDOT “Low Growing Showy Upland Mix – Item 765.414”

Seeding Rate: for Item 765.414

Species ecotype shall be as native to New England region as possible. Apply this mix at 15 lbs PLS/acre.

URBAN RAIN GARDEN MIX

Seed mix shall be MassDOT “Urban Rain Garden Mix – Item 765.554”

Seeding Rate: for Item 765.554

Species ecotype shall be as native to New England region as possible. Apply this mix at 12 lbs PLS/acre.

WETLAND SEED – OBLIGATE MIX OR FACW MEADOW MIX

Seed mix shall be MassDOT “Wetland Seed – Obligate Mix – Item 765.552” or as determined by the Wetland Specialist at time of construction.

Seeding Rate: for Item 765.552

Species ecotype shall be as native to New England region as possible. Apply this mix at 20 lbs PLS/acre.

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.

ITEMS 765.11 and 765.411 through 765.554 (Continued)**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

Item 765.11 – Seeding Turf / Lawn Mix per MassDOT standard materials Table M6.03-1, will be measured for payment by the square yard of successful establishment of turf lawn as defined by the standard specifications.

Item 765.411 - Short Grassland Mix will be measured for payment by the pound of Pure Live Seed delivered and complete in place.

Item 765.414 – Low Growing Showy Upland Mix will be measured for payment by the pound of Pure Live Seed delivered and complete in place.

Item 765.554 – Urban Rain Garden Mix will be measured for payment by the pound of Pure Live Seed delivered and complete in place.

Item 765.552 – Wetland Seed – Obligate Mix will be measured for payment by the pound of Pure Live Seed delivered and complete in place.

All seed mixes 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 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 765.635 Native Seeding and Establishment.

Mowing of seed mixes during establishment will be paid for separately under Item 765.664 Mowing.

ITEMS 765.11 and 765.411 through 765.554 (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 (PLS¹):

_____ **Total Pounds PLS**

Engineer: Verification at Time of Application

Number pounds delivered to site²: _____ Date(s): _____

Actual Seed Bag Tag/s Received or photo documented by Engineer: _____

¹ PLS=% pure seed x % viable seed (total germination, hard seed, and dormant seed).

²Quantity delivered should match pounds **Total Pounds PLS and Verification of Seed Delivery**. Pounds should be shown on each Seed Tag.

ITEMS 765.11 and 765.411 through 765.554 (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 765.21 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 and at the rate specified herein.

- Used with 765.411 Short Grassland Mix
- Used with 765.414 Low Growing Showy Upland Mix

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:

Avena sativa (Grain Oats): 1 January to 31 July
Cecale cereale (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

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.

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 regraded to a relatively 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.

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.

ITEM 765.635 (Continued)

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 an acre in size or with permission of the Engineer.

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.

ITEM 765.635 (Continued)

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.

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 7th and August 1st, 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.

ITEM 765.635 (Continued)

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.

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.

ITEM 765.635 (Continued)**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 1st. All remediation shall be at the contractor's expense.

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 paid as specified under Item 765.664.

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 765.664 MOWING FOR NATIVE SEED ESTABLISHMENT SQUARE YARD

DESCRIPTION

Item 765.664 Mowing for Native Seed Establishment shall be used solely for the purpose of weed management for upland native seed establishment, only when required by the Landscape Architect and the Engineer, and only during the period prior to weed seed dispersal as specified herein unless otherwise directed.

METHODS

Mowing shall be completed after weeds have sprouted and show leaf and bud growth, but prior to setting seed, generally between July 7th and August 1st, 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 not occur when ground or grasses are wet. 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.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Mowing for Native Seed Establishment will be measured for payment per Square Yard of area mowed complete in place.

Mowing for Native Seed Establishment will be paid at the contract unit price per Square Yard of area mowed and upon completion during the approved period for mowing as described under Methods. Payment shall include all labor, materials, equipment, traffic controls, and all incidental work required for satisfactory completion of mowing.

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.

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.

ITEM 767.121 (Continued)**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 only 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 in order 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.

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.

ITEM 767.121 (Continued)**Sedimentation Fence**

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 in order 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.

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.

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.

ITEM 767.121 (Continued)

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.

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 Contractors expense.

Sedimentation fence used in conjunction with compost filter will be measured and paid for separately under Standard Item 697, Sedimentation Fence.

ITEM 767.122**SEDIMENT BARRIER – COIR LOG****FOOT**

The work under this item shall conform to the relevant provisions of Subsections 101, 120, 170, and 751 of the Standard Specifications and the following:

Sediment Barrier - Coir Log shall be used in wet locations where the barrier will not require removal; when barrier is placed immediately adjacent to existing wetlands; as a check dam in swales; in locations as shown on the Drawings; and/or in locations required by the Engineer.

Permits, Codes and Regulations: The Contractor shall comply with all rules, regulations, laws and ordinances of the City/Town and State, and all other authorities having jurisdiction over the Project site. All labor, materials, equipment, and services necessary to make the work comply with such requirements shall be provided by the Contractor without additional cost to the Department.

MATERIALS

Coir Log: Coir Log shall be biodegradable coir fiber cylindrical bundles. Inner core shall be 100 percent unsorted, well-cleaned, coir fiber uniformly distributed along the length of the log. The stuffed density of the coir fiber shall be a minimum of 9 pounds per cubic foot.

Outer netting shall be constructed from a minimum 3-ply high strength coir bristle twine. The netting shall have 2-inch by 2-inch rhombic openings with hand-knotted junctions. The average breaking strength of the coir twine shall be a minimum of 80 pounds. Production tolerance for all the above parameters shall not exceed plus or minus 10 percent.

Coir log diameter shall be sized as shown on the drawings. Typical lengths are supplied in 10 foot or 20-foot increments. Coir logs or coir netting may not be cut to decrease length and shall maintain the physical properties as supplied by the Manufacturer.

Notched Wood Stakes: Stakes shall be oak or southern pine with dimensions as shown on the Drawings. Stakes shall be free from knots and other defects which would cause splitting and shall have a downward-angled notch as shown in the drawing.

Coconut Fiber Cord: Coconut fiber cord shall be two-ply braided cord with a breaking strength of 80 pounds, minimum 0.25-inch diameter.

Delivery, Storage and Handling: Protect materials from deterioration during delivery and while stored at site.

CONSTRUCTION METHODS

General: Prior to initial placement of the coir log sediment barrier, the Contractor and the Engineer shall review locations specified on the plans and adjust placement, if required, to ensure that the coir log positioning and configuration will provide maximum sediment capture. Coir log sediment barrier(s) shall be in place prior to excavation work and no work shall take place outside the coir log barrier(s).

ITEM 767.122 (Continued)

Installation: Coir logs shall be staked and secured as shown on the Drawings, as specified herein, and/or as recommended by the Manufacturer. The Contractor shall remove all underlying vegetation or debris to ensure that each coir log is securely in contact with soil, such that there is no flow beneath the log.

When used as a check dam barrier in a swale, the coir log shall be centered in the low point of the swale, perpendicular to the flow, with ends extending upslope. The log check dam barrier shall extend such that the log top elevation at the center of the swale is lower than the lowest elevation at the end log, to ensure that sediment-laden runoff will flow either through or over the coir log but not around it. The coir log check dam barrier shall have length such that no seams occur in the swale.

Notched wood stakes shall be driven parallel on both sides of the coir log at a typical spacing of 5 feet on center, unless site conditions warrant a closer spacing distance to ensure logs are firmly secured to the underlying soil. Stakes shall not extend more than 1 foot beyond the top of the log. Coir twine shall lash the logs to notched stakes in a cross-lashing fashion between stakes, throughout the length of the log barrier.

When utilizing multiple logs for sediment control, each coir log shall be laced together end-to-end (creating a seam) with coir twine to create a continuous length. End-to-end lacing may be completed before or after placement, to facilitate handling.

Maintenance: Maintenance of the coir log sediment barrier shall be per the Stormwater Pollution Prevention Plan (SWPPP).

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. The Contractor shall be responsible for ensuring that an effective barrier is in place and working effectively for all phases of the Contract. Under no condition shall sediment be allowed to accumulate more than 4 inches above the original ground line.

If a breach or other failure of the barrier occurs, the barrier shall be immediately restored. Repair shall include replacement of entire defective segments or for short breaches, revetment with additional coir logs, set directly adjacent to the downslope side of the breach. Revetment coir logs must overlap breach by a minimum of 2 feet on each side. The Engineer must approve breach repair means and methods as well as outcome.

If the coir log sediment barrier is damaged by equipment or undergoes a significant washout or other major failure, the Contractor shall replace the component in its entirety, at the discretion and approval of the Engineer. Any delay in maintaining the barrier shall be cause to immediately suspend the work as provided for in Subsection 8.09: Delay and Suspension of Work.

Disposition/Removal: For naturalized areas, coir logs and wooden stakes may be left in place to decompose on-site. For areas where, in the determination of the Engineer, aesthetics are a concern, logs, errant coir fiber material, and stakes may require removal.

ITEM 767.122 (Continued)

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Item 767.122 Sediment Barrier - Coir Log will be measured for payment by the FOOT, complete in place and will be paid for at the Contract unit price per FOOT, which price shall include all labor, materials, equipment, and incidental costs required to complete the work.

No separate payment will be made for coir log(s) follow-up maintenance and repairs, or disposal (if required), but all costs in connection therewith shall be included in the Contract unit price bid.

ITEM 801.72 **2 INCH ELECTRICAL CONDUIT TYPE FRE** **FOOT**

The work under this Item shall conform to the relevant provisions of Subsection 801 of the Standard Specifications, and the following:

CONSTRUCTION METHODS

The work shall include furnishing and installing a 2-inch FRE conduit for Lighting Installation as shown on the plans and as required by the Engineer.

The 2" FRE conduit shall be placed between the junction boxes and installed along the side of Bridge Nos. L-04-030 and L-04-045, as shown in the Plans.

The 2" FRE conduit shall be placed between the junction boxes and within the cast-in-place precast deck panel closure pour at Bridge No. L-04-032, as detailed in the Plans.

METHOD OF MEASUREMENT

Item 801.72 will be measured for payment as specified in Subsection 801.80 of the Standard Specifications.

BASIS OF PAYMENT

Item 801.72 will be paid for at the Contract unit prices per Foot, which prices shall be full compensation for furnishing and installing conduit(s) of the appropriate size and kind, excavation, backfill, compaction, pull wires and concrete encasement at roadways and drives.

ITEM 804.2 2 INCH ELECTRICAL CONDUIT TYPE NM – PLASTIC (UL) FOOT

The work under this Item shall conform to the relevant provisions of Subsection 801 of the Standard Specifications, and the following:

CONSTRUCTION METHODS

The work shall include furnishing and installing a 2-inch conduit for Lighting Installation as shown on the plans and as required by the Engineer.

The 2” conduit shall be placed between the pull boxes, lighting poles, and lighting load centers. Coring through the concrete wall adjacent to Manchester Street for connection to the existing lighting load center shall be considered incidental to the work as well as any material used to fill and seal around the conduit.

METHOD OF MEASUREMENT

Item 804.2 will be measured for payment as specified in Subsection 801.80 of the Standard Specifications.

BASIS OF PAYMENT

Item 804.2 will be paid for at the Contract unit prices per Foot, which price shall be full compensation for furnishing and installing conduit(s) of the appropriate size and kind, excavation, backfill, compaction, pull wires and concrete encasement at roadways and drives.

No separate payment shall be made for coring through the concrete wall adjacent to Manchester Street for connection to the existing lighting load center. All materials for this connection shall be considered incidental.

ITEM 804.41**4 INCH ELECTRICAL CONDUIT
TYPE NM - FIBERGLASS (UL)****FOOT**

The work under this Item shall conform to the relevant provisions of Subsection 801 of the Standard Specifications and the following:

In addition to the relevant provisions of Section 800 of the Standard Specifications, the work under these Items shall conform to the relevant standards of the coordinating utility companies, as included in the appendix to these special provisions. Where a utility owner has not provided a standard, the work for that utility shall conform to the relevant standards of AT&T.

Fiberglass conduit shall be constructed where utilities are to be located on bridges in final conditions.

FIBERGLASS CONDUITS

The work under this heading consists of providing bridge mounted fiberglass utility conduits as shown and detailed on the Plans.

The conduits shall be fiberglass reinforced Epoxy (FRE), TYPE IPS, conforming to NEMA TC-14B, UL1684, ultraviolet inhibitor, and shall have a heavy wall thickness.

The conduits shall have a minimum ultimate tensile strength of 11,000 psi when tested in accordance with ASTM D 2105.

The minimum strength of the joints shall be equal to the conduit tensile strength when tested in accordance with ASTM D 2105.

Every joint shall be glued with a two-component epoxy adhesive. The expansion joints shall be socket x spigot with O-ring, and shall be installed in front of each abutment and pier to allow for thermal movements. The joints shall be taped during construction to ensure they remain in position. The Contractor shall remove the tape after construction is completed.

Holes that are field drilled in the structural steel must be coated with an approved coating compatible with the galvanized or metalized coating.

The conduit support system shall be equipped with FRP flat bars and FRP round tubes, where applicable. All steel hardware for the conduit support system, including rods, washers and nuts, shall be 316 stainless steel, unless noted otherwise.

The conduits included with this Item shall be measured from a point at 5-foot behind the back of each abutment, and paid by the lump sum price for all conduits installed, including all adhesives, conduit supports, expansion joints, fittings, and any miscellaneous materials to complete the installation.

ITEMS 804.41 (Continued)

COORDINATION

The Contractor shall coordinate with the Utility Owners to allow for their installation and removal of utilities from their existing location on the bridge.

The Contractor shall coordinate with each Utility Owner and allow time to schedule for their installation of utility lines and cables.

Existing utility services shall not be removed or interrupted to complete this work.

Utility owners Comcast, AT&T, and Lawrence shall complete work to pull utility cables through the conduit and manholes constructed under these Items.

METHOD OF MEASUREMENT

Item 804.41 will be measured for payment as specified in Subsection 801.80 of the Standard Specifications.

BASIS OF PAYMENT

Item 804.41 will be paid for at the Contract unit price per Foot, which price shall include all materials, labor, fittings, sleeves, supports and rollers, excavation, backfill, coordination, and all incidental costs required to complete the work.

ITEM 804.42 **36 INCH SWEEP AND MANHOLE CONNECTION** **LUMP SUM**

The work under this Item shall conform to the relevant provisions of Subsection 800 of the Standard Specifications, and the following:

CONSTRUCTION METHODS

The work shall include 36 inch sweeps from the proposed Verizon Conduit on Lowell Street which will be 4 inch schedule 40 concrete encased as shown on the plans and as required by the Engineer. The Contractor shall install and properly cap the telephone conduit as telephone manholes 255 and 266.

Work may also include breaking into telephone manholes 255 and 266. The Contractor is required to coordinate the work with Verizon before entering either manhole.

BASIS OF PAYMENT

Item 804.42 will be paid for at the Lump Sum Contract unit price, which price shall be full compensation for furnishing and installing required conduit sweeps, excavation, backfill, and compaction.

No separate payment shall be made for coring through the concrete wall adjacent to Manchester Street for connection to the existing lighting load center. All materials for this connection shall be included in the Contract unit price bid..

ITEM 811.39 ELECTRIC HANDHOLE REMOVED AND STACKED EACH

The work under this item shall conform to the relevant provisions of Subsection 800 of the Standard Specifications and the following:

The work shall consist of the removal of existing electric handholes / pull boxes as noted on the plans and where required by the Engineer. All components of the electric handholes / pull boxes including, but not limited to, frame / cover, concrete, reinforcing steel, ground rods, and pulling irons shall be removed.

The holes shall be backfilled with suitable material approved by the Engineer.

The electric handholes / pull boxes be stacked at the Lawrence Department of Public Works, 200 Common Street, Lawrence, MA; exact location on site shall be as directed by the Engineer, in coordination with the DPW.

All components of the handhole, as determined by the City, to be unusable or not sought, shall become property of the Contractor and shall be disposed off of the construction site.

METHOD OF MEASUREMENT

Item 811.39 will be measured for payment by Each electric handhole/pull box removed and stacked.

BASIS OF PAYMENT

Item 811.39 will be paid for at the Contract unit price per Each, which price shall include all labor, materials, equipment, and all incidental costs required to complete the work.

No separate payment will be made for excavation, removal, and disposal, but all costs in connection therewith shall be included in the contract unit price bid.

Removal of existing traffic signal conduit sweeps associated with the removal of electric handholes / pull boxes, and the removal of electric handholes associated with the traffic signal will be paid for under Item 816.80.

ITEM 812.09 **LIGHT STANDARD FOUNDATION PRECAST** **EACH**

The work under this item shall conform to the relevant provisions of Subsections 801, 813 and 820 of the Standard Specifications, and the following:

The work shall include the furnishing and installation of concrete light standard foundation for street lighting system as shown on the plans, in accordance with the light pole manufacturer, and as directed.

Refer to the plans for the details of the light standard foundation dimensions and installation grade requirements.

SUBMITTALS

Submittals for light standard foundations shall be made in a timely fashion including all manufactures data sheets, and shop drawings, as applicable, and specified herein.

MATERIALS

All light standard foundations shall be constructed per Section 801.62 and M4.02.14: Precast concrete highway units of the Standard specifications, except deviations may be required based on field conditions. All deviations must be approved by the Engineer prior to making any changes.

Contractor shall remove any existing sidewalk materials, curbing and other masonry to be replaced after light pole foundation is installed. Existing soil shall be excavated out and disposed of, taking care to not damage surrounding structures, electrical conduits and other utilities. Contractor to barricade areas disturbed until fully repaired unless directed otherwise.

Cylindrical foundations for light poles shall be specified by lighting manufacture, including number, type and location of anchor bolts. Foundations shall be made of minimum 5,000 psi concrete (at 28 days) and have steel reinforcement meeting ASTM A-615, grade 60 (cover to steel, 1" minimum). Foundations shall have a minimum of two 2" PVC conduits for lighting circuits, 180 degrees apart or as directed.

Light standard foundations should be placed per the plans and positioned using an approved grade. Precast concrete foundations shall include epoxy coated reinforcing, as shown on the plans, and per the manufacturer's Structural Engineer's recommendations. Confirm exact light fixture pole base anchor bolt requirements for size, length, projection, bolt circle diameter and pattern with the pole manufacturer prior to furnish and installation and install accordingly. Anchor bolts shall be hot dipped galvanized and j-hook style. Minimum foundation diameter and depth shall be as indicated on the plans. Furnish and install galvanized rigid metal conduit in foundation and coupling and plastic type NM conduit stub out over to adjacent handhole, as shown on the plans.

ITEM 812.09 (Continued)

METHOD OF MEASUREMENT

Item 812.09 will be measured for payment by Each Light Standard Foundation installed, complete in place.

BASIS OF PAYMENT

Item 812.09 will be paid for at the Contract unit price per Each, which price shall include all labor, materials, equipment, galvanized anchor bolts, galvanized nuts and washers, rigid metal conduit, plastic Type NM conduit, elbows, sweeps, compaction and leveling, excavation (except rock), backfilling and all incidental costs required to complete the work.

<u>ITEM 813.34</u>	<u>WIRE TYPE 7 NO. 2 GENERAL PURPOSE</u>	<u>FOOT</u>
<u>ITEM 813.521</u>	<u>WIRE TYPE 10 NO. 6 GROUNDING AND BONDING</u>	<u>FOOT</u>
<u>ITEM 813.522</u>	<u>WIRE TYPE 10 NO. 10 GROUNDING AND BONDING</u>	<u>FOOT</u>

The work under these Items shall conform to the relevant provisions of Subsection 813 of the Standard Specifications and the following:

The Contractor shall be required to furnish and install all materials, equipment and labor necessary to completely wire and operate the street lighting system. All materials and wiring procedures shall conform to the specifications contained herein and to the requirements and standard practices of the Section 800 and the following:

All wire and connectors shall conform to the standards of the National Electrical Manufacturers Association or the Underwriters' Laboratories, Inc., whichever is applicable. All materials and workmanship shall conform to the requirements of the National Electrical Code, Standards of the American Society for Testing and Materials, and any local ordinances that may apply.

Wherever any reference is made to the standards mentioned above, the reference should be construed to mean the standard that is in effect on the day the Notice to Proceed to the Contractor for the work is dated.

Wire sizes shall be based on American Wire Gage (AWG), as applied to copper conductors.

SUBMITTALS

Submittals for wire and splice materials shall be made in a timely fashion including all manufactures data sheets, and shop drawings, as applicable, and specified herein.

MATERIALS

The conductor shall be composed of soft drawn 7-strand copper of the gauge shown on the drawings. The insulation shall be installed as a single jacket of cross-linked polyethylene of Underwriter's Laboratories Type USE-2 or RHH-2-RHW-2 rated at 90 degrees C continuous in wet and dry locations, 600 volt as per the National Electrical Code.

#6 AWG ground conductor shall be bare copper as specified in the standard specifications.

Wire and cable furnished and used shall be new and shall have the size, grade of insulation, voltage and manufacturer's name permanently marked on the outer covering at regular intervals. Wire and cable shall be delivered to the site in complete coils or reels with identifying size, type SS-111 and insulation tags. Wire and cable shall be protected from weather and damage during storage and handling.

ITEMS 813.34, 813.521 and 813.522 (Continued)**Splicing Materials and Methods**

Splicing shall be in accordance with the contract drawings and the standard specifications. All splices shall be suitable for wet locations, including splices in pole bases and load centers. Use of wire nuts is prohibited. Connections in the pole top shall be with insulated pressure connectors.

Construction

No wire shall be drawn in to any conduit until all work that may cause damage to the wire is complete.

All wire shall be continuous from light pole to light pole without running splices in conduits or handholes. Splices are prohibited in handholes except ground conductor.

All wire terminals, taps and splices shall be made secure with connectors, splicing materials and methods as hereinafter specified.

All incoming wires and outgoing wires in highway lighting load centers, handholes and poles shall be banded as indicated on the contract drawings.

Grounding

Coatings and rust on conduits and grounding rods shall be removed at the location where the ground fittings are to be installed.

The bare copper conductor shall be connected to the continuous insulated bonding lead, which shall be identified with green plastic marking tape as noted in the specifications. Bonding leads for lighting fixtures on poles shall be an insulated #10 AWG, marked green, which shall be extended to the nearest handhole and interconnected to the bare copper ground wire in the handhole of gauge shown on the contract drawings and the pig tail conductor shall be connected to the ground rod. The ground wire shall also connect to the ground lug on the handhole frame and be bonded to the handhole cover.

A conductor with the same insulation of the power leads shall be installed in all conduits as a continuous bond wire. All bonding leads from fixtures, pole, control boxes, fittings and ground rods shall be connected to the continuous insulated bonding lead which shall be identified with green plastic marking tape as noted in the specifications.

All grounding shall conform to the applicable provisions of the National Electrical Code.
SS-112

ITEMS 813.34, 813.521 and 813.522 (Continued)**Field Tests**

Upon the completion of each wiring system, and before any connection is made to operating equipment, the Contractor shall perform, in the presence of the Engineer, the following tests of each circuit to determine whether the installations are in acceptable working order.

- a. Tests for continuity
- b. Tests for ground
- c. Tests for insulation resistance (Megger Test) from circuit wires to ground, and between circuit wires.

Tests for ground shall be performed in accordance with the relevant provisions of Section 813 of the Standard Specifications. The entire electrical wiring system shall be tested for continuity, grounds, resistance to ground, insulation, shorts and opens. This shall be done by means of a megohm meter test.

After installation of the wiring system is complete with the required splices, the lamp ballast primary shall be disconnected and each circuit shall be tested with a 1000 volt megger. Tests on each circuit shall be between each conductor. When the measured value is less than 200 megohms between two conductors, the Contractor shall locate the point or points at fault, make proper corrections, and then demonstrate by further test the elimination of such faults. These tests shall be performed in the presence of the Engineer.

The test results shall be submitted to the Engineer for review and approval. If any results are questionable or inconsistent, the Contractor shall repeat the tests and make any necessary corrections at the request of the Engineer. No wiring system will be accepted until these are satisfactorily performed and approved.

The Contractor shall furnish the Engineer with a report of the megohm-meter readings for a permanent project record.

All tests and any necessary repairs or replacements that are indicated by the Engineer to produce a fault-free system will be performed at the Contractor's expense.

Warranties

The Contractor shall provide a performance warranty for six months on the entire work performed under this contract including the performance of all equipment and components of the roadway lighting system specified. The performance warranty responsibility of the contractor shall commence after official acceptance by the City of Lawrence or the Engineer.

NOTE: The Contractor shall be completely responsible for all maintenance, repairs and replacement of damaged equipment during the functional test and throughout the performance warranty period.

ITEMS 813.34, 813.521 and 813.522 (Continued)

If within 48 hours after notification by the Engineer of a malfunction, and the Contractor fails to make such repairs as necessary, the Engineer will undertake repairs of which all costs are to be SS-113 borne by the Contractor. The cost of any maintenance necessary, except electrical energy, shall be at the Contractor's expense and will be considered as included in the price paid for the Contract item involved and no additional compensation will be allowed therefore.

METHOD OF MEASUREMENT

Items 813.34, 813.521 and 813.522 will be measured for payment respectively by the Foot along the center line of the conduit in which the conductor is placed. No allowance will be made for the necessary lengths of slacked cable laid around the sides of manholes, handholes, junction boxes, pull boxes, or extending from foundations for making splices, taps in cable, and connecting the internal components of control cabinets. No allowance will be made for cable in controllers, light poles or other items other than conduit.

BASIS OF PAYMENT

Items 813.34, 813.521 and 813.522 will be paid for at the respective Contract unit price per Foot, which price shall include all labor, materials, equipment, furnishing, installing and connecting the street lighting cables, the grounding of the system, testing the lighting circuit wiring, grounding wire testing, and all incidental costs required to complete the work.

<u>ITEM 813.801</u>	<u>SERVICE CONNECTION (OVERHEAD)</u> <u>LOCATION NO. 1</u>	<u>LUMP SUM</u>
<u>ITEM 813.802</u>	<u>SERVICE CONNECTION (OVERHEAD)</u> <u>LOCATION NO. 2</u>	<u>LUMP SUM</u>
<u>ITEM 813.803</u>	<u>SERVICE CONNECTION (OVERHEAD)</u> <u>LOCATION NO. 3</u>	<u>LUMP SUM</u>

The work under these Items 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 City of Lawrence. The proposed service connections Locations No. 1, 2, and 3 are for proposed Load Center No. 1, Load Center No. 2, and Load Center No. 3 respectively.

The Contractor shall arrange to complete the power service connections identified in the plans and be responsible for all utility charges and permit fees incidental thereto, including any upgrades the utility company must make to their system in order to power each individual site.

The Contractor must obtain all applicable permits from the City of Lawrence, which costs shall be considered incidental to these Items.

The power service connections include connections to new public utility power services, identified in the plans. A meter socket approved by the servicing utility company shall be furnished and installed at the locations identified in the plans for new public utility services.

Each 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, wood poles as identified on plans (poles shall be installed by the utility company), the power wires from the identified power service point to the Street Lighting 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 City requirements. Wiring shall be Type XHHW-2 with XLP jacket between the power service connection points and the lighting control 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 costs associated with obtaining electrical service for this project, including the monthly electrical service fees and permits, shall be paid by the Contractor until Final System Acceptance.

The preliminary estimates provided by the National Grid for the power service connections proposed have not been obtained and will be required to be submitted by the Contractor within 120 days of notice to proceed.

ITEMS 813.801, 813.802 and 812.803 (Continued)

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 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 poles, as shown on the plans and in accordance with the local utility company's requirements paid as part of this item. All exposed conduits shall be PVC coated 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. The disconnects, and breaker panels shall be NEMA 3R #316 stainless steel enclosures. All mounting hardware shall be #316 stainless steel.

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 leave 30 feet of coiled ground wire at the base of the pole, 10' riser pole with weatherhead and coil of wire to be left at 10', for installation by the servicing utility company.

BASIS OF PAYMENT

Items 813.801, 813.802 and 813.803 will be paid for at the respective Contract Lump Sum price for all service connections and equipment listed above with all appurtenances in acceptable operating condition, which price shall include all labor, materials, wood utility poles, and 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 this Item. It should be noted that the utility company may alter the location of the service due to availability.

ITEM 813.811 ELECTRIC SERVICE RISER RELOCATION NO. 1 LUMP SUM

The work under this item shall conform to the relevant provisions of Subsection 813 and the following:

The work under this item shall consist of the removal and relocation of the existing electric service riser attached to utility pole located at STA 25+61 LT. This riser supplies secondary electrical service through underground conduit.

The Contractor shall coordinate with National Grid during the relocation of the Utility Pole.

The Contractor shall notify the respective utility company immediately following the Notice to Proceed from MassDOT to generate a Work Order for each Electric Service Riser requiring relocation. These private service relocations need to be properly coordinated with the utility to ensure that they are relocated in conjunction with their overhead relocations and to ensure that they do not delay the other utilities from relocating according to the project schedule.

The existing underground conduit shall be excavated and exposed for a sufficient distance to allow for the re-alignment of the conduit to the relocated pole as determined by the local utility company servicing the property. The existing galvanized riser and sweep at the base of pole shall be removed and become the property of the contractor to dispose of in accordance with all applicable regulations. This service shall include the first 10' of the riser on the described utility pole, the sweep, a coil of wire acceptable to the local utility company and all other materials required for the relocation including any additional conduit.

The work shall include all excavation and backfill, compaction, new riser, new conduit, a new handhole to splice service to the abutting business, new wire and materials, concrete encasement, or any other requirements in accordance with the latest edition of the National Electrical Code, the respective utility company, local codes and guidelines.

The work associated with disconnecting power and reconnecting power to the utilities secondary and power lines is the responsibility of the Contractor to coordinate with the local utility company and shall be performed at a time convenient to the property owners or tenants occupying the building. The actual time of day or evening for the disconnecting and reconnecting will be agreed upon between the Engineer, the local power company servicing this location and the property owner/tenant during construction. A representative from the contractor shall be present when this work is performed. No additional compensation shall be given for this work outside of normal work hours if required.

Removal of utility poles and the transfer of the Utilities overhead primary and secondary wiring shall be the responsibility of the respective utility company, and is not included under these items.

To initiate National Grid Electric Work Request
<https://ngus.force.com/electric/s/> or 1-800-375-7405, Option #2

ITEM 813.811 (Continued)

BASIS OF PAYMENT

Item 813.811 will be paid for at the Contract lump sum price, which price shall include all labor, materials, equipment, and all incidental costs required to complete the work. No separate payment will be made for conduit, handhole or wire, but all costs in connection therewith shall be included in the Contract unit price bid.

<u>ITEM 816.01</u>	<u>TRAFFIC SIGNAL RECONSTRUCTION</u> <u>LOCATION NO. 1</u>	<u>LUMP SUM</u>
---------------------------	---	------------------------

<u>ITEM 816.02</u>	<u>TRAFFIC SIGNAL RECONSTRUCTION</u> <u>LOCATION NO. 2</u>	<u>LUMP SUM</u>
---------------------------	---	------------------------

The work under these items shall conform to the relevant provisions of Subsection 815 of the Standard Specifications, the 2009 Manual on Uniform Traffic Control Devices for Streets and Highways (MUTCD), and the following:

The work shall include the furnishing and installation of part or all of the following items: local traffic signal controller; cabinet and foundation with concrete pad; mast arm assemblies with anchor bolts and foundations; signal posts, bases, and foundations; signal housings; retroreflective backplates; vehicular and bicycle video detection; pedestrian signals with countdown timers; accessible pedestrian signals (APS) push buttons with signage; emergency vehicle preemption; all cable and wiring; ground rods, equipment grounding and bonding; service connections; removal of existing traffic signal equipment, and all other equipment, materials and incidental costs necessary to provide complete, fully operational traffic control signal system as specified herein and as shown on the plans at the following location:

- Location 1 (Item 816.01): Broadway (Route 28) / Canal Street / Water Street
- Location 2 (Item 816.02): Broadway (Route 28) / Essex Street

A list of major traffic signal items as required at these locations is included on the traffic signal plans. It is not intended that every fitting, minor detail or feature be shown and described, as the assumption is made that the Contractor and/or their Subcontractor is an expert in the particular area of responsibility and is capable of interpreting the plans, Specifications, and Special Provisions so that the bid and/or construction shall include all items required to provide complete, fully operational traffic control signal system and that they shall be provided and installed in a neat and workmanlike manner.

All traffic signal equipment shall comply with the MassDOT Qualified Traffic Control Equipment List unless otherwise approved by the Engineer:

(<https://www.mass.gov/lists/massdot-qualified-traffic-control-equipment-qtce>)

Maintenance of Traffic Signals

It shall be the responsibility of the Contractor to provide all labor, equipment and material required for the total maintenance and repair of all existing and proposed traffic signal control equipment, including damage by automobile accidents until final completion and acceptance of the project, unless otherwise specified under Subsection 7.17 "Traffic Accommodation: of the Standard Specifications as amended, in which case Subsection 7.17 will govern. These provisions will apply to the signalized location included as part of this construction Contract from the date of written notice given to the Engineer that the Contractor will work on or adjacent to the existing signals until the date when the City and Department accepts the complete project. This written notice must be given before the Contractor may proceed with any work on a specified traffic signal location.

ITEMS 816.01 and 816.02 (Continued)

For the purpose of these Special Provisions, the phrase “Traffic Signal Control Equipment” is intended to include, but is not limited to, controllers, signal housings, supporting structures, cabinet accessories and panels, wires, conduit and all other ancillary electrical equipment used for traffic control.

Shop Drawings and Certificate of Compliance

Within 30 days following Notice to Proceed, the Contractor shall submit a list of equipment and manufacturer’s equipment specifications he proposes to install to the Engineer in accordance with the relevant provisions of Section 815.20. No equipment or accessories will be accepted unless type tested and approved by the MassDOT – Highway Division prior to the date of proposal, unless otherwise noted in the plans or the Special Provisions.

The Contractor shall commence no work until approval of the shop drawings 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 required by the plans and these specifications.

Along with the shop drawings the Contractor shall deliver to the Engineer a certificate of compliance with the manufacturer for all materials purchased from the manufacturer.

Existing Traffic Signal Installations*Broadway at Canal Street / Water Street*

All of the existing traffic signal equipment and infrastructure shall be removed and stacked, unless otherwise indicated, and paid for under Item 816.80. The Contractor shall remove and stack all existing traffic signal related pull boxes and handholes under Item 811.39. Old cable and unusable materials shall be disposed of by the Contractor at the Contractor’s expense. The existing traffic signal at the location to be reconstructed under Item 816.01 shall be maintained in operation throughout the construction period and until the new traffic signal is ready for operation. Individual traffic signal infrastructure items may be removed from operation if its proposed equivalent infrastructure item within the new traffic signal is approved/accepted and operational.

Broadway at Essex Street

All the existing traffic signal equipment shall be retained unless otherwise indicated. For those components to be removed under this item and as indicated on the plans, the existing traffic signal equipment shall be maintained in operation throughout the construction period and until the new signal equipment is ready for operation. Old cable and unusable materials shall be disposed of by the Contractor at the Contractor’s expense.

ITEMS 816.01 and 816.02 (Continued)*All Locations*

Prior to initial turn-on of the new or modified signals, equipment, signal displays, and vehicle detection as shown on the plans and called for in these special provisions, shall be installed and operable. Applicable signs and pavement makings shall also be in place when the signals are put into operation.

The Contractor may use temporary supports for signal heads as necessary to allow construction activities. Any temporary installations shall be in conformance with the MUTCD at all times. Prior to installation any temporary installations not part of the original design shall be reviewed and approved by the Engineer. This includes adjusting (relocating) traffic signal heads to accommodate maintaining traffic requirements associated during construction. As applicable, this work includes adjusting existing and temporary traffic signal heads, wiring, fittings, cabling, and all other materials and labor required to ensure complete and operating traffic signals. If an existing signal is to be turned off temporarily to allow controller switch over or rewiring, police details 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.

Service Connection

Under Item 816.02, the service connection at the intersection of Broadway / Essex Street shall be maintained.

Under Item 816.01, the service connection shown on the plans is approximate only. The Contractor shall determine exact location from the servicing utility, arrange to complete the modified service connection, and be responsible for all charges incidental thereto. The existing service connection to be modified under Item 816.01 shall be maintained in existing operation throughout the construction period and until the new traffic signal is ready for operation. The existing service connection shall be transferred by the contractor after the new traffic signal is fully operational and the service connection to the existing traffic signal cabinet is no longer required. The contractor shall arrange to have the components of the existing service connection disconnected by the servicing utility company if required. Once the existing connection is modified, the contractor shall remove and dispose of legally all existing wiring, risers, and all other hardware and materials related to the former service connection installation.

It shall be the Contractor's responsibility to contact the utility company. The electric company will connect and disconnect power as required. No work shall be done in manholes or on power poles without a representative of the electric company being present. The Contractor will be responsible for coordinating work with the electric company. All details for conduit, risers, wire, and meter socket, etc. shall conform to the utility company's standard at no additional costs.

The utility will provide a connection at the overhead structure and make the connection from the power source to the meter socket. The Contractor will install the conduit connecting the connection to the controller cabinet foundation. The service connection shall include a riser, weatherhead, and disconnect switch.

ITEMS 816.01 and 816.02 (Continued)

The Contractor shall furnish and install, or cause to be installed, all service equipment to the satisfaction of National Grid. It shall also be the Contractor's responsibility to pay all charges to the utility company for performing the work previously described.

Openings where cables enter the bottom of the controller cabinet, and each pull box shall be sealed with approved elastic sealing compound.

No direct reimbursement will be made under this contract to the Contractor for payments made to electric company, it being understood that full compensation for any payment made by the Contractor to the utility company will be included in the contract prices bid.

Testing of Grounding System

Grounding Cable - Grounding cable shall be bare copper No. 8 AWG wires. All proposed traffic signal equipment shall have new cabling.

The Contractor shall perform testing of the equipment grounding system in the presence of the Engineer, the City, and MassDOT in accordance with the Standard Specifications.

Traffic Controller Cabinet

The controller cabinet and associated in-cabinet equipment shall conform to the MassDOT Advanced Transportation Controller (ATC) specifications in Section M10.01.1 of the Standard Specification. All ATC cabinets shall P4 type as noted on the plans by intersection.

The cabinet shall be made of aluminum and painted black.

The top of the cement concrete foundation for the controller cabinet shall be 18 inches above grade. Controller cabinet foundations shall not obstruct a sidewalk or crosswalk so that passage by physically challenged persons is impaired. Anchor bolts shall be internal to the cabinet. A 1/2-inch bead of silicone sealant is required to form a waterproof seal between the controller cabinet and the top of the concrete foundation.

All sweeps to be installed in cabinet foundation shall be 3-inch (PVC) sweeps with sufficient 3-inch PVC riser to project above the finish grade of the base. A cement concrete pad and walkway shall abut the front and one side of the cabinet and shall be built in accordance with the MassDOT's sidewalk specifications. The width of the concrete pad and walkway shall be a minimum of 3 feet wide.

The cabinet shall be installed with the door opening positioned in order to allow general observation of the flow of traffic and the inside of the cabinet at the same time.

ITEMS 816.01 and 816.02 (Continued)**Ethernet Switch**

Each new controller cabinet shall be equipped with a minimum 8 port industrially-hardened managed Ethernet switch capable of Ethernet communication over proposed fiber optics and existing copper. The Ethernet switch shall be NEMA TS-2 rated.

This work shall consist of furnishing, installing, and testing an Ethernet Switch that meets the requirements of a 100 Mbps Ethernet Switch. The Ethernet Switch shall include a minimum of four single mode fiber optic patch cords, each one meter in length, and terminated on both ends with Type SC single mode fiber optic connectors.

The Ethernet Switch shall include sufficient Category 6 Ethernet patch cords, each one meter in length, and terminated on both ends with Type RJ45 connectors to provide full connectivity within the cabinet as shown in the Contract Documents.

The Ethernet Switch shall include all accessories required for a full and complete installation, including but not limited to all connecting cables, serial to Ethernet modems, power supplies, and mounting hardware.

ATC Controller

The traffic controller supplied shall conform to the MassDOT Advanced Transportation Controller (ATC) specifications in Section M10 of the Standard Specification.

The controller and cabinet shall be capable of accommodating flashing yellow arrow (FYA) operations per Section 4D.18 and 4D.20 of the MUTCD.

The controller shall be capable of operating adaptive traffic signal control.

Flashing Operation

The controller shall be capable of functioning with both incoming and outgoing coordination.

The controller shall be equipped with a separate emergency flashing mechanism capable of providing flashing operation at the rate of 50 to 60 flashes per minute. This mechanism shall be so wired and so mounted within the cabinet that it will continue to cause the signals to flash even when the basic controller is removed from the cabinet.

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.28-31 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.

ITEMS 816.01 and 816.02 (Continued)

Radio Interconnect

A radio antenna is provided at each project intersection. Although traffic signal coordination is not currently programmed and not proposed to be reinstated as part of the project, the radio antennas at each location will be retained and/or removed and reset as part of the project and as noted on the plans.

Traffic Signal Cabinet Equipment

The traffic signal controller unit (CU), cabinet monitor unit (CMU), detector amplifiers, cabinet power supply, bus interface units (BIUs), flashers, load switches, flash transfer relays, and all other ancillary traffic signal control components included in the traffic control cabinet shall comply with the MassDOT Advanced Transportation Controller (ATC) specifications in Section M10 of the Standard Specification.

Spare Equipment

The Contractor shall provide the following spare signal equipment in the traffic signal controller cabinet listed below:

- A 25-foot RS-232 cable for communication function with a laptop computer

Emergency Vehicle Preemption

The emergency vehicle preemption system shall be per City Standards, shall be fully compatible with City of Lawrence Fire Department equipment, including any coding requirements and installed in the same cabinet as the controller. It is the responsibility of the Contractor to determine pre-emption operation requirements through the City's Fire Chief.

Cabling for the emergency preemption system shall be separate from the cable associated with the traffic signal system.

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. All traffic signal installations shall be supplied with a minimum of two optical detectors unless otherwise noted in the major items list.

ITEMS 816.01 and 816.02 (Continued)

The phase selector shall be a rack-mounted plug-in, dual priority device. The phase selector shall plug into a shelf-mounted single card slot chassis. Programming the phase selector shall be via a PC-based computer utilizing unit specific software. One copy of software, on a CD shall be supplied and licensed to the City of Lawrence. A hard copy of final programming data shall be left in the control cabinet. The Contractor shall supply a complete set of interface cables for phase selector to laptop connection.

The Contractor shall install a confirmation strobe at the traffic signal location as shown on the plans. The confirmation strobe shall serve to validate to the driver of the emergency vehicle that the traffic signal has recognized the preemption call and will initiate the proper preemption sequence. The confirmation strobe shall be a white lens.

The Contractor shall be responsible for the proper programming of the phase selector, final orientation of the optical detectors (should field conditions warrant a different direction per the plans), and all other work necessary to provide a complete and operating emergency vehicle preemption system. The Contractor may be required to field adjust the location of the optical detectors in the presence of the Engineer to properly detect preemption calls from approaching vehicles.

Existing Loop or Video Detection

Existing video detection at Location 1 (Item 861.01) shall be maintained; however, the camera will be relocated as noted on the plan and the processor module will be reset to the new cabinet and location. The Contractor shall be responsible to reset all video detection zones based on the new camera location as part of the Item 816.01. If the existing detection is compromised by other work; detection shall be restored within 10 calendar days.

All wire loop detectors shall be abandoned at Location 2 (Item 816.02). If the existing detection is compromised by other work; detection shall be restored within 10 calendar days. All lead-in cables shall be disposed by the contractor at no additional expense.

Video Detection

Video detection shall be installed for vehicle and bicycle detection at the intersection of Broadway / Essex Street as part of Item 816.02. Specific video detection to be installed at this location is specified on the plans. This section covers the minimum requirements for a system that detects vehicles on a roadway using only video images of vehicle traffic.

The Contractor has option to provide and install a Single-Point Video Detection (SPVD) System [omni-directional] or a multi-camera system as also defined in these special provisions. Plan set currently shows location a multi-camera system. The Contractor shall notify designer of use of SPVD to allow for revisions to traffic signal plans.

ITEMS 816.01 and 816.02 (Continued)

The video detection system (VDS) shall consist of one or more video cameras, a video detection processor (VDP); a detector rack mounted extension module (as needed), field video monitor and pointing device, software and all associated equipment required to set up and operate the system in the field. The equipment shall include camera mountings, extensions, connectors and standard detector rack with power supply. The system software shall be capable of detecting vehicles in multiple lanes using only the video image. Detection zones shall be defined using only onboard video menu and a pointing device to place the zones on a video image. Up to 24 detection zones per camera shall be available.

Camera Monitor

The Contractor shall install a 7-inch TFT L.C.D. video monitor that is to be permanently mounted in the controller cabinet on a swivel mount of Item 816.02. The Contractor shall provide any wires or ancillary equipment to allow for communication between the L.C.D. monitor and the traffic signal controller cabinet.

SINGLE-POINT VIDEO DETECTION OPTION A:

The SPVD system shall include a single ultra-wide-angle lens camera, 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.

Video software and a transfer cable shall be supplied to the City of Lawrence at the time of acceptance.

System Hardware

The SPVD system shall detect and monitor vehicles on approach roadways utilizing advanced, omni-directional, vehicle tracking algorithms along with three-dimensional vehicle modeling to supply accurate and consistent stop line detection.

The SPVD system shall include all necessary software and hardware to allow the end user to program, setup, and/or modify detection zones within the video camera image. One pointing device and one swivel mounted color monitor within the controller cabinet for future viewing of the detection camera images shall be supplied by the Contractor. The Contractor shall also supply any necessary cables, interface devices and software for monitoring video detection via laptop computers per the manufacturer's recommendations.

The camera shall be mounted at the intersection, as shown on the plan or as directed by The Engineer. The Contractor shall notify designer of use of SPVD to allow for update of traffic signal plans with single camera location).

ITEMS 816.01 and 816.02 (Continued)*Camera Minimum Requirements*

At a minimum, the SPVD shall meet the following camera requirements:

- Power: 48 VDC, single burial grade CAT 5e cable
- Operating Temp: -35C to +60C
- Humidity: Up to 100%
- Dimensions: 10" diameter x 9"
- Weight: less than 11 lbs.
- The camera shall include an ultra-wide-angle lens.
- The camera shall include a heater to prevent the formation of ice and condensation.
- The camera, when properly installed and configured, shall be able to concurrently observe at least 5 lanes of traffic per approach.
- The camera shall be able to concurrently observe more than one approach.
- The camera, mounting hardware, and any related materials, when properly installed, shall withstand 150 mph wind speeds.
- The camera shall operate at a level of presence detection accuracy at or above 97 percent, excluding issues of occlusion due to limitations imposed by camera placement.

Video Processor Unit Minimum Requirements

- Power: 120-240 VAC, requiring 150 watts or less.
- Operating Temp: -34C to +74C
- Humidity: Up to 95% non-condensing
- Dimensions: 12.25" wide x 11.25" depth x 5" high
- Enclosure: Rack mount in traffic cabinet

The video processor unit shall save configurations and zone plans locally to maintain operation with or without monitoring equipment connected. The video processor unit shall be designed to function dependably in the adverse environment found in the typical roadside traffic cabinet. The video processor unit shall include at least 24 detector outputs. The video processor unit shall include an SDLC connection for TS2 type controllers. The video processor shall be compatible with TS1 type controllers as well. The video processor unit shall include a USB on the front surface for simple data collection on non-networked systems. The video processor unit shall include both LAN and WAN RJ-45 interface ports on the front surface of the unit.

ITEMS 816.01 and 816.02 (Continued)*Application Software Minimum Requirements*

The application software shall support the creation and modification of at least twenty-four (24) polygonal detection zones within the graphical user interface.

The application software will show images of the detection zones superimposed on the video image of traffic.

The application software shall support the assignment of a detector output(s) to each zone. These assignments can be modified at any time through the software.

The application software shall support direction of travel assignment within detection zones. The vehicle detection zone shall not activate for objects traveling any direction other than the one specified for detection. Cross-street and wrong way traffic shall not cause detection.

The application software shall change the color of the zone within the graphical user interface as vehicles enter or exit a detection zone, changing its occupancy status.

The application software shall provide visual indication of the light state for each zone within the graphical user interface.

The application software shall feature the ability to digitally pan, tilt, and zoom within the camera's field of view without movement of the camera.

The application software shall feature the ability to mask objects that occlude the camera field of view and/or disrupt the camera automatic gain and exposure control.

The application software shall feature an optional reporting interface offering point and click reporting for turning movement counts and vehicle classification.

The Contractor shall provide software that enables a technician to test all features and functions of the SPVD system, and to perform all set-up procedures. This software shall be delivered on a CD so that it can be installed on other laptops. The City shall have the right to make and use an unlimited number of copies of this software.

Installation

The SPVD system shall be installed in accordance with the manufacturer's recommended procedure for installation. The SPVD system shall be installed by factory certified installers and as recommended by the manufacturer and documented in installation materials provided by the manufacturer. Proof of the factory certification shall be provided. Installation includes connecting the SPVD to the traffic signal controller and power supply in the associated controller cabinet assembly. When the setup is complete and the SPVD system is ready for operation, the values of all parameters that were set during the process shall be delivered to the Engineer in printed and computer readable form. All equipment, such as software, laptop computer, tools and cables, needed for setup work shall be provided by the Contractor.

ITEMS 816.01 and 816.02 (Continued)

If the mounting suggested height of installation cannot be performed with traditional mast arm, the contractor shall supply a combination mast arm / luminaire pole to achieve height requirements at which the cost shall be considered under Item 816.02.

Programming

The Contractor shall be responsible for the proper programming of the SPVD, orientation of the SPVD, and all other work necessary to provide a complete vehicle detection system. The Contractor may be required to field adjust the location of the SPVD system in the presence of the Engineer to properly detect approaching vehicles.

Documentation

The cabinet documentation (box prints) shall show all wiring between the SPVD system and the controller cabinet.

Warranty

The supplier shall provide a three-year warranty on the SPVD system following installation and warranty registration. The camera shall include an additional warranty to require no aiming or focusing for a period of five years. During the warranty period, technical support shall be available from the supplier via telephone within 4 hours of the time a call is made by a user, and this support shall be available from factory-certified personnel or factory-certified installers.

During the warranty period, updates to SPVD software shall be available from the supplier without charge.

MULTI-CAMERA SYSTEM OPTION B:

A multi-camera system shall include four cameras (one per approach), 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.

System Hardware

Processor shall be a 2-channel processor. The video detection system shall consist of one or more video cameras, a video detection processor (VDP) which mounts in a standard detector rack, and a pointing device.

ITEMS 816.01 and 816.02 (Continued)*System Software*

The system shall include software that detects vehicles in multiple lanes using only the video image. Detection zones shall be defined using only an onboard video menu and a pointing device to place the zones on a video image. Up to 24 detection zones per camera shall be available. A separate computer shall not be required to program the detection zones.

Video software and a transfer cable shall be supplied to the City of Lawrence at the time of acceptance.

Limited Warranty

The supplier shall provide a two-year warranty on the entire video detection system (equipment and software).

During the warranty period, technical support shall be available from the supplier via telephone within 4 hours of the time a call is made by a user, and this support shall be available from factory-certified personnel or factory-certified installers.

During the warranty period, updates to VDP software shall be available from the supplier without charge.

Maintenance Support

The supplier shall maintain an adequate inventory of parts to support maintenance and repair of the video detection system. These parts shall be available for delivery within 30 days of placement of an acceptable order at the supplier's then current pricing and terms of sale for said parts.

The supplier shall maintain an ongoing program of technical support for the video detection system. This technical support shall be available via telephone, or via personnel sent to the installation site upon placement of an acceptable order at the supplier's then current pricing and terms of sale for on-site technical support services.

Installation or training support shall be provided by a factory authorized representative. All product documentation shall be written in the English language.

Functional Capabilities

The VDP shall process video from one or two sources, as specified. The source can be a video camera or video tape player. The video shall be input to the VDP in RS170 format and shall be digitized and analyzed in real time. Dual video VDP's shall process images from both inputs simultaneously.

ITEMS 816.01 and 816.02 (Continued)

The VDP shall detect the presence of vehicles in up to 24 detection zones per camera. A detection zone shall be approximately the width and length of one car.

Detection zones shall be programmed via an on board menu displayed on a video monitor and a pointing device connected to the VDP. The menu shall facilitate placement of detection zones and setting of zone parameters or to view system parameters. A separate computer shall not be required for programming detection zones or to view system operation.

The VDP shall store up to three different detection zone patterns. The VDP can switch to any one of the three different detection patterns within 1 second of user request via menu selection with the pointing device.

The VDP shall detect vehicles in real time as they travel across each detector zone.

The VDP shall have an RS-232 port for communications with an external computer. The VDP RS-232 port shall be multi-drop compatible.

The VDP shall accept new detector patterns from an external computer through the RS-232 port when the external computer uses the correct communications protocol for downloading detector patterns. A Windows™-based software designed for local or remote connection and providing video capture, real-time detection indication and detection zone modification capability shall be provided with the system.

The VDP shall send its detection patterns to an external computer through the RS-232 port when requested when the external computer uses the appropriate communications protocol for uploading detector patterns.

VDP communications shall be accommodated by methods using differential signals to reject electrically coupled noise.

The camera system shall be able to transmit an NTSC video signal, with minimal signal degradation, up to 1000 feet under ideal conditions.

The associated VDP shall default to a safe condition, such as a constant call on each active detection channel, in the event of loss of video signal.

The system shall be capable of automatically detecting a low-visibility condition such as fog and respond by placing all defined detection zones in a constant call mode. A user-selected output shall be active during the low-visibility condition that can be used to modify the controller operation if connected to the appropriate controller input modifier(s). The system shall automatically revert to normal detection mode when the low-visibility condition no longer exists.

ITEMS 816.01 and 816.02 (Continued)*Vehicle Detection*

A minimum of 24 detection zones shall be supported and each detection zone shall be user definable in size and shape to suit the site and the desired vehicle detection region.

A single detection zone shall be able to replace multiple inductive loops and the detection zones shall be OR'ed as the default or may be AND'ed together to indicate vehicle presence on a single phase of traffic movement.

Placement of detection zones shall be done by using only a pointing device, and a graphical interface built into the VDP and displayed on a video monitor, to draw the detection zones on the video image from the video camera. No separate computer shall be required to program the detection zones.

A minimum of 3 detection zone patterns shall be saved within the VDP memory. The VDP's memory shall be non-volatile to prevent data loss during power outages. The VDP shall continue to operate (e.g. detect vehicles) using the existing zone configurations even when the operator is defining/modifying a zone pattern. The new zone configuration shall not go into effect until the configuration is saved by the operator.

The selection of the detection zone pattern for current use shall be done through a menu or remote computer via RS-232 port. It shall be possible to activate a detection zone pattern for a camera from VDP memory and have that detection zone pattern displayed within 1 second of activation.

When a vehicle is detected crossing a detection zone, the corners of the detection zone (for the entire polygon) will flash on the video overlay display screen to confirm the detection of the vehicle.

Detection shall be at least 98% accurate in good weather conditions and at least 96% accurate under adverse weather conditions (rain, snow, or fog). Detection accuracy is dependent upon site geometry; camera placement, camera quality and detection zone location, and these accuracy levels do not include allowances for occlusion or poor video due to camera location or quality.

Detector placement shall not be more distant from the camera than a distance of ten times the mounting height of the camera.

The VDP shall provide up to 24 channels of vehicle presence detection per camera through a standard detector rack edge connector and one or more extension modules.

The VDP shall provide dynamic zone reconfiguration (DZR) to enable normal detector operation of existing channels except the one where a zone is being added or modified during the setup process. The VDP shall output a constant call on any detection channel corresponding to a zone being modified.

ITEMS 816.01 and 816.02 (Continued)

Detection zone setup shall not require site specific information such as latitude, longitude, date and time to be entered into the system.

The VDP shall output a constant call for each enabled detector output channel if a loss of video signal occurs. The VDP shall output a constant call during the background learning period.

Detection zone outputs shall be configurable to allow the selection of presence, pulse, extend, and delay outputs. Timing parameters of pulse, extend, and delay outputs shall be user definable between 0.1 to 25.0 seconds.

Up to six detection zones shall be capable to count the number of vehicles detected. The count value shall be internally stored for later retrieval through the RS-232 port. The data collection interval shall be user definable in periods of 5, 15, 30 or 60 minutes.

VDP Hardware

The VDP shall be specifically designed to mount in a standard TS-1, TS-2, and 170 type detector rack, using the edge connector to obtain power and provide contact closure outputs. No adapters shall be required to mount the VDP in a standard detector rack. Detector rack rewiring shall not be required or shall be minimized.

The VDP shall operate in a temperature range from -34°C to +74°C and a humidity range from 0%RH to 95%RH, non-condensing.

The VDP shall be powered by 12 or 24 volts DC. These modules shall automatically compensate for the different input voltages.

VDP power consumption shall not exceed 300 milliamps at 24 VDC.

The VDP shall include an RS-232 port for serial communications with a remote computer. The VDP RS-232 port shall be multi-drop compatible. This port shall be a 9-pin "D" subminiature connector on the front of the VDP.

The VDP shall utilize flash memory technology to enable the loading of modified or enhanced software through the RS-232 port without modifying the VDP hardware.

The VDP shall include detector output pin out compatibility with industry standard detector racks.

The front of the VDP shall include detection indications, such as LED's, for each channel of detection that display detector outputs in real time when the system is operational.

ITEMS 816.01 and 816.02 (Continued)

The front of the VDP shall include one or two BNC video input connection suitable for RS-170 video inputs as required. The video input shall include a switch selectable 75-ohm or high impedance termination to allow camera video to be routed to other devices, as well as input to the VDP for vehicle detection. Video must be inputted via a BNC connector on the front face of the processor. RCA type connectors/jacks for video input are not allowed. Video shall not be routed via the edge connectors of the processor.

The front of the VDP shall include one BNC video output providing real time video output that can be routed to other devices. An RCA type connector/jack for video output is not allowed.

The front panel of the VDP and EM shall have a detector test switch to allow the user to place calls on each channel. The test switch shall be able to place either a constant call or a momentary call depending on the position of the switch.

Video Detection Camera

The video cameras used for traffic detection shall be furnished by the VDP supplier and shall be qualified by the supplier to ensure proper system operation.

The camera shall produce a useable video image of the bodies of vehicles under all roadway lighting conditions, regardless of time of day. The minimum range of scene luminance over which the camera shall produce a useable video image shall be the minimum range from nighttime to daytime, but not less than the range 0.1 lux to 10,000 lux.

The camera shall use a charge coupled device (CCD) sensing element and shall output monochrome video with resolution of not less than 380 lines vertical and 380 lines horizontal.

The camera shall include an electronic shutter control based upon average scene luminance and shall be equipped with a factory adjusted manual iris. Auto-iris lenses are not allowed.

The camera shall include a variable focal length lens with variable focus that can be adjusted, without opening up the camera housing, to suit the site geometry by means of a portable interface device designed for that purpose and manufactured by the detection system supplier.

The horizontal field of view shall be adjustable from 8.1 to 45.9 degrees. A single camera configuration shall be used for all approaches in order to minimize the setup time and spares required by the user. The camera electronics shall include automatic gain control (AGC) to produce a satisfactory image at night.

The camera shall be housed in a weather-tight sealed enclosure. The housing shall be field rotatable to allow proper alignment between the camera and the traveled road surface.

ITEMS 816.01 and 816.02 (Continued)

The camera enclosure shall be equipped with a sunshield. The sunshield shall include a provision for water diversion to prevent water from flowing in the camera's field of view. The camera enclosure with sunshield shall be less than 6" diameter, less than 15" long, and shall weigh less than 6 pounds when the camera and lens are mounted inside the enclosure.

The camera enclosure shall include a thermostatically controlled heater to assure proper operation of the lens shutter at low temperatures and prevent moisture condensation on the optical faceplate of the enclosure.

When mounted outdoors in the enclosure, the camera shall operate satisfactorily in a temperature range from -34 °C to +60 °C and a humidity range from 0% RH to 100% RH.

The camera shall be powered by 120-240 VAC 50/60 Hz. Power consumption shall be 15 watts or less under all conditions.

Recommended camera placement height shall be at least 20 feet (or 6 meters) above the roadway, and over the traveled way on which vehicles are to be detected. For optimum detection the camera should be centered above the traveled roadway. The camera shall view approaching vehicles at a distance not to exceed 200 feet for reliable detection (height to distance ratio of 10:100). Camera placement and field of view (FOV) shall be unobstructed and as noted in the installation documentation provided by the supplier.

The camera enclosure shall be equipped with separate, weather-tight connections for power and setup video cables at the rear of the enclosure. These connections may also allow diagnostic testing and viewing of video at the camera while the camera is installed on a mast arm or pole using a lens adjustment module (LAM) supplied by the VDP supplier. Video and power shall not be connected within the same connector.

The video signal output by the camera shall be black and white in RS170 or CCIR format.

The video signal shall be fully isolated from the camera enclosure and power cabling.

Co-Axial Cable

The coaxial cable to be used between the camera and the VDP in the traffic cabinet shall be Belden 8281 or a 75 ohm, precision video cable with 20 gauge solid bare copper conductor (9.9 Ohms/M), solid polyethylene insulating dielectric, 98% (min) tinned copper double-braided shield and black polyethylene outer covering. The signal attenuation shall not exceed 0.78 dB per 100 feet at 10 MHz. Nominal outside diameter is 0.304 inches. The coax cable shall be a continuous unbroken run from the camera to the VDP. This cable shall be suitable for installation in conduit or overhead with appropriate span wire. 75-ohm BNC plug connectors should be used at both the camera and cabinet ends. The coaxial cable, BNC connector, 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.

ITEMS 816.01 and 816.02 (Continued)*Power Cabling*

The power cabling shall be 16 AWG three-conductor cable. The cabling shall comply with the National Electric Code, as well as local electrical codes. Cameras may acquire power from the luminaire if necessary.

Execution

The video detection system shall be installed by supplier factory certified installers and as recommended by the supplier and documented in installation materials provided by the supplier. Proof of factory certification shall be provided.

Testing of Cameras

The following test procedure shall be performed in the presence of the Engineer before and after the camera detection is used. The cost of equipment, labor, and materials to perform such testing and similar re-testing following repairs, replacement, or adjustment of any camera within the project area shall be included in the contract unit price for this Item.

After installation of cameras above the roadway each camera shall be tested (at the controller cabinet) for proper installation.

Mast Arms, Poles, and Foundations (less than 60 feet in length)

All new mast arm poles shall be Type 2 steel monolevers primed to MassDOT standards, with shoe bases and painted black. Mast arms and poles shall be fabricated and constructed in conformance with the MassDOT's *Overhead Signal Structure & Foundation Standard Drawings* issued December 2015. Foundations are of special design and are noted in the plans; however, the all components of the foundations shall also comply with the MassDOT *Overhead Signal Structure & Foundation Standard Drawings* issued December 2015.

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 the Type 2 mast arm pole. 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 review by the Engineer.

ITEMS 816.01 and 816.02 (Continued)

The mast arm pole foundations shall be a cored pier foundation and constructed in conformance with MassDOT Standard Drawings included in the plans and priced per the table provided below.

MassDOT 110 MPH Zone Mast Arm Assembly Summary

STA/OFF	Mast Arm Length	Fdn. Dia.	Fdn. Depth	Vertical Bars	Tie Bars
15+26.2' RT 8.0'	20'	3'-6"	9'-6"	18 - #8	#5 @ 12"
15+57.0' LT 68.4'	20'	3'-6"	9'-6"	18 - #8	#5 @ 12"
15+73.7' RT 6.2'	30'	3'-6"	11'-6"	18 - #8	#5 @ 12"

Concrete foundations shall be constructed of 4000 psi, 565 Cement Concrete. The Contractor shall submit shop drawings of any bolt circle details for approval by the Engineer. Anchor bolts shall be set accurately, and tops shall be formed neatly. The top forming of cast-in-place units shall extend downward for a minimum of 24" on the side of any foundation. The lower portions of all foundations shall be placed directly against undisturbed earth. At the time of foundation construction, the Contractor shall be responsible to complete material testing of mast arm foundation concrete and rebar in accordance with the Standard Specifications.

Relocation of utilities for the convenience of drilling may be needed and shall be at the expense of the Contractor if requested. The Contractor shall be responsible for all items required to install traffic signal infrastructure at location(s); including, but not limited to, shielding of overhead primary / secondary wires within 10-feet, insulation of overhead wires, relocation of overhead wires, and/or for the potential use of other low-profile installation and/or excavation techniques as necessary. The Contractor shall be responsible for making all necessary arrangements to have the proper utility company(s) relocate overhead wires in order for the proper mast arm clearances or visibility to traffic signal indications to be obtained, should any conflicts arise. The Contractor shall take extra care and precaution in placing signal heads to ensure the existing or proposed/future overhead utility wires do not interfere with the visibility of the signal heads located above the roadway. All measurements to determine the exact dimensions and clearances to existing overhead utility lines shall be made in the field by the Contractor for incorporation into the erection plans and shop drawings which are submitted for approval. This may require relocation of overhead wires in coordination with the utility company. No separate payment will be made for work considered incidental to the traffic signal equipment related to the utility company coordination or implementation as noted, but all costs in connection therewith shall be included in the lump sum bid price for 816.01.

In the event that soil conditions or ledge prevent the use of MassDOT standard foundation type, the Contractor shall coordinate with the Engineer to select and design alternative foundation types that fit within the existing right-of-way. Alternative foundation types could include spread footings, coring and socketing into rock or other foundations previously used to support similar loads, within reason.

ITEMS 816.01 and 816.02 (Continued)

The bottom of the signal head shall have a minimum clearance of not less than 17'-6" or greater than 19 feet above the pavement grade at the center of the roadway.

New mast arm pole foundations shall not obstruct a sidewalk or crosswalk so that passage by physically-challenged persons is impaired. The installation shall be in compliance with ADA/AAB standards.

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 lump sum bid price for Item 816.01.

Steel Equipment*Galvanizing*

All bolts, screws, nuts, rods and washers shall be galvanized in accordance with AASHTO M232 and the Standard Specifications. The hardened machine screws may be electroplate galvanized. Stainless steel studs, bolts, screws, nuts, straps and washers shall not be galvanized. Galvanized hardware need not be painted; however, the ends of bolts, nuts, and washers shall be painted in the field according to section "Touch-up and Repairs." Immediately prior to galvanizing, the steel shall be immersed in a bath of zinc ammonium chloride. The dry kettle galvanizing process shall be used.

All steel components, other than above, shall be galvanized after fabrication in accordance with AASHTO M111. The galvanizing bath shall contain nickel (0.05% to 0.09% by weight).

Galvanized members requiring shop assembly shall be welded and drilled prior to galvanizing.

The applicator shall ensure that all components are smooth and without sharp protrusions that would present an injury hazard to pedestrians. Also, the fabricator shall ensure that all welds shall be cleaned thoroughly in accordance with good practice and according to AWD D1.5 and ASTM A123-89a and shall have a suitable surface to accept the galvanizing.

Coating Over Galvanized Steel

Prior to painting, the applicator shall ensure that all components are smooth and without sharp protrusions that would present an injury hazard to pedestrians. Also, the fabricator shall ensure that all welds shall be cleaned thoroughly in accordance with good practice and according to AWD D 1.5 and ASTM A 123-89a and shall have a suitable surface to accept the galvanizing.

ITEMS 816.01 and 816.02 (Continued)

In preparation for the two coat painting system, the surface shall be blast cleaned in accordance with the requirements of SSPC SP7 "Brush-Off Blast Cleaning" or other method producing equivalent results and uniform profile, to achieve a 1.0 to 1.5 mils anchor profile as indicated by a Keane Tator Profile Comparator or similar device. The creation of the anchor profile shall be performed prior to the formation of "white rust" on the galvanized surface. Following blast cleaning, the zinc coating thickness shall be measured to verify that the coating thickness is in accordance with AASHTO M111.

A two-coat painting system shall be applied by the Galvanizer in his own facility within twelve hours of galvanizing the steel components.

The prime coat material shall be a polyamide epoxy applied to minimum dry film thickness of 2.0 to 4.0 mils (0.002-0.004 in.) and force cured as given below for the finish coat.

The finish coat material shall be a two component, catalyzed aliphatic urethane applied by airless spray to a minimum dry film thickness of 4.0 mils.

ITEM 816.01 & 816.02 (Continued)

The fabricator shall submit to the Engineer for approval, paint chips of the intended color prior to any work being done under this Item.

All finish coat material shall be applied under conditions within the following tolerances:

- Air Temperature 50 °F min., 90 °F max.
- Surface Temperature 50 °F min., 100 °F max.
- Surface temperature must be at least 3 °F above the dew point. The finish coat shall be cured in a booth capable of maintaining 150 °F for 2-4 hours.

All paint coating over galvanized steel must be furnished with a five (5) year manufacturer warranty.

Touch-Up and Repairs

Should any damage occur to the galvanized coating during shipping or handling at the job site, the Contractor shall repair and touch-up any damaged areas to the satisfaction of the Engineer and the following:

Touch-up of galvanizing before the finish coat is applied shall be accomplished by applying galvanizing repair paint in accordance with Subsection M7.04.11. The dry film thickness of the applied repair paint shall not be less than 4.0 mils. Applications shall be in accordance with the manufacturer's instructions.

ITEMS 816.01 and 816.02 (Continued)

Field touch-up procedures shall conform to the recommendations of the galvanizer. Touch-up of the finish coat shall be by applying a coating of a two-part urethane, as supplied by the Galvanizer, to achieve a dry film thickness of at least 4.0 mils. Prior to the application of the paint, remove all damaged coatings down to a solidly adhered coating and apply galvanizing repair paint as primer. Allow the primer to dry for at least 4 hours prior to top coating.

The Contractor shall also use the touch-up paint material and procedures to paint the galvanized hardware used in field erection that has not been finish coated previously.

Aluminum Equipment

All aluminum signal pedestal posts shall have a powder coat finish **BLACK** in color. The coating shall be a polyester-TGIC (triglycidyl isocyanurate) resin system conforming to the following:

Quality	Test	Limits
Abrasion	Taber abraser CS-10, 1000 gram load, 1000 cycle, ASTM D4060	100 mg. Maximum weight loss
Adhesion	ASTM D .59 Initial 1000 hours	5A 5A
Gloss	ASTM D 523 60° - 600 hours 60° - 1000 hours	82% retention 90% retention (washed)
Hardness	ASTM D 3363	2H – No Gouge

Quality	Test	Limits
Impact	ASTM D 2794 Direct	Pass 80 inch-lb.
Salt Spray Resistance	ASTM B 177 ASTM D 1654 1000 hours unscribed 400 hours scribed	Table 2-10 Table 1-10
Weather Resistant	ASTM G 23, 1000 hours, 18 min. waterspray, 102 min. light	No film failure
Color	Black	
Identify	Infrared fingerprint	Match
Flexibility	180° bend; ½” dia, mandrel within 10 seconds	No breaks, flaking or cracks. Tested with a Q-panel with 2 mils or less of coating
Humidity	ASTM D 2247, 1000 hours	No blister or film failure
Thickness		4 mils +/- 1 mils
Mar Resistance		Good

A Certificate of Compliance of the powder coating system is required for the Engineer's approval.

ITEMS 816.01 and 816.02 (Continued)**Signal Posts / Stanchions and Foundations**

The new pedestal posts shall have transformer bases and be made of aluminum. Bases shall be square unless otherwise noted. Bases shall be provided with a door opening and a cast aluminum door, complete with a cap screw fastening device and a tapped hole for a grounding lug. All pedestal posts, stanchions, and bases shall be painted black.

New signal base foundations shall not obstruct a sidewalk or crosswalk so that passage by physically challenged persons is impaired. The installation shall be in compliance with ADA/AAB standards. Sidewalk extensions shall be provided when needed in order to maintain minimum ADA/AAB compliance.

The new pedestal posts on new foundations may utilize either precast or cast-in-place cement concrete pedestal post foundations constructed in conformance with the MassDOT Standard Drawings.

No separate payment will be made for work considered incidental to the excavation, including but not limited to, pedestal post foundations, dewatering, etc. but all costs in connection therewith shall be included in the lump sum bid price for Item 816.01 or 816.02.

Signal Housings

Signal housings mounted on mast arms shall be rigidly attached to the mast arms unless otherwise noted. All signal housings 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 unless otherwise noted on the plans. All proposed post-mounted signal housings shall be retrofitted or installed with retroreflective backplates. All backplates shall be 5" wide beyond the signal housing and consist of a 3" yellow retroreflective strip. The border shall be made from an adhesive-backed retroreflective yellow micro-prismatic sheeting, Type III or IV, and cover the entire perimeter of the backplate. Each indication section of the signal housing shall be installed with a tunnel visor as noted on the plans. All signal housings shall be equipped with ball and/or arrow light emitting diode (LED) modules.

Signal housings, visors, and backplates located at the intersection of Broadway / Canal Street / Water Street (Location 1) shall be painted black. Signal housings and visors at the intersection of Broadway / Essex Street shall be painted standard colors (yellow).

ITEMS 816.01 and 816.02 (Continued)**LED Signal Modules**

All signal and pedestrian displays shall be equipped with LED signal modules. All red, yellow, green, and pedestrian signal housings with the exception of 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 July 1, 2007
- 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, February 2011
- On the MassDOT Traffic Signal Approved Equipment List

For an LED module to be installed on this project, the LED module shall have approval from the MassDOT Traffic Control Products Approved Equipment Committee and be included on the Traffic Control Products List prior to the date of this proposal

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 housing 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

Pedestrian Signal Housings with Countdown Timers

All pedestrian signal housings shall be 16-inch, single units, with countdown timers. All pedestrian signal housings shall include audible devices, if not installed as part of the push button, in conformance with the MassDOT Accessible Pedestrian Signal (APS) Installation Policy, dated June 1, 2012 and as revised. Pedestrian signal housing indications shall be illuminated L.E.D. type displaying graphical filled-in symbols of a walking person and/or upraised hand. The countdown module shall display the number of seconds remaining throughout the flashing don't walk (UPRAISED HAND) interval and blank out during the steady walk (WALKING PERSON) and steady don't walk (UPRAISED HAND) intervals. The countdown module shall be automatically set by the intersection controller based upon the walk (WALKING PERSON) and flashing don't walk (UPRAISED HAND) signal intervals only.

ITEMS 816.01 and 816.02 (Continued)

The countdown module shall continuously monitor the intersection controller for any changes to the pedestrian phase timing and reprogram itself automatically. All L.E.D. indications on the pedestrian signal shall have an automatic dimming circuit for night illumination to reduce long-term degradation to the LEDs.

Pedestrian signal heads shall come equipped with cut-away visors. Heavy duty blind clamp fittings are required for mounting hardware as necessary. Where mast arm mounting is required, including at intermediate arm locations, signal heads shall be all vertically fixed-mounted.

Pedestrian signal housings and visors located at the intersection of Broadway / Canal Street / Water Street (Location 1) shall be painted black. Pedestrian signal housings and visors at the intersection of Broadway / Essex Street shall be painted standard colors (yellow).

Pedestrian Push Buttons and Audible Devices

Pedestrian push buttons shall be in conformance with the MassDOT Accessible Pedestrian Signal (APS) Installation Policy, dated June 1, 2012 and as revised. Pedestrian push buttons shall be 4-wire. Countdown signage shall be 9"x15".

Pedestrian push button controls shall be raised from or flush with their housings and shall be a minimum of 2 inches in the smallest dimension. The force required to activate the controls shall be no greater than 5 pounds.

Pedestrian push buttons shall be located as close as practical to the sidewalk curb ramp serving the controlled crossing 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 pushbuttons and/or legends on the pedestrian push button signs should clearly indicate which crosswalk signal is actuated by each pedestrian push button.

Upon installation, the push button should be perpendicular to the crosswalks with the raised arrow on the push button parallel to the path of pedestrian travel towards the opposing ramp. Where two crosswalks correspond to the same push button, a double arrow shall be provided. The audible device (which may be part of the push button assembly) should be capable of providing alternative audio messages / sound for those locations in which two push buttons for two separate crosswalks are within ten (10) feet of each other. At locations where two separate push buttons are within ten (10) feet of each other, different audible tones shall be set for each audible device and the audible walk indication shall be a speech "WALK"-type message.

When pressed, the push button should provide an audible "WAIT TO CROSS" message. When the pedestrian walk interval commences, the push button should provide an audible "WALK SIGN IS ON TO CROSS _____(Street Name)."

ITEMS 816.01 and 816.02 (Continued)

A maximum mounting height of 42-inches above the finish sidewalk grade shall be used for pedestrian push buttons. The maximum pedestrian reach from a level surface to any installed pedestrian push button shall be no more than 10-inches. Where an unforeseen field adjustment results in more than a 10-inch reach from a level surface, the contractor shall be responsible to retrofit the push button with an extension arm or device compatible with the push button and associated pole/post.

Pedestrian push buttons located at the intersection of Broadway / Canal Street / Water Street (Location 1) shall be painted black. Pedestrian push buttons at the intersection of Broadway / Essex Street shall be painted standard colors (yellow).

Equipment Finish and Color

Traffic signal equipment including, but not limited to, signal pedestal posts, bases, signal housings, visors (outside), doors, service meter socket box, optical preemption detectors, hardware, and rigid mounting brackets for signals and signs shall be painted black or standard colors as noted in this special provision, subject to the approval of MassDOT. The Contractor shall submit to the Engineer paint chips and sample finishes on steel and aluminum of the intended color prior to any work being done under this heading.

Signal housings, doors, visors, mounting brackets, and hardware supplied direct from the manufacturer in the color stipulated above may be acceptable provided it meets or exceeds the finish process for the material indicated below.

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 Owner for a period of five years after acceptance of the traffic signal installation.

Data Base Programming

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 sets of hard copy programming per device shall be supplied by the Contractor.

The Contractor shall supply a laminated copy of the traffic signal design plans and sequence and timing chart to be left in the cabinet's documentation envelope mounted on the inside of the cabinet door.

ITEMS 816.01 and 816.02 (Continued)**Electric Power Cost**

The payment for power under 816.01 will be undertaken by the Contractor during the construction period. After the project's completion and acceptance by the City and MassDOT, the utility charges and account will be transferred to the City of Lawrence. Payment for power under Item 816.02 shall be retained by the City of Lawrence during construction.

Traffic Signal Timing – Fine Tuning

After the Contractor has finished installing the controllers and all other associated signal control equipment and after the Contractor has set the signal equipment to operate as specified in the contract documents, the fine tuning, adjusting and testing period shall begin. The Contractor shall advise the Engineer, City and MassDOT in writing of the date of the beginning of the fine-tuning and testing period.

During this period, the Contractor, under the direction of the Engineer will make necessary adjustments and tests to ensure safe and efficient operation of the equipment. This period shall not last be less than 30 days. The contract completion date shall take this testing period into consideration. No request for final acceptance will be considered until successful completion of the testing period.

The Contractor shall notify the City, MassDOT, and the Engineer in writing of the starting date of the fine-tuning period and shall have MassDOT and the City present for an inspection of the traffic signal.

The cost of electrical energy consumed by the operation of the traffic signal during the construction, fine-tuning and testing until final acceptance of the signal shall be borne by the Contractor.

Final 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 the City and MassDOT. The Engineer will make a final inspection of the installation in the presence of the City, MassDOT, 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.).

ITEMS 816.01 and 816.02 (Continued)

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 the City and 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 the Department.

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.

Upon the date of acceptance of the project by the City and MassDOT, the Contractor shall turn over all guarantees and warranties to the City.

As-Built Plans

It will be the responsibility of the Contractor to provide the Design Engineer with as-built traffic signal layout plans indicating all changes made during the construction. The plans shall indicate the location of all traffic signal equipment installed including detectors, signal posts, mast arms, strain poles, pedestrian and vehicular signal heads, controller cabinets, conduit, pull boxes, service connections and pre-emption equipment. The plans shall also indicate the final as-built timing and sequence, major item list, power-pole number and meter number. Upon receipt of the above as-built information from the Contractor, the Design Engineer will field verify the as-built information and plans. Following field verification, the Design Engineer will prepare the as-built Traffic Signal Layouts and/or Permits for submission to the MassDOT and the City of Lawrence prior to the final acceptance of the project.

The Contractor shall supply As-Built Plans and wiring diagrams in 2018 AutoCAD DWG, DWF, and PDF formats.

ITEMS 816.01 and 816.02 (Continued)

Technical Manuals and “Box Prints”

Per MassDOT Specifications the Contractor shall provide prior to final acceptance as furnished by the manufacturer.

1. Controller Unit, Flasher, Load Switches, Conflict Monitor and all external logic units.
 - a. Electronic schematic of circuit boards.
 - b. Pictorial layout of components on circuit boards.
 - c. Service manual for troubleshooting.
 - d. Manual describing the theory of operations.
 - e. Parts list showing manufacturer’s part number and location.
2. Controller cabinet.
 - a. Cabinet wiring diagram (3 sets).
 - b. Field wiring diagram (3 sets).

BASIS OF PAYMENT

Items 816.01 and 816.02 will be paid for at the Contract lump sum price, which price shall include all labor, material, equipment and incidental costs required to complete the work.

No separate payment will be made for adjusting or readjusting of proposed vehicle detection zones, but all costs in connection therewith shall be included in the lump sum price bid for Items 816.01 and 816.02.

Conduit shall be paid separately under Item 804.3, 3-Inch Electrical Conduit, Type NM Plastic (UL).

Pull boxes shall be paid separately under Item 811.31, 12” x 12” Pull Boxes - SD2.031.

ITEM 816.80**TRAFFIC CONTROL SIGNAL
REMOVED AND STACKED****LUMP SUM**

The work under this item shall also consist of removing, transporting, protection, temporary storage, stacking or disposal of existing traffic control signal equipment at both Location 1 (Item 816.01): Broadway (Route 28) / Canal Street / Water Street and Location 2 (Item 816.02): Broadway (Route 28) / Essex Street as shown on the plans and shall conform to the relevant provisions of Section 815 of the Standard Specifications and the following:

All existing traffic signal infrastructure shall be maintained in operation throughout the construction period and until the new signal is ready for operation. Individual traffic signal infrastructure items may be removed from operation if its corresponding proposed equivalent within the new traffic signal is approved/accepted and operational.

The Contractor shall remove all existing traffic signal conduit within areas of newly constructed sidewalk, accessible ramps, and/or full depth roadway reconstruction in conflict with other work. Old cable and unusable materials shall be disposed of by the Contractor.

The Contractor may use temporary supports for signal heads as part of the existing traffic signal as necessary to allow construction activities. Any temporary installations shall be in conformance with the *MUTCD* at all times. As applicable, this work includes adjusting existing and temporary traffic signal heads, wiring, fittings, cabling, and all other materials and labor required to ensure complete and operating traffic signals. Once construction is completed and the new signals are in operation, unused items of the old traffic signal shall be completely removed and stacked as directed by the Engineer in accordance with Subsection 815.65.

Should the existing cabinet and controller equipment need to be powered off during the removal of the existing cabinet and the new installation, a police detail shall be provided to maintain traffic operations during the temporary period at the discretion of the City and Engineer.

The Contractor shall exercise extreme care in the removal, transporting, and stacking of the existing traffic control signal equipment. Any equipment damaged by the Contractor's operations shall be replaced at no additional cost. Items to be removed and stacked shall be stacked at the City of Lawrence DPW yard, or as required by the Engineer. The City of Lawrence DPW Yard is located at 1 Auburn Street Lawrence, MA. Contact DPW (# 978-620-3090) to coordinate one day in advance of drop off. Shall the City not want any particular piece of signal equipment; they shall become the property of the Contractor

Modifying Existing Controller and Cabinet

The Contractor shall be responsible to excavate, demolish (if necessary), and remove the existing foundation at Location 1 (Item 816.01). Excavation, demolition, and removal shall be by approved methods. The existing cabinet and controller shall remain in operation until the new traffic signal is operational or the new traffic signal controller/cabinet is operational to operate existing conditions whereas the existing controller is within the roadway based on the new curb lines shown in the design plans. Should the cabinet and controller equipment need to be powered off during the removal of the existing cabinet and the new installation, a police detail shall be provided to maintain traffic operations during the temporary period.

ITEM 816.80 (Continued)

BASIS OF PAYMENT

Item 816.80 will be paid for at the Contract lump sum price, which price shall include all labor, material, equipment and incidental costs required to complete the work.

Removal and stacking of existing pull boxes and handholes will be paid for under Item 816.39. Removal of existing conduit sweeps will be incidental to Item 816.80.

ITEM 819.9

**TRAFFIC SIGNAL CONTROLLER
REMOVED AND DISCARDED**

EACH

The work under this Item shall conform to the relevant provisions of Subsection 815 of the Standard Specifications and the following:

The work under this item shall consist of removing and disposal of existing abandoned traffic signal controller equipment on Broadway at the old railroad crossing as shown on the plans.

The Contractor shall remove all existing signal conduit within areas of newly constructed sidewalk and/or full depth roadway reconstruction in conflict with other work. Old cable and unusable materials shall be disposed of by the Contractor.

The Contractor shall be responsible to excavate, demolish (if necessary), and remove the existing foundation. Excavation, demolition, and removal shall be by approved methods.

METHOD OF MEASUREMENT

Item 819.9 will be measured for payment by Each traffic signal controller removed and discarded.

BASIS OF PAYMENT

Item 819.9 will be paid for at the Contract unit price per Each, which price shall include all labor, material, equipment and all incidental costs required to complete the work.

ITEM 820.15**HIGHWAY LIGHTING - OVERHEAD
REMOVED AND RESET****EACH**

The work under this item shall conform to the relevant provisions of Subsection 820 of the Standard Specifications, and the following:

The work under this item includes the removal and resetting of overhead light fixtures mounted to light poles and utility poles. The existing/proposed utility pole modifications will be performed by the respective utility companies. The Contractor shall coordinate the removal and resetting of the overhead lighting fixtures with the utility companies and the City of Lawrence. The Contractor shall pay all disconnect/reconnect fees, and should coordinate with National Grid contractors performing the utility pole and overhead wire relocations to ensure secondary wires placed at new poles include the pig tails necessary to connect in the relocated overhead highway lighting.

The Contractor shall exercise caution when removing the lighting fixtures. Any damage to the lighting fixtures caused by the Contractor's negligence shall be repaired, by the Contractor, at no additional cost to the Owner.

The Contractor shall reset the lighting fixtures at pole locations as noted on the Plans. The Contractor shall ensure the lighting fixtures are in full operation as part of this Item. The Contractor shall provide any additional hardware, wiring, or any other materials required to install the lighting fixtures and have them be operational, and per the requirements of the utility companies.

All work shall be performed by a licensed electrician in the state of Massachusetts, qualified to work on National Grid poles in electrical space.

The Contractor shall be made aware that disconnect/reconnect request to National Grid could impact schedule for the relocation of the poles. Work on the Contractor's portion must be completed in a timely manner to allow the next utility in line to relocate.

METHOD OF MEASUREMENT

Item 820.15 will be measured for payment by Each highway lighting – overhead removed and reset, complete in place.

AND BASIS OF PAYMENT

Item 820.15 shall be paid for at the Contract unit price per Each, which price shall include all labor, materials, stacking, installation, wiring, hardware, and all incidental costs required to complete the work.

ITEM 821.992 **PATH LIGHT POLE MOUNTED FIXTURE ASSEMBLY** **EACH**

ITEM 821.993 **BRIDGE LIGHT COLUMN FIXTURE ASSEMBLY** **EACH**

The work under these Items shall conform to the relevant provisions of Subsections 813 and 820 of the Standard Specifications and the following:

The work under these Items shall include all labor, materials, and equipment necessary to furnish and install Streetlights complete and ready for operation. See Contract Drawings for locations of each type of street light.

The work shall include, but not be limited to, the installation of Ornamental light poles, light fixtures, bulbs, ballasts, receptacles and appropriate grounding. Contractor shall provide all labor, materials, equipment, tools, supplies and transportation involved in the installation of electrical equipment as specified.

All work under these and other electrical systems shall conform to the requirements of the National Electrical Code.

SUBMITTALS

Submittals for lighting equipment shall include photometric data. Shop drawings and reports shall employ the terminology, classifications, and methods prescribed by the IES Lighting Handbook, as applicable, for the lighting systems specified. Manufacturer's data shall be submitted for the following:

- Luminaires, including lamps, ballast.
- Lamp Sockets and Lampholders
- Independent Testing Laboratory Photo metric Data
- Lighting standards and mounting Brackets.

Shop drawings shall be submitted for the following:

- Luminaire type: fabrication and assembly drawings and paint finish process.
- Lighting standards: including base details, dimensions, wind loading, EPA ratings, pole deflection, and other applicable information.
- Wind load calculations verifying conformance to AASHTO publication "Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signs", 2009 edition. Calculations and shop drawings shall be stamped by a Professional Engineer Registered in the Commonwealth of Massachusetts

ITEMS 821.992 and 821.993 (Continued)

MATERIALS

Materials and products furnished shall be designed for the intended use, shall meet all requirements of the latest edition of the National Electric Code (NEC), and all local codes.

Materials shall be manufactured in accordance with the standards indicated in this Section, and typical industry standards and codes for the products specified.

The materials used shall be new, unused, and of the best quality for the intended use. All equipment shall have the manufacturer's name, address, model or type designation, serial number and all applicable ratings clearly marked thereon in a location which can be readily observed after installation. The required information should be marked on durable nameplates that are permanently fastened to the equipment.

Electrical equipment shall at all times during construction be adequately protected against mechanical injury or damage by water. Electrical equipment (excluding light poles) shall not be stored outside exposed to the elements. If any equipment or apparatus is damaged, such damage shall be repaired at no additional cost, or replaced at no additional cost as directed by the Engineer.

Wire & Cable

Unless otherwise noted, conductors for power, lighting, and grounding above grade shall be No. 12 through No. 8 AWG, NEC type THWN/THHN, meeting the requirements of UL 83. Conductors for power and lighting shall be no smaller than No. 12 AWG.

All conductors shall be annealed copper, 98% conductivity, Class B stranded, except conductors used for power and lighting circuits No. 10 AWG and smaller which may be solid. All conductors should be rated for 600 volts or less, with a thermal rating of 90° C.

The outside covering of all wiring for power, lighting, grounding, and control uses shall be color coded to identify polarity as follows:

Phase	Color
A or 1	Black
B or 2	Red
Neutral	White
Equipment Ground	Green

ITEMS 821.992 and 821.993 (Continued)Pathway Light

Fixture shall have the following features:

- 3000K Color Temperature
- Gray / Silver Finish
- LED Lamp
- Minimum 100,000 operating hours
- Diffused Acrylic Lens (Soft Vue)
- Type III Distribution
- 120V Operation
- 17' Mounting Height
- 80 watts
- 7011 lumens

Fixture Manufacturer: Sternberg Lighting Solana Series cat # 1A SL730 24L 30 MDL018 SV1
Pole Manufacturer: Valmont Curved 18' steel pole w/25' bend radius, 7" O.D.

The pathway fixture is to have a slip-on arm to fit a horizontal 2-3/8" OD tenon with an elongated arm no more than 2'2" in length as a design esthetic and for scalability. The arm is to have a sealed driver compartment for ease of access to the LED driver. The LED driver shall be securely mounted inside the fixture's arm, for optimized performance and longevity and shall be U.L. recognized. It shall be supplied with a quick-disconnect electrical connector on the power supply, providing easy power connections and fixture installation. It shall have overload, overheat and short circuit protection, and have a DC voltage output, constant current design, 50/60HZ. It shall be supplied with line-ground, line-neutral and neutral-ground electrical surge protection in accordance with IEEE/ANSI C62.41.2 guidelines. It shall be a high efficiency driver with a THD less than 20% and a high-power factor greater than .9. It shall be dimming capable using a 0-10v signal and wired to the fixed dimming resistor board located and mechanically fastened within the access door area in the base of the pole.

Fixture housing to be casted aluminum and UL listed per UL1598 for wet locations in US and Canada. Heat sink of the LEDs is to be accomplished in the fixture hood with the use of advanced air flow dynamics to maximize thermal management for long life LED performance and energy efficiency. Heat sink fins must not be visible for design esthetics. Fixtures with exposed heat sinks and/or motorized thermal management systems will not be considered for this project. The fixture must be full cut off with a flat diffused lens over the LEDs to reduce visibility of the LEDs from below. Each LED must have an internal shield covering each LED

ITEMS 821.992 and 821.993 (Continued)

offering back light optical control. For esthetic concerns, external house side shields attached to the fixture will not be considered for this project. Lumen output of the fixture, considering the diffused lens and using a type 3 distribution pattern, shall not exceed 7,100 lumens and a systems wattage of 89. CRI to be 70 and maximum driver current to be 140mA to ensure LED and driver longevity. A typically photometric layout must be presented to the design team for review and approval. Typical conditions to have on center pole spacing of 80 feet where poles are installed on one side of the pathway. The pathway is to be 12 feet wide and fixture mounting height above finish grade to be 17 feet. Avg/min results to be no greater than 6 footcandles with an average not greater than 2.75 footcandles.

Warranty of the fixture, its LEDs, and power supply is to be 7 years.

Basis of design is Sternberg Lighting, represented locally by ILLUMISITE: Division of Omnilite/Illuminate – 263 Winn Street, Burlington, MA 01803 @ 781.272.2300. Part# SSP20396-1A-SL735-24L30T3-MDL014-SV1-BLOC-FDRB-STANDARD FINISH.

Pole to be 18' and curved per the detail shown. Pole must be round with a pole base diameter of 7" and a top diameter of 4.48". Material must be galvanized steel with a swing latch cover to ensure longevity. The internal swing latch must allow the FDRB to mechanically fasten for easy of usability. Handhole covers attached with fasteners only will not be considered for this project. The pole must be fully hot dipped galvanized, so the full length of the pole is treated, both outside and inside. Spray on galvanization or partial galvanization will not be considered for this project. The pole will have a horizontal tenon at 17' with an OD suitable for accepting the fixture's slip-on arm. The base plate of the pole shall be covered with a 2 piece, 20" diameter casted aluminum cover. Finish shall be baked on powder coat. A PE stamped structural analysis of the pole must be presented to the design team for review and approval. The assembly must be able to withstand AASHTO 2013 – 130MPH with 1.3 gust per MassDOT requirements.

Basis of design is Valmont, represented locally by ILLUMISITE: Division of Omnilite/Illuminate – 263 Winn Street, Burlington, MA 01803 @ 781.272.2300. Part#: 18' CURVED POLE-FPGV-STANDARD FINISH-HH-AB-DT20AC.

Bridge Light

Bridge light shall be contemporary illuminating column style. Fixture shall have the following features:

- 3000K Color Temperature
- Gray / Silver Finish
- LED Lamp
- Minimum 100,000 operating hours
- 120V Operation
- 16' Mounting Height
- Remote DMX control panel

ITEMS 821.992 and 821.993 (Continued)

Manufacturer: Hess Lighting Solana Series cat # MSC300M-F 16 30K DIM RGBW40K DMX-RDM GG

Illuminating column is constructed of four panels extruded from 6063-T65 aluminum alloy which are mechanically interlocked to form a square profile column. Panel thickness is 3/16". Overall column height is 16' with nominal cross section of 8.7". Decorative patterns are precision cut for refined detailing. Column roof with beveled edges is fabricated aluminum and provides access to the upper luminaire. Flush mounted access cover at base allows access to anchor bolts and connection to power while the column is installed. Concealed trap door with quarter-turn thumbscrew at base of column allows for removal of debris as needed. Column base is fabricated from 1" thick aluminum plate and features recessed cavity for leveling nuts to minimize gap between the foundation and column. All hardware is stainless steel.

OPTICS

The column incorporates two independent light sources to provide ambient illumination and dynamic color accenting, respectively. The top luminaire features diffused optics to provide striation-free ambient illumination. Color temperature of 3000K. Power consumption is 22 watts at 450mA for standard model and 37 watts at 700mA for high-output model. Bug rating is B1-U2-G1 for all variants.

Secondary luminaire with narrow beam optics inside the main column body backlights the decorative panels. Light sources may be RGBW, dynamic white, or static white depending on the model. Secondary luminaire consumes 38 watts.

ELECTRICAL

Universal drivers accept 120v through 277v input voltage at 50/60 Hz. Top module is available with optional 0-10vDC dimming. Standard luminaire control option for RGBW and dynamic white secondary luminaire within the column body include on-board circuitry for interface with external DMX-RDM controller systems, stand-alone operation, or master-satellite configurations for simple multiple unit synchronization. Infrared remote control (Ordering code AL1321) for programming is required for models with RGBW and dynamic white and is sold separately.

MOUNTING

Column features concealed fabricated aluminum mounting plate at the base and mounts to four galvanized steel anchor bolts embedded in a concrete foundation by others. Anchor bolts may be pre-shipped in advance upon request.

WEIGHT

16' column: 107 lbs

FINISH

Standard finishes are finely textured matte silver grey metallic, dark grey, graphite grey, matte black, or dark bronze. Custom RAL colors are available on request. Premium anodized aluminum finishes in clear satin, bronze, or black are also available.

ITEMS 821.992 and 821.993 (Continued)

CERTIFICATION

CSA/US Certified for Wet Location.

WARRANTY

Limited product warranty period including LEDs is five years. Driver shall carry the manufacturer's limited warranty.

Experience / Warranties

The pole manufacturer shall have been in the business of manufacturing outdoor lighting products for the municipal street lighting market for a minimum of ten (10) years.

All materials and component parts, excluding lamps, ballasts and transformers are guaranteed to be free from defects of material and/or workmanship for a period of three years from date of shipment. Lamps, ballasts and transformers are covered to the extent of that particular manufacturer's warranty.

LED modules and drivers are guaranteed to be free from defects of material and/or workmanship for a period of five years from the date of shipment. Failure is defined as having 15% or more LED's not illuminated in a luminaire.

CONSTRUCTION METHODS

This Section covers the requirements for installation of materials, proper workmanship, testing, cleaning, grounding, and work methods to be followed by the Contractor. This Section also includes specific instructions and to be used in conjunction with the Contract Drawings. Any discrepancies noted between the Specification, Drawings, and actual installation shall be reported immediately to the Engineer.

Materials & Workmanship

Work shall be executed in workmanlike manner and equipment shall be new and installed according to manufacturer's recommended best practice so that complete installation shall operate safely and efficiently.

Remove all debris caused by Contractors' work.

ITEMS 821.992 and 821.993 (Continued)**Grounding**

Grounding of all light poles and fixtures shall be in accordance Section 250 of the latest edition of the National Electrical Code. Equipment bonding conductor shall be installed from branch feeder circuit to light pole base. Bonding conductor to be permanently attached to metal light pole per grounding stud provided by manufacturer or field installed if not provided. Bonding conductor to be bonding to metal handhole cover, if present. Provide #10AWG copper bonding conductor vertically up length of pole shaft along with power conductors and bond to fixture ground stud. Test all bonding conductors to be continuous back to source. Perform ground resistance test at each pole location. Should ground resistance be less than 25 Ohms, contractor shall provide additional ground rod electrode at pole foundation, in accordance with NEC requirements and re-test to determine if resistance is below 25 Ohms. Report all instances where ground resistance is above 25 Ohms. All grounding conductors to be provided with either green outer jacket or green marking tape.

Testing, Inspection & Cleaning

Test wiring and connections for continuity and grounds before fixtures are connected; demonstrate insulation resistance by megger test as required at not less than 500 volts. Insulation resistance between conductors and grounds for secondary distribution systems shall meet National Electrical Code (NEC) requirements.

Test lighting fixtures with specified lamps in place for 100 hours. Replace lamps that fail within 1 year after acceptance.

Installation of Lighting Fixtures

Verify construction of light pole foundations is suitable, and provide fixtures, poles, hardware, and other accessories suitable for construction encountered.

Contractor to provide (furnish and install) new poles and light fixtures. These light poles and fixtures shall be installed on precast concrete foundation, in locations as indicated on the Contract Drawings.

Coordinate installation of fixtures with installation of surrounding materials. Investigate lighting fixture locations and foundation supports to ensure that no interference exists between lighting fixtures, supports, and other equipment including that provided by other trades. Report any possible interferences to the Engineer.

ITEMS 821.992 & 821.993 (Continued)

METHOD OF MEASUREMENT

Item 821.992 will be measured for payment by Each path light pole mounted fixture assembly installed, wired and lamped, complete in place.

Item 821.993 will be measured for payment by Each bridge light column fixture assembly installed, wired from junction box and lamped, complete in place.

BASIS OF PAYMENT

Items 821.992 and 821.993 will be paid for at the respective Contract unit price per Each, which price shall include all labor, materials, equipment. And all incidental costs required to complete the work.

Schedule of Payment

Payment under these items shall be scheduled throughout the length of contract:

- 30% of value shall be paid upon material delivery to the site of respective items.
- 30% of value shall be paid upon installation of 50% of respective items.
- 30% of value shall be paid upon installation of the remaining 50% of respective items.
- The remaining 10% of the respective items shall be paid at the contract close-out.

Precast foundations for Path Light Pole Mounted Fixture Assembly shall be paid for under item 812.09.

ITEM 823.55**DMX CONTROL PANEL****LUMP SUM**

The work under this Item shall conform to the relevant provisions of Subsections 813 and 820 of the Standard Specifications and the following:

The work under this Item shall include, but not be limited to, the installation of all electrical components detail in the drawings and in these specifications, DMX controller and components, internet connection to allow the city remote lighting augmentation (if required), weatherproof cabinet, pad, control wire, coordination of installation, coordination of light control with the City of Lawrence and programming/schematic design with DMX representative, appropriate grounding. This Item shall also include all related fees to provide lighting control components for the bridge lighting fixtures.

SUBMITTALS

List of materials and equipment requiring catalog cut or shop drawings shall include:

1. DMX equipment
2. Enclosure
3. Control Cable

MATERIALS

Materials and products furnished shall be designed for the intended use, shall meet all requirements of the latest edition of the National Electric Code (NEC), and all local codes.

Materials shall be manufactured in accordance with the standards indicated in this Section, and typical industry standards and codes for the products specified. Materials and equipment shall be Underwriter's Laboratory (UL) listed.

The materials used shall be new, unused, and of the best quality for the intended use. All equipment shall have the manufacturer's name, address, model or type designation, serial number and all applicable ratings clearly marked thereon in a location which can be readily observed after installation. The required information should be marked on durable nameplates that are permanently fastened to the equipment.

Electrical equipment shall at all times during construction be adequately protected against mechanical injury or damage by water. Electrical equipment shall not be stored outside exposed to the elements. If any equipment or apparatus is damaged, such damage shall be repaired at no additional cost, or replaced at no additional cost as directed by the Engineer.

Obtain all necessary permits and licenses, file necessary plans, and pay all fees for permits and inspections. Permit fees are the responsibility of the Contractor as part of his bid.

ITEM 823.55 (Continued)

Wire & Cable

DMX cable shall be rated for outdoors. DMX wire must daisy chain and be continuous from controller to driver; no T-taps or start topology or splices. DMX terminator must be installed at the end of each DMX run.

Lighting Controls

Installation shall include a third-party DMX integrator for programming services and to supply miscellaneous parts and all necessary accessories to control bridge lighting.

DMX Cabinet components (or approved equal)

**DMX Control
Bill of Materials**

Item	Qty	Description
Section I - Control Equipment		
1.1		Mosaic
	1	Mosaic Show Controller - 1 Universe
	1	Mosaic 1-Gang, 8-Button Wall Station, Black finish
	1	Rack Mount Faceplate for 8-Button Station, 3U
1.2		Networking & Accessories
	1	NEMA 3R Rated Heated & Cooled Control Enclosure - 8RU, Pad Mounted Rack Dimensions: 32" Tall x 28" Wide x 22" Deep
	3	UFA Rackshelf, 14.5" Deep
	3	UFA Face Plate, 3U
	6	500mm x 35mm x 7.5mm DIN-Rail
	1	DIN Powersupply 48V 100W
	1	8-Port PoE+ Industrial Switch (IP30) (24V/120W Max)
	1	DIN-Rail Adapter
	10	Keystone DIN-Rail Mounting Module
	10	CAT6 RJ45 Keystone Jack - Full Set
	10	CAT6 Patch Cable 3'
	1	4-PORT DMX Gateway
	1	Rack Mount UPS
	1	Wireless Interface/Connection
		Note: Wireless interface requires internet conection by others.

ITEM 823.55 (Continued)**Cabinet**

Cabinet shall be lockable weatherproof NEMA 3R approximately 32”Hx28”Wx22”D tamperproof cabinet (final cabinet to be sized upon final equipment selection). Cabinet shall be furnish with integral GFI receptacle, fan and heater. American products Manifort or equal. Cabinet shall be mounted on precast pad (to be sized with final enclosure selected).

CONSTRUCTION METHODS

This Section covers the requirements for installation of materials, proper workmanship, testing, cleaning, grounding, and work methods to be followed by the Contractor. This Section also includes specific instructions and to be used in conjunction with the contract Drawings. Any discrepancies noted between the specification, Drawings, and actual installation shall be reported immediately. Failure on the part of the Contractor to report discrepancies immediately will be considered negligent.

Work will be coordinated such that systems can be properly located, and conflicts and delays are avoided.

Materials & Workmanship

The Contractor’s work shall be executed in workmanlike manner and shall present neat, rectilinear and mechanical appearance when completed. Material and equipment shall be new and installed according to manufacturer’s recommended best practice so that complete installation shall operate safely and efficiently.

Testing, Inspection & Cleaning

The Contractor will test wiring and connections for continuity and grounds before fixtures are connected; demonstrate insulation resistance by megger test as required at not less than 500 volts. Insulation resistance between conductors and grounds for secondary distribution systems shall meet National Electrical Code (NEC) requirements.

Grounding

The Contractor shall ensure bond and ground equipment and systems connected under this Section are in accordance with standards of the NEC and other applicable regulations and codes. The Conduit system shall be electrically continuous throughout, grounded at service entrance. Equipment frames, enclosures, boxes, etc. shall be grounded by use of green-jacketed (or bare copper) ground, sized as per Table 250-95 of the NEC.

Green bonding jumper shall be installed in flexible conduits.

Copper fittings for ground connections shall conform to the requirements of ASTM B 30. All bolts, u-bolts, cap screws, nuts, and lock washers for copper fitting shall be of approved corrosion-resisting material.

ITEM 823.55 (Continued)

BASIS OF PAYMENT

Item 823.55 will be paid for at the Contract Lump Sum price, which price shall include all coordination, labor, internet connection, materials, equipment required to furnish, install, test, foundation, complete in place and operational, and the load center as specified herein. It shall also include furnishing and installing all wiring and related connections, splices and hardware and incidental labor and equipment to complete and make operation the entire related lighting and outlet system. No additional compensation will be made to the National Grid fees or charges.

<u>ITEM 823.61</u>	<u>HIGHWAY LIGHTING LOAD CENTER NO.1</u>	<u>LUMP SUM</u>
<u>ITEM 823.62</u>	<u>HIGHWAY LIGHTING LOAD CENTER NO.2</u>	<u>LUMP SUM</u>
<u>ITEM 823.63</u>	<u>HIGHWAY LIGHTING LOAD CENTER NO.3</u>	<u>LUMP SUM</u>

The work under these Items shall conform to the relevant provisions of Subsections 813 and 820 of the Standard Specifications and the following:

The work under this Item shall include, but not be limited to, the installation of all electrical wiring and cabling for the entire, meter sockets, electrical metering, control cabinet, distribution panels, circuit breakers, GFI receptacles (where specified), foundations, appropriate grounding.

This Item shall also include conduit, cabling and related fees to provide an overhead service connection to National Grid..

SUBMITTALS

List of materials and equipment requiring catalog cut or shop drawings shall include:

1. Rigid Conduit
2. Panelboards
3. Service Cabinet, Foundation and Equipment
4. Meter Sockets
5. Main Breaker
6. Circuit Breakers
7. Cabinet Light
8. Cabinet Heater
9. Lighting Contactor
10. Photocell
11. Astronomic timer
12. Wiring Devices and Receptacles

MATERIALS

Materials and products furnished shall be designed for the intended use, shall meet all requirements of the latest edition of the National Electric Code (NEC), and all local codes.

Materials shall be manufactured in accordance with the standards indicated in this Section, and typical industry standards and codes for the products specified. Materials and equipment shall be Underwriter's Laboratory (UL) listed.

The materials used shall be new, unused, and of the best quality for the intended use. All equipment shall have the manufacturer's name, address, model or type designation, serial number and all applicable ratings clearly marked thereon in a location which can be readily observed after installation. The required information should be marked on durable nameplates that are permanently fastened to the equipment.

ITEMS 823.61, 823.62 and 823.63 (Continued)

Electrical equipment shall at all times during construction be adequately protected against mechanical injury or damage by water. Electrical equipment shall not be stored outside exposed to the elements. If any equipment or apparatus is damaged, such damage shall be repaired at no additional cost, or replaced at no additional cost as directed by the Engineer.

Obtain all necessary permits and licenses, file necessary plans, and pay all fees for permits and inspections. Permit fees are the responsibility of the Contractor as part of his bid.

Wire & Cable

Unless otherwise noted, conductors for power, lighting, and grounding above grade shall be No. 12 through No. 8 AWG, NEC type THWN/THHN, meeting the requirements of UL 83. Conductors for power and lighting shall be no smaller than No. 12 AWG.

All conductors shall be annealed copper, 98% conductivity, Class B stranded, except conductors used for power and lighting circuits No. 10 AWG and smaller which may be solid. All conductors should be rated for 600 volts or less, with a thermal rating of 90° C.

The outside covering of all wiring for power, lighting, grounding, and control uses shall be color coded to identify polarity as follows:

<u>Phase</u>	<u>Color</u>
A or 1	Black
B or 2	Red
Neutral	White
Equipment Ground	Green

Raceways (Conduit)

Rigid Metallic Conduit: UL6 and ANSI C80.1.

Flexible Metallic Conduit: UL1. Liquid tight flexible metal conduit shall be used in wet locations.

Minimum size of conduit shall be 3/4". Unless indicated on Drawings, conduit sizes can be sized in accordance with National Electric Code (NEC). Conduit bends shall not have kinks or flats, and shall not be less than standard radii.

Rigid Galvanized Steel (RGS) conduit shall be used for all power, control signal, and instrumentation wiring, except where noted. Conduit shall be fully threaded at both ends and each length shall be furnished with one threaded coupling.

ITEMS 823.61, 823.62 and 823.63 (Continued)

Conduits shall be made electrically continuous at coupling and connections to boxes and cabinets by means of joining fasteners or copper bond wires. Conduit shall be connected to grounded structural steel or the ground network. After assembly all conduit locknuts, all EMT coupling fittings, and all bond wire screws shall be set up tight before installation of wiring. Insulated metallic bushings shall be used on all conduits entering panel cabinets, handholes, and wiring gutters, except on branch lighting circuits.

Expansion fittings shall be provided on all conduits as required by the latest National Electrical Code, and as required by local and state codes. This includes, but is not limited to, vertical conduit risers coming from below-grade.

Wiring Devices

Wiring Devices: NEMA WD 1.

Wiring devices for shall be specification grade, 20 ampere, ivory with Type 302 stainless steel plates. Ground fault current interrupting (GFCI) devices shall be provided where specified and/or required by applicable codes.

Panelboards

Panelboards: NEMA PB1, and UL 67.

Panelboards shall be door-in-door construction with copper bus. Circuit breakers shall be molded case, thermal magnetic, bolt-on type rated as noted, and rated to match panelboard voltage and interrupting rating (22kA minimum). Circuit breakers should be capable of accepting up to #4 Awg wiring.

Panelboard to be 100A, 1-phase, 120/240V with circuit breaker minimum quantities as shown on Contract Drawings. Provide 100A main circuit breaker in panel, and sufficient breakers for lighting circuits and receptacle in cabinet.

Meter Sockets

Meter Sockets: UL 414, UL 486B, and ANSI C12.7.

Outdoor meter sockets are to be NEMA 3R, and have vandal-proof covers to protect utility kWh meters (if specified). Unless otherwise noted, meter sockets shall be ringless, with lever bypass, tin plated connections, and have provision for a fifth terminal on single-phase applications.

Meter Socket shall be either heavy duty or medium duty, 100 ampere, ringless, 5 terminal, with approximate dimensions of 19"H x 13"W x 5"D. Socket to meet local utility requirements.

ITEMS 823.61, 823.62 and 823.63 (Continued)**Metering Cabinets**

Provide outdoor NEMA 3R metering cabinet. Contractor to size cabinet to coordinate with sizes of panelboard and equipment to be installed within cabinets. Dimensions shown are typical and are for reference only. Cabinet to include all equipment shown or implied and all equipment shall be installed inside of cabinet without physical conflicts and per NEC. Cabinet to be sized for all necessary conduits, whether active, spare or future as listed on panelboard schedules.

Cabinets to be manufactured from 14 gauge minimum stainless steel with 12 gauge steel panel, mounted inside. Cabinets to have integral keyed locking mechanism, keyed alike, with provision for pad-lock. Cabinets shall be ventilated type and **factory painted black powder-coat**. Cabinets to have door hold-open latches.

Provide outdoor-rated 100A meter socket mounted on the side of the cabinet to meet local utility requirements.

Provide non-fused safety switch, rated 100A, 1-phase, 240V maximum, 2-pole inside of cabinet, per local utility requirements.

Metering cabinet to be installed on new concrete foundation as shown and as directed. Contractor responsible for coordinating foundation dimensions to be 6-inches wider than cabinet.

Lighting Controls

Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

Timer Switches

Electromechanical-Dial Time Switches: Comply with UL 91

1. Contact Configuration: SPST
2. Contact Rating: 20-A ballast load, 120/240 V ac
3. Circuitry: Allow connection of a photoelectric relay as substitute for on-off function of a program.
4. Astronomical time dial.
5. Wound-spring reserve carryover mechanism to keep time during power failures, minimum of 16 hours.

Outdoor Photoelectric Switches

Solid state, with SPST dry contacts rated for 20 Amp, 125V to operate connected relay, contactor coils, and microprocessor input; complying with UL 773A. Light-Level Monitoring Range: 1.5 to 10 fc, with an adjustment for turn-on and turn-off levels within that range. Time Delay: 15-second minimum.

ITEMS 823.61, 823.62 and 823.63 (Continued)**Lighting Contactors**

Electrically operated and mechanically held, combination type with nonfused disconnect, complying with NEMA ICS 2 and UL 508.

CONSTRUCTION METHODS

This Section covers the requirements for installation of materials, proper workmanship, testing, cleaning, grounding, and work methods to be followed by the Contractor. This Section also includes specific instructions and to be used in conjunction with the contract Drawings. Any discrepancies noted between the specification, Drawings, and actual installation shall be reported immediately. Failure on the part of the Contractor to report discrepancies immediately will be considered negligent.

Work will be coordinated such that systems can be properly located, and conflicts and delays are avoided.

Materials & Workmanship

The Contractor's work shall be executed in workmanlike manner and shall present neat, rectilinear and mechanical appearance when completed. Material and equipment shall be new and installed according to manufacturer's recommended best practice so that complete installation shall operate safely and efficiently.

Testing, Inspection & Cleaning

The Contractor will test wiring and connections for continuity and grounds before fixtures are connected; demonstrate insulation resistance by megger test as required at not less than 500 volts. Insulation resistance between conductors and grounds for secondary distribution systems shall meet National Electrical Code (NEC) requirements.

Grounding

The Contractor shall ensure bond and ground equipment and systems connected under this Section are in accordance with standards of the NEC and other applicable regulations and codes.

The Conduit system shall be electrically continuous throughout, grounded at service entrance. Equipment frames, enclosures, boxes, etc. shall be grounded by use of green-jacketed (or bare copper) ground, sized as per Table 250-95 of the NEC.

Green bonding jumper shall be installed in flexible conduits.

Copper fittings for ground connections shall conform to the requirements of ASTM B 30. All bolts, u-bolts, cap screws, nuts, and lock washers for copper fitting shall be of approved corrosion-resisting material.

ITEMS 823.61, 823.62 and 823.63 (Continued)

Ground Rods shall be 5/8" diameter and 10' in length, solid copper as required by applicable codes (NEC, NESC). Bonding connections to ground rods shall be permanent, welded or crimped, with copper connectors. All wire used for grounding shall be no smaller than #4 Awg copper, stranded conductor.

Contractor to provide two (2) 5/8" x 10'-0" copper ground rods, 1 ground rod to be installed around the base of the new metering cabinets and one ground rod to be installed inside the new cabinets. Grounding to be installed per installation detail.

Electrical Service Conduit Installation

Electrical Service connection shall be paid for under item 813.801, 813.802, 813.803. Conduit sweeps at metering cabinet shall be rigid galvanized steel (RGS), 24" minimum radius (as required by Utility). Provide 3-conductor, #2AWG 600V service cable with ground to utility manhole or transformer OR POLE for new 100A service to metering cabinet.

Electrical Metering Control Cabinet Installation

Contractor to provide new outdoor NEMA 3R stainless steel metering cabinet (factory painted color: black), with 100 amp, 5 terminal, meter socket mounted on the side of meter cabinet as indicated on the Drawings. Contractor to coordinate the incoming underground 100-amp service from the utility to the new metering cabinet. Cabinet must be painted black by manufacturer, as field painting is not acceptable.

All exposed hardware fittings and the like shall be colored flat black.

Contractor shall co-ordinate with National Grid on connections to utility pole. The Contractor shall make the connection to its system. Contractor shall be responsible for all charges and fees assessed by National Grid.

Foundation pad shall be as installed according to detail SD3.020 and as described in section 812.20. Installation shall include all sand and gravel borrow underneath foundation.

BASIS OF PAYMENT

Items 823.61, 823.62 and 823.63 will be paid for at the Contract Lump Sum unit, which price shall include all labor, materials, equipment required to furnish, install and test, foundation as shown on detail, complete in place and operational, the load center as specified herein. This price shall include associated electrical components, miscellaneous hardware, and 3 inch rigid steel conduit required for the service connection. It shall also include furnishing and installing all wiring and related connections, splices and hardware and incidental labor and equipment to complete and make operation the entire related lighting and outlet system. No additional compensation will be made to National Grid fees or charges.

Service connection and coordination is paid for under respective item 813.801, 813.802, 823.803

ITEM 823.64**EXISTING HIGHWAY LIGHTING
LOAD CENTER ADDITIONS****LUMP SUM**

The work under this Item shall conform to the relevant provisions of Subsections 813 and 820 of the Standard Specifications and the following:

The work under this Item shall include, but not be limited to, the installation of all electrical components detail in the drawings and in these specifications, including circuit breakers, contactor, timer and photocell, appropriate grounding. This Item shall also include conduit, cabling and related fees to provide lighting components in existing Lighting control Cabinet and all coordination with National Grid.

SUBMITTALS

List of materials and equipment requiring catalog cut or shop drawings shall include:

1. Circuit Breakers
2. Astronomic timer

MATERIALS

Materials and products furnished shall be designed for the intended use, shall meet all requirements of the latest edition of the National Electric Code (NEC), and all local codes.

Materials shall be manufactured in accordance with the standards indicated in this Section, and typical industry standards and codes for the products specified. Materials and equipment shall be Underwriter's Laboratory (UL) listed.

The materials used shall be new, unused, and of the best quality for the intended use. All equipment shall have the manufacturer's name, address, model or type designation, serial number and all applicable ratings clearly marked thereon in a location which can be readily observed after installation. The required information should be marked on durable nameplates that are permanently fastened to the equipment.

Electrical equipment shall at all times during construction be adequately protected against mechanical injury or damage by water. Electrical equipment shall not be stored outside exposed to the elements. If any equipment or apparatus is damaged, such damage shall be repaired at no additional cost, or replaced at no additional cost as directed by the Engineer.

Obtain all necessary permits and licenses, file necessary plans, and pay all fees for permits and inspections. Permit fees are the responsibility of the Contractor as part of his bid.

Wire & Cable

Unless otherwise noted, conductors for power, lighting, and grounding above grade shall be No. 12 through No. 8 AWG, NEC type THWN/THHN, meeting the requirements of UL 83. Conductors for power and lighting shall be no smaller than No. 12 AWG.

ITEM 823.64 (Continued)

All conductors shall be annealed copper, 98% conductivity, Class B stranded, except conductors used for power and lighting circuits No. 10 AWG and smaller which may be solid. All conductors should be rated for 600 volts or less, with a thermal rating of 90° C.

The outside covering of all wiring for power, lighting, grounding, and control uses shall be color coded to identify polarity as follows:

<u>Phase</u>	<u>Color</u>
A or 1	Black
B or 2	Red
Neutral	White
Equipment Ground	Green

Raceways (Conduit)

Rigid Metallic Conduit: UL6 and ANSI C80.1.

Flexible Metallic Conduit: UL1. Liquid tight flexible metal conduit shall be used in wet locations.

Minimum size of conduit shall be 3/4". Unless indicated on Drawings, conduit sizes can be sized in accordance with National Electric Code (NEC). Conduit bends shall not have kinks or flats, and shall not be less than standard radii.

Rigid Galvanized Steel (RGS) conduit shall be used for all power, control signal, and instrumentation wiring, except where noted. Conduit shall be fully threaded at both ends and each length shall be furnished with one threaded coupling.

Conduits shall be made electrically continuous at coupling and connections to boxes and cabinets by means of joining fasteners or copper bond wires. Conduit shall be connected to grounded structural steel or the ground network. After assembly all conduit locknuts, all EMT coupling fittings, and all bond wire screws shall be set up tight before installation of wiring. Insulated metallic bushings shall be used on all conduits entering panel cabinets, handholes, and wiring gutters, except on branch lighting circuits.

Expansion fittings shall be provided on all conduits as required by the latest National Electrical Code, and as required by local and state codes. This includes, but is not limited to, vertical conduit risers coming from below-grade.

ITEM 823.64 (Continued)**Lighting Controls**

Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

Timer Switches

Electromechanical-Dial Time Switches: Comply with UL 91

1. Contact Configuration: SPST
2. Contact Rating: 20-A ballast load, 120/240 V ac
3. Circuitry: Allow connection of a photoelectric relay as substitute for on-off function of a program.
4. Astronomical time dial.
5. Wound-spring reserve carryover mechanism to keep time during power failures, minimum of 16 hours.

CONSTRUCTION METHODS

This Section covers the requirements for installation of materials, proper workmanship, testing, cleaning, grounding, and work methods to be followed by the Contractor. This Section also includes specific instructions and to be used in conjunction with the contract Drawings. Any discrepancies noted between the specification, Drawings, and actual installation shall be reported immediately. Failure on the part of the Contractor to report discrepancies immediately will be considered negligent.

Work will be coordinated such that systems can be properly located, and conflicts and delays are avoided.

Materials & Workmanship

The Contractor's work shall be executed in workmanlike manner and shall present neat, rectilinear and mechanical appearance when completed. Material and equipment shall be new and installed.

Testing, Inspection & Cleaning

The Contractor will test wiring and connections for continuity and grounds before fixtures are connected; demonstrate insulation resistance by megger test as required at not less than 500 volts. Insulation resistance between conductors and grounds for secondary distribution systems shall meet National Electrical Code (NEC) requirements.

ITEM 823.64 (Continued)

Grounding

The Contractor shall ensure bond and ground equipment and systems connected under this Section are in accordance with standards of the NEC and other applicable regulations and codes.

The Conduit system shall be electrically continuous throughout, grounded at service entrance. Equipment frames, enclosures, boxes, etc. shall be grounded by use of green-jacketed (or bare copper) ground, sized as per Table 250-95 of the NEC.

Green bonding jumper shall be installed in flexible conduits.

Copper fittings for ground connections shall conform to the requirements of ASTM B 30. All bolts, u-bolts, cap screws, nuts, and lock washers for copper fitting shall be of approved corrosion-resisting material.

BASIS OF PAYMENT

Item 823.64 will be paid for at the Contract Lump Sum Price, which price shall include all labor, materials, equipment required to furnish, install and test, complete in place and operational, the load center as specified herein. It shall also include furnishing and installing all wiring and related connections, splices and hardware and incidental labor and equipment to complete and make operation the entire related lighting and outlet system. No additional compensation will be made to National Grid fees or charges.

ITEM 823.71 **HIGHWAY LIGHTING POLE AND LUMINAIRE** **EACH**
REMOVED AND STACKED

The work under this item shall conform to the relevant provisions of Subsection section 800 of the Standard Specifications and the following:

Work shall include the removal and stacking of an existing highway lighting pole and luminaire at the locations shown on the plans and as required by the Engineer. The Contractor shall completely remove the lighting pole and foundation. The foundation shall be disposed of offsite and the pole and hardware shall be stacked at the City of Lawrence DPW yard, or as required by the Engineer. The City of Lawrence DPW Yard is located at 1 Auburn Street Lawrence, MA. Contact Lance Hamel (# 978-960-9337) to coordinate one day in advance of drop off. Shall the City not want the lighting pole and hardware; they shall become the property of the Contractor.

The Contractor shall backfill with compacted gravel all holes resulting from the removal of the existing light pole foundation and restore the area to match existing conditions of adjacent areas.

METHOD OF MEASUREMENT

Item 823.71 will be measured for payment by Each highway lighting pole and luminaire removed and stacked.

BASIS OF PAYMENT

Item 823.71 will be paid for at the Contract unit price per Each, which price shall include all labor, materials, equipment and all incidental costs required to complete the work.

No separate payment will be made for fees required by National Grid to disconnect and de-energize the wires each light pole in the National Grid electric manhole and remove each light from the Lawrence National Grid bill.

No separate payment will be made for offsite disposal of light pole foundation.

No separate payment will be made for compact gravel or any type of material required to restore damaged areas to their existing conditions.

<u>ITEM 825.21</u>	<u>RRFB (2-POST ASSEMBLY SYSTEM) LOCATION 1</u>	<u>EACH</u>
<u>ITEM 825.22</u>	<u>RRFB (2-POST ASSEMBLY SYSTEM) LOCATION 2</u>	<u>EACH</u>
<u>ITEM 825.23</u>	<u>RRFB (2-POST ASSEMBLY SYSTEM) LOCATION 3</u>	<u>EACH</u>

The work under these items shall conform to the relevant provisions of Section 800 of the Standard Specifications, Subsection 825 of the Supplemental Specifications (Document 00715), the Plans, and the following:

DESCRIPTION

The work shall include furnishing and installing a solar-powered, pedestrian actuated, rectangular rapid flashing beacon (RRFB) system at the locations shown in the plans. RRFBs are intended to provide supplemental warning to approaching vehicles of the potential for pedestrians to be crossing in an adjacent crosswalk.

One RRFB (for two-way indications on both sides of the roadway) shall be installed at all locations:

Location 1 – LMRC Rail Trail at Merrimack Street

Location 2 – LMRC Rail Trail at LMRC Rail Trail at Essex Street

Location 3 - LMRC Rail Trail at Haverhill Street (Route 110)

MATERIALS

An RRFB system shall, at a minimum, consist of the following items, which shall be included in the lump sum bid:

- (2) cement concrete foundations;
- (2) 17' traffic signal posts and pedestals;
- (2) APS pushbutton systems;
- (4) dual rectangular yellow LED beacons in NEMA enclosures with side LED pilot light;
- (2) 9"x12" R10-25 (PUSH BUTTON TO TURN ON WARNING LIGHTS) signs;
- (4) 30"x30" W11-15 (Bike/Pedestrian Warning) signs;
- (4) 24"x18" W11-15p (Trail Crossing) signs;
- (2) 24"x12" W16-7PR and (2) 24"x12" W16-7PL (Diagonal Downward Arrow) signs;
- (2) solar panel systems;
- (2) NEMA Type 3R or higher enclosures to house:
 - Electrical components, including wiring and solid-state circuit boards;
 - On-board user interface;

ITEMS 825.21, 825.22 & 825.23 (Continued)

- Battery; and
- Frequency hopping spread spectrum (or other alternate FCC approved) wireless activation unit with a minimum 150' range; and
- All mounting and supporting hardware and wiring necessary to complete a working system.

RRFB controller and LED beacons, APS pushbutton systems, and traffic signal posts and pedestals shall be listed on the Qualified Traffic Control Equipment List. Pedestals shall be cast iron.

Incidental RRFB Signage

All signs attached to the RRFB assemblies shall be incidental to the lump sum bid price of the RRFB. All signs shall be MUTCD-compliant. \

R10-25 signs may be integrated into the APS pushbutton system as a single unit or mounted separately on Type A aluminum.

Solar Power System for Flashing Warning Beacon

All locations shall be a solar-powered RRFB and solar-powered components shall conform to Subsection 825 and to the following:

1. The RRFB shall also include power inputs for connections to external power sources from either utility company AC line service or generator supplied power.
2. The solar power system shall conform to the following:
 - a. The solar panel array shall provide sufficient power to meet RRFB operational performance specifications identified in this Special Provision.
 - b. A photovoltaic controller shall be provided to monitor batteries and maintain the maximum power level without over-charging the batteries. The photovoltaic controller shall provide an automatic load disconnect if a low voltage condition is detected and shall automatically reconnect the load upon power restoration.
 - c. The solar panel array shall be inclinable in two axes to optimize the solar collection and charging capabilities of the solar panels. The solar panels shall rotate a full 360° and shall tilt up to 70° from horizontal.

The Contractor shall provide a warranty valid for a minimum of 2 years for all batteries and solar panels.

The Contractor shall provide shop drawings and calculations to confirm solar panel sizing and battery/solar energy storage will meet the functional requirements of the system.

ITEMS 825.21, 825.22 & 825.23 (Continued)**Detection System**

The Contractor shall provide a detector compatible with the proposed RRFB system hardware and programming and operating video, infrared, or microwave. The detector shall be installed on each RRFB for the Essex Street and Haverhill Street crossing locations and shall be mounted at the height that provides the necessary visibility to the detection zone shown on the plans.

The detector shall activate the RRFB if a person and/or vehicle (bike) enters the detection zone in the direction of travel towards the crosswalk.

The Contractor shall provide the necessary detection processor unit within the RRFB controller cabinet and provide all necessary cabling and labor to provide a functioning detection system.

The Contractor shall provide documentation that the proposed RRFB assembly solar panel and battery system shall, at a minimum, meet all the requirements outlined in this special provision in addition to operating the detection system.

Posts and Foundations

All pedestal posts associated with the RRFB shall be painted black. The new pedestal posts shall have cast-iron transformer bases and be made of aluminum. New RRFB base foundations shall not obstruct a sidewalk or crosswalk so that passage by physically challenged persons is impaired and installation shall be in compliance with ADA/AAB standards. Sidewalk extensions shall be provided when needed in order to maintain minimum ADA/AAB compliance.

The new pedestal posts on new foundations may utilize either precast or cast-in-place cement concrete pedestal post foundations constructed in conformance with the MassDOT Standard Drawings.

Signal posts and bases shall be minimum 4" diameter aluminum shafts with cast pedestal bases. Poles shall be of a length such that a minimum vertical clearance of 7 feet is achieved between the ground surface and the bottom of the sign closest to the ground surface.

Construction Methods

The Contractor shall diagnose and replace any part of the pedestrian activated warning system that is found to be defective in workmanship, material, or manner of functioning within six months of final acceptance by the Engineer. This requirement does not supersede the one-year warranty period on materials specified in Subsection 825.

BASIS OF PAYMENT

Items 825.21, 825.22, 825.23 will be paid for at their respective contract unit prices per lump sum, which price shall include all labor, materials, equipment, wiring, and incidental costs required to complete the work for each location.

ITEM 852.12**TEMPORARY PEDESTRIAN CURB RAMP****EACH**

The work under this item consist of furnishing, deploying, maintaining in proper operating conditions, and removing 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 Curb Ramp shall provide a 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, 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 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 60 inches, but if constraints exist a minimum clear width of 48 inches shall be provided along its entirety. If a 60 inch width cannot be accommodated in full, a 60 inch by 60 inch passing space shall be provided every 200 feet or less along the TPAR.

Turning areas shall be 60 inches by 60 inches minimum.

Lateral joints between any surfaces shall not exceed 0.5 inches. Lateral edges may be vertical up to 0.25 inches high and shall be beveled at 1V:2H between 0.25 inches and 0.5 inches.

The TPAR shall be kept clear of debris, snow, and ice and the Temporary Pedestrian Curb Ramps shall not obstruct drainage.

Removal and/or resetting of Temporary Pedestrian Curb Ramps shall be considered incidental.

ITEM 852.12 (Continued)

METHOD OF MEASUREMENT

Item 852.12 will be measured for payment by Each temporary pedestrian curb ramps installed, complete in place.

BASIS OF PAYMENT

Item 852.12 will be paid for at the Contract unit price per Each, which price shall include all labor, materials, equipment required for furnishing, installing, resetting, removal, and maintaining in good working condition.

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:

The work under this Item shall include the deployment and maintaining in proper operating condition a LED balloon diffuser lighting system. These portable light towers shall be used throughout the project area for temporary work zone lighting. The use of unshielded high wattage flood lights shall not be permitted.

These towers shall be used, relocated and adjusted to meet the criteria in Section 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

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.

Task Classifications	Illumination Level	Average Minimum Maintained Illuminance
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 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 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.

The Contractor shall allow MassDOT up to 30 calendar days for review and comment.

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, wiring connections, equipment relocations, 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 859.1 **REFLECTORIZED DRUMS WITH SEQUENTIAL** **DAY**
FLASHING WARNING LIGHTS

The work under this Item shall conform the relevant provisions of Subsection 850 of the Standard Specifications and the following:

Work under this item consists of furnishing, installing, maintaining in proper operating conditions, and removing reflectorized drums, and any necessary ballast, equipped with sequential flashing warning lights.

MATERIALS

Reflectorized drums shall be listed on the MassDOT Qualified Traffic Control Equipment List. Reflective sheeting on drums shall meet or exceed ASTM D4956 Type VIII. All drums shall be maintained in a satisfactory manner including the removal of oils, dirt, and debris that may cause reduced retroreflectivity.

The Contractor shall use one of the following sequential flashing warning light systems unless otherwise approved by the Engineer:

1. Empco-Lite LWCS.
2. pi-Lit® Sequential Barricade-Style Lamp; or
3. Unipart Dorman SynchroGUIDE.

Sequential flashing warning lights shall be secured to reflectorized drums per the light manufacturer's specifications.

CONSTRUCTION METHODS

The first ten (10) drums in any merging or shifting taper as designated in the Temporary Traffic Control Plan shall be equipped with sequential flashing warning lights. These lights shall be operating, at a minimum, between dusk and dawn when the taper is deployed.

The successive flashing of the sequential warning lights shall occur from the upstream end of the merging or shifting taper to the downstream end of the taper in order to identify the desired vehicle path. Each warning light in the sequence shall be flashed at a rate of not less than 55, nor more than 75 times per minute.

Warning lights shall be powered off when drums are not deployed in a taper.

METHOD OF MEASUREMENT

A group of ten (10) reflectorized drums with sequential flashing warning lights is considered one (1) unit and will be measured by the day. Each period of up to 24 hours during which this unit is in use will be measured as one day regardless of the number of times that the drums are positioned, repositioned, removed, or returned to service.

BASIS OF PAYMENT

Reflectorized Drums with Sequential Flashing Warning Lights will be paid for at the contract unit price per day, which shall include full compensation for furnishing, positioning, repositioning, and removing the group of ten (10) drums as directed by the Engineer.

ITEM 874.2**TRAFFIC SIGN REMOVED AND RESET****EACH**

The work under this item shall conform to the relevant provisions of Subsection 828 of the Standard Specifications and the following:

The Contractor shall carefully remove and reset all designated existing signs including attachment hardware and sign support posts located as needed and where directed by the Engineer.

Work shall include the dismantling, removal, transporting, storing and resetting of existing traffic signs at the locations shown on the plans. The Contractor shall completely remove the sign and post and reset said sign and post at the new location. If existing sign and/or post are not suitable for reuse as determined by the Engineer, the contractor shall provide new sign and/or post under items 832. and/or 847.1 and 848.1 respectively. New attachment hardware shall be furnished as necessary to replace any missing or unusable existing hardware.

Existing sign and/or post damaged by the contractor's operations shall be replaced in-kind by the Contractor at no additional compensation

Included under this item are warning, regulatory, and route marker signs and miscellaneous directional signs.

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.

METHOD OF MEASUREMENT

Item 874.2t will be measured for payment by Each traffic sign removed and reset, complete in place.

BASIS OF PAYMENT

Item 874.2 will be paid for at the Contract unit price per Each, which price shall include all labor, materials, equipment and all incidental costs required to complete the work.

No separate payment will be made for gravel backfill, excavation and disposal of existing footings, if required, or all material required to restore the damage area to its existing conditions but all costs in connection therewith shall be included in the Contract unit price bid.

No separate payment will be made for furnishing and installing new attachment hardware, as required, but all costs in connection therewith shall be included in the Contract unit price bid.

ITEM 874.4

TRAFFIC SIGN REMOVED AND STACKED

EACH

The work under this item shall conform to the relevant provisions of Subsection 828 of the Standard Specifications and the following:

The work includes removing, transporting, protection, temporary storage and stacking of signs, posts and hardware. The signs, posts and hardware shall be stacked on boards at the Lawrence Department of Public Works, 200 Common Street, Lawrence, MA; exact location on site shall be as directed by the Engineer, in coordination with the DPW. Work shall also include the removal and disposal of footings, if present, up to a depth of 12 inches below the proposed surface of sidewalks and driveways as well as up to 36 inches below the proposed roadway.

Traffic signs determined to be unsuitable for reuse shall become the property of the Contractor and shall be removed and discarded.

The Contractor shall completely remove the sign and post. If existing sign and/or post are damaged by the Contractor's operations, a new sign and/or post of the same size and material shall be provided to the City 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.

METHOD OF MEASUREMENT

Item 874.4 will be measured for payment by Each traffic sign removed and stacked.

BASIS OF PAYMENT

Item 874.4 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 gravel backfill or excavation and disposal of existing footings, if required, but all costs in connection therewith shall be included in the Contract unit price bid.

ITEM 874.71 MISCELLANEOUS SIGNS ‘TRAIL SIGNS AND POSTS’ EACH

The work under this item consists of furnishing and installing miscellaneous signs as shown on the plans or directed by the Engineer. Sign layout shall follow the MassTrails Bike Wayfinding Design Guide, Blade Style, Section 5.4. Aluminum sign panels (Type A, 0.08” thickness) - See Document A00819, hardware, and reflectorized sheeting shall conform to applicable provisions of Section 828 of the standard specifications.

Each sign panel shall be mounted to its outside diameter 3” hot dipped galvanized steel round support post with pipe post brackets. Posts shall be furnished with a galvanized acorn shape cap with set screw. The tip and corners of all sign panels shall be per MassTrails Bike Wayfinding Design Guide (Document A00819). All edges of sign shall be ground to eliminate sharp edge.

Colors: The sign legend shall be reflectorized with white letters on blue background per MassTrails Bike Wayfinding Design Guide, Section 6.2.1 Sign Background Color. Confirm color selection and lettering format with Engineer prior to producing shop drawings.

Shop drawings shall be submitted to the Engineer for approval before fabrication.

METHOD OF MEASUREMENT

Item 874.71 will be measured for payment by the unit each for each sign panel and sign post installed, complete in place.

Where lettering is required on both sides (double-sided) of a sign it will be considered incidental to the item and no additional compensation will be made for cost to produce the second side.

BASIS OF PAYMENT

Item 874.71 will be paid for at the contract unit price per Each, which price shall include all signs, sign supports, mounting hardware, posts, pipe post brackets, labor, equipment, material, concrete footings, excavation, backfilling, finish grading and all incidental costs required to complete the work.

ITEM 874.8 **WEATHERING STEEL BRIDGE RAIL SIGNAGE** **EACH**

The work under this item shall conform to the relevant provisions of Section 700 of the Standard Specifications and the following.

The work of this Section consists of providing all labor, equipment, materials, structural engineering stamps, incidental work, and construction methods necessary to furnish and install weathering steel bridge rail sign, as indicated on the Contract Documents, as specified, and as follows.

Coordination

Coordinate installation of anchorages for Weathering Steel Bridge Rail Sign. Submit shop drawings, structural stamped drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts and anchor bolts. Deliver items to Project site in time for installation.

Coordinate installation of Weathering Steel Bridge Rail Sign with adjacent construction to ensure that adjacent construction is protected from damage by the work of this Section.

Design Requirements

Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime sky heat loss.

Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

Samples

Submit samples in accordance with Division 1 Section, Submittals.

Submit duplicate, minimum 3-inch x 5-inch samples of each color/finish selected.

Shop Drawings

Submit stamped structural engineering and shop drawings in accordance with Division 1 Section, Submittals.

Indicate elevations, profiles, dimensions and thickness of panels.

Indicate location and detail of joints including joints necessary to accommodate thermal movement.

Show fastening and anchoring details.

ITEM 874.8 (Continued)

Coordination Drawings: For weathering steel assemblies that house items specified in other Sections. Show dimensions of housed items, including locations of housing penetrations and attachments, and necessary clearances.

QUALITY ASSURANCE

Structural Engineering Design Services:

- Contractor, sub-contractor and fabricator shall provide structural engineering calculations to verify all structural elements.
- Structural Engineer performing the calculations shall be a Professional Engineer licensed by the Division of Professional Licensure, Office of Consumer Affairs and Business Regulation, Commonwealth of Massachusetts. Submit name and contact information for Professional Engineer, including Massachusetts License Numbers, Types of License, Expiration Dates, contact addresses and telephone numbers.
- The Contractor shall employ and pay all costs for the Structural Engineer to provide structural engineering services to verify all steel elements meet reference loading requirements. In the event that the structural engineering services and loading calculations and analysis determines the proposed design does not meet loading requirements then Structural Engineer shall provide design services to determine component sizing to meet structural loading requirements

The current issue of Standard Code of Arc and Gas Welding in Building Construction shall apply to this Section as though written out in full. Welding shall be in accordance with the Structural Welding Code of the American Welding Society.

Stainless Steel

- a. All surfaces and connections of stainless steel items shall be without visible grinding marks, surface differentiation or variation.
- b. All fabricated stainless steel items shall have bead blasted surfaces where exposed to view.
- c. All stainless steel surfaces, regardless of manufacturer or fabricator shall have a bead blasted finish that is free of corrosion and match the approved project standard for bead blasted stainless steel.
- d. All exposed welds on stainless steel components shall be ground smooth and set flush with base metal. When bead blasted the welds shall be invisible to view by the Engineer from a 5-foot distance in full sun and reflected sunlight.
- e. Stainless steel surfaces shall be clean and smooth, free from welding discoloration due to heat.
- f. Stainless steel plate and sheet shall be free of dimpling, buckling. 'oil canning' and similar distortions cause by welding or bending of the plate or sheet material

ITEM 874.8 (Continued)

Fabricator Qualifications: A firm experienced in producing metal fabrications like those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

Product Delivery, Handling And Storage

Product shall be received in solid wood crates fabricated to fit product dimensions.

Content shall be packaged and delivered in accordance with manufacturer specification.

Protect finish and edges using a plastic film adhered to prefinished components in accordance with manufacturer's recommendations.

Store components and materials in accordance with manufacturer's recommendations.

Workmanship

Workmanship and finish shall be equal to the best practice of modern shops for each item of work. Metal fabrication shall be accomplished using the highest standards of workmanship. Miscellaneous metalwork shall be well formed to shape and size, with sharp lines and angles and true curves. Drilling and punching shall produce clean true lines and surfaces. Welding shall be continuous along the entire area of contact except where tack welding is permitted. Exposed connections of work in place shall not be tack welded. Exposed welds shall be ground smooth. Exposed surfaces of work in place shall have a smooth finish, and unless otherwise approved, exposed riveting shall be flush. Where tight fits are required, joints shall be milled. Corner joints shall be coped or mitered, well formed, and in true alignment. Work shall be accurately set to established lines and elevations and securely fastened in place. Installation shall be in accordance with manufacturer's installation instructions and approved drawings, cuts, and details.

Warranty

Submit manufacturer's written warranty covering failure of factory-applied exterior finish within the warranty period. Warranty period for finish: One year after the date of Substantial Completion.

MATERIALS**Material Requirements**

Furnish all supplemental parts necessary to complete each item whether or not such parts are shown or specified. Furnish all fastenings for securing the work required in this section to the work of other trades. Furnish, deliver, and pay for the costs of furnishing and delivery under the work of this section.

Provide only new materials, free from defects impairing strength, durability or appearance and of the quality specified.

ITEM 874.8 (Continued)

Standard products meeting the detailed requirements specified in this Section will be considered for approval by the Engineer.

Furnish all supplemental parts necessary to complete each item whether or not such parts are shown or specified. Furnish all fastenings for securing the work required in this Section to the work of other trades. Furnish, deliver, and pay for the costs of furnishing and delivery under the work of this Section.

Provide fastenings of the same material, color and finish as the metal to which applied unless otherwise indicated.

WEATHERING STEEL

Cor-Ten Steel: shall be a high-strength, low-alloy, atmospheric-corrosion-resistant structural steel, commonly called *weathering steel*, Grade 50 with a minimum yield stress of 50 ksi (345 MPa) conforming to ASTM A 588/A 588M, or, high-strength, low-alloy, hot- and cold-rolled sheet and strip, Type 4 containing additional alloying elements and providing a level of corrosion resistance substantially better than that of carbon steels with or without copper addition, conforming to ASTM A 606.

1. Exposure to normal atmospheric conditions shall cause the formation of a tightly adherent oxide coating in this steel, which protects it from further erosion. It can be left exposed and uncoated.
2. All weathering steel components shall be pre-weathered prior to arrival to the project site.

Surface Textures And Finish**Weathering Steel**

1. Exposure to normal atmospheric conditions shall cause the formation of a tightly adherent oxide coating in this steel, which protects it from further erosion. It can be left exposed and uncoated.
2. All weathering steel components shall be pre-weathered prior to arrival to the project site.

CONSTRUCTION METHODS**Examination**

Examine work of other Sections upon which work of this Section depends.

Report any unsatisfactory conditions to Engineer in writing. Do not start work until unsatisfactory conditions are corrected.

ITEM 874.8 (Continued)Coordination

Fabricators producing precast concrete and site furnishings materials and components as specified in other Sections shall utilize the material standards and fabrication requirements specified in this section for the fabrication of metal components utilized in the precast concrete and site furnishing products specified in other Sections.

Metal Fabrication Requirements

Welding: Qualify procedures and personnel according to the following:

1. AWS D1.1, "Structural Welding Code—Steel."
2. AWS D1.3, "Structural Welding Code—Sheet Steel."
3. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.

Where structural joints are made by welding, the details of all joints and techniques of welding employed, the appearance and quality of welds made, and the methods used to correct defective work shall conform to requirements of the AISC and AWS codes.

Welds shall be made only by welders who have previously been qualified by tests as prescribed in AWS "Standard Qualification Procedure" for the type of work required.

All dissimilar metals shall be insulated from one another to prevent bimetallic interaction.

Workmanship and finish shall be equal to the best practice of modern shops for each item of work. Metal fabrication shall be accomplished using the highest standards of workmanship. All work shall be executed by experienced metal workers, shall conform to the requirements of the Contract Documents, and meet the following requirements.

1. General:
 - Individual metal pieces shall be saw cut and carefully fitted together.
 - Sections shall be well formed to shape and size with sharp lines and angles; curved work shall be sprung evenly to curves.
 - Fabricated items shall show metal pieces that are accurately saw cut and are fitted together without gaps, spaces, voids, breaks and crooks in arriss lines, humps, bumps, sags and saddles.
 - Horizontal and vertical curves shall meet the shapes and profiles shown on the Contract Documents. Curves shall be free of broken backs, sags, saddles, tangents or kinks.
 - Exposed surfaces shall have a smooth finish and sharp, well defined lines and arrises.
 - Grind all edges of bars and plates completely free from nicks and machine marks, prior to galvanizing or shop priming.
 - All surfaces and connections of metal items shall be without visible grinding marks, surface differentiation or variation.

ITEM 874.8 (Continued)

- Castings shall have sharp corners and edges and shall be clean, smooth and true to pattern.
 - Welding shall be continuous and shall extend for the entire length of the joints except where specifically indicated on the Contract Documents. All exposed welds shall be ground smooth.
 - All fabricated metal items shall be fine sanded throughout to produce a high standard of surface smoothness.
 - Square and rectangular steel tubing shall have sharp 90 degree corners and edges. Metal furnishings with rounded corners and edges arriving to the Project site or having been installed on the Project site will be rejected, removed and discarded. Replacement of all metal furnishings so rejected shall be entirely at the Contractor's expense.
 - Weld with uncoated wire to prevent flux deposits. If coated wire is used, all flux residue shall be thoroughly removed and bare white metal exposed, prior to galvanization, if applicable. Where overlapping surfaces are welded, seal off contact area by welding all edges around contact area.
 - All welds shall be water tight.
 - Nylon insulating pads, bushings and washers used to prevent bimetallic reaction at all locations where dissimilar metals come into contact.
 - All shop connections shall be full seam welded and ground flush and smooth. Field connections bolted unless otherwise permitted as indicated in this Section. Draw up all threaded connections tightly, after buttering same with pipe joint compound, to exclude water. Deform threads to prevent loosening for all exposed connections subject to vandalism.
 - Inspect all components prior to galvanizing to verify all welds are sound and steel has sufficient integrity to be galvanized.
 - Field connections bolted unless otherwise permitted as indicated in this Section. Draw up all threaded connections tightly, after buttering same with pipe joint compound, to exclude water. Deform threads to prevent loosening for all exposed connections subject to vandalism.
2. Acceptance standards for fabricated miscellaneous site metal items:
- a. Where any of the workmanship standards are not met Engineer will inspect the extent of failure to meet standards and will determine whether the metal items are acceptable.
 - b. The determination of the Engineer will be final.
 - c. Inspection may occur at the source of fabrication, following delivery of the metal items to the Project site or after installation.
 - d. Remove and discard sub-standard metal items at no additional cost to the Owner. Replace sub-standard metal items with newly fabricated, delivered and installed site metal items that meet the requirements of this Article without additional cost to the Owner.

ITEM 874.8 (Continued)

Where the work of this Section must be attached to other materials or where it must be assembled and installed in the field, Contractor shall cut, drill, punch and ream, countersink and tap, or otherwise provide the required holes in the shop, unless such connections are to be welded. The sizes and locations of all such holes shall be shown on the Shop drawings.

Metal work to be built in with concrete or masonry shall be of the form required for anchorage or shall be provided with suitable anchors or expansion shields.

All materials and workmanship under this Section shall be subject to inspection in the mill, shop or field by the Engineer, or by qualified inspectors retained by the Owner. Inspection shall be without expense to the Contractor. However, such inspection, wherever conducted, shall not relieve Contractor of his responsibility to furnish materials and workmanship in accordance with Contract requirements.

Take all measurements required at the work site. Check measurements, compare dimensions and other data with various trades installing adjoining work to assure proper coordination.

Fabricate metal items such that elements are level and plumb or as shown.

Do all shop drilling, tapping, shop fitting, shop cutting, shop welding, and bolting required to erect, install and fit metal work to adjoining work. Conform to AISI Code for Steel or Stainless Steel as applicable. Furnish all screws, bolts, anchors, etc., required to attach metal work securely to adjoining work.

Utilize plug welds, interior pipe and tube welding through access holes, welding on the underside of channel stock and similar devices to conceal all welds from view. Intersections of all component parts shall appear crisp and clean without welding or grinding. Fill access holes after welded with filler metal and grind smooth and invisible from distance of 5-feet. Utilize plug welds ground smooth. All strategies for fabrication and joining of metal parts shall lead to railing assemblies without external welds or visible grind marks.

Steel items shall be fabricated so that there are no visible welds. Utilize plug welds, interior pipe and tube welding through access holes, welding on the underside of channel stock and similar devices to conceal all welds from view. Intersections of all component parts shall appear crisp and clean without welding or grinding. Fill access holes after welded with filler metal and grind smooth and invisible from distance of 5-feet. Utilize plug welds ground smooth. All strategies for fabrication and joining of metal parts shall lead to railing assemblies without external welds or visible grind marks.

Do not enlarge unfair holes by burning and forcing, but correct by reaming.

Install all supports and anchors for metal work except those to be cast into concrete or built into masonry as shown.

Furnish all required metal inserts, anchor slots, anchors, anchor bolts, fastenings, etc., for attachment of work of all trades to Cast-in-Place Concrete and Unit Masonry, except where otherwise specified or obviously included under other Sections of the Specifications.

ITEM 874.8 (Continued)

Weld with uncoated wire to prevent flux deposits. If coated wire is used, all flux residue shall be thoroughly removed and bare white metal exposed. Where overlapping surfaces are welded, seal off contact area by welding all edges around contact area.

Weld corners and seams continuously to comply with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so that no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

Clean-Up

Remove protective film from components.

Clean exposed surfaces in accordance with manufacturer's instructions.

Replace damaged components that, in opinion of the Engineer, cannot be satisfactorily repaired.

METHOD OF MEASUREMENT

ITEM 874.8, will be measured for payment by Each weathering steel bridge rail sign, installed, complete in place.

BASIS OF PAYMENT

ITEM 874.8 will be paid for at the Contract unit price per Each, which price shall include all labor, material, equipment, tools, tests, weathering steel bridge rail sign includes shop drawings, fabrication, surface preparation, coring, anchorage, structural steel, weathering steel panels, hardware, steel fabrication, plasma cutting for lettering, surface preparation, coring and all incidental costs required to complete the work.

ITEM 911.1

SHEAR CONNECTORS

EACH

The work under this Item shall conform to the relevant provisions of Subsections 901 M8.04.1 of the Standard Specifications and the following:

Shear connectors shall comply with all requirements as stated in the Plans. Welding of stud shear connectors shall conform to the latest edition of the AASHTO/AWS Bridge Welding Code and Structural Welding Code, where applicable.

It is understood that the base material for the existing steel stringers is wrought iron. All stud shear connectors shall be field tested by bend and/or torque test methods.

Submittals

Details of shear connectors, including manufacturer, sequence of installation, weld procedure and all relevant technical data shall be submitted to the Engineer for approval prior to installation.

METHOD OF MEASUREMENT

Item 911.1 will be measured for payment by Each shear connector installed, complete in place.

BASIS OF PAYMENT

Item 911.1 will be paid for at the Contract unit price per Each, which price shall include all labor, equipment, materials, production testing, and all incidental costs required to complete the work.

ITEM 950.19**TEMPORARY SUPPORT OF EXCAVATION
BRIDGE NO. L-04-027 (C90)****LUMP SUM**

The work under this Item shall conform to the relevant provisions of Subsections 140 and 950 of the Standard Specifications and the following:

The Contractor shall design, furnish, install, and maintain a temporary earth support system to retain the existing stone walls on both sides of the LMRC Rail Corridor while installing the proposed Bridge No. L-04-027 (C90), as shown on the Plans. The proposed earth support system shall serve to eliminate any potential undermining or surcharge loading associated with the excavation for the proposed bridge.

Included in this item are four (4) test pits to be taken at the base of the existing walls to determine the existing bottom of wall/footing elevations. The location of the test pits shall be determined in the field by the Engineer. Information gathered from the test pits shall be incorporated into the Contractor's design.

The temporary earth support system shall consist of any system deemed appropriate by the Contractor and approved by the Engineer. No work under this Item shall have an adverse effect on the existing stone walls, utilities (buried or otherwise), or abutments. The approximate layout of the temporary earth support system is shown on the Plans. If used, steel sheeting shall conform to ASTM A328/A328-93.

Contractor shall confirm location of all existing utilities prior to installing temporary earth support system. Any damage to adjacent utilities caused by the use of the chosen system shall be repaired to the satisfaction of the utility Owners at no additional cost to the project.

In order to minimize disturbance of and potential damage to the existing walls, the Contractor shall leave as much of the temporary earth support system in place as possible. Only as much of the system as is required to construct the bridge structure, approach roadways, or associated site infrastructure shall be removed.

DESIGN

The Contractor shall be responsible for the design of the temporary earth support system. Design calculations and detailed drawings shall be submitted to the Engineer for review and approval prior to installation. The design package shall be stamped by a Professional Engineer registered in the Commonwealth of Massachusetts.

The system shall be designed to adequately resist all forces acting upon it, including but not limited to earth pressures, vehicular live loads, and construction live loads. Loading shall meet all AASHTO LRFD Bridge Design Specifications and the MassDOT Highway Division LRFD Bridge Manual specifications. The design shall be used on soil strata and design parameters provided in the Geotechnical Report included in this contract.

ITEM 950.19 (Continued)

CONSTRUCTION METHODS

The temporary earth support system shall be securely and satisfactorily braced to withstand all pressures to which it may be subjected. Any damage to the adjacent ground, stone walls, buildings, etc. caused by using the chosen system shall be repaired to the satisfaction of the Engineer at no additional cost. Severe damage which directly affects the safety of the public shall be immediately repaired to the satisfaction of the Engineer. All construction activities shall be halted until the System is satisfactorily repaired.

Excavation support shall be installed in accordance with the accepted working drawings. Contractor shall install and maintain excavation support system in such a manner as to prevent movement, settlement, or loss of ground, removal of fines from the adjacent ground, or damage to or movement of adjacent stone walls, buildings, etc.

Whether support of excavation is indicated on the Construction Drawings or not, the Contractor shall be informed by the Special Provisions that any part of the support system that protrudes in to the supporting soil below the bridge structure, as defined in the paragraph below, shall be cut off and left in place and no additional payment will be made for this part.

All permanent and temporary support of excavation that protrudes into the soil that supports the bridge structure shall be left in place. Supporting soil shall be defined as all soil directly below the footing contained within a series of planes that originate at the perimeter of the bottom of the footing and project down and away from the footing at an angle of 45° from the horizontal.

BASIS OF PAYMENT

Item 950.19 will be paid for at the Contract LUMP SUM bid price, which price shall include all design, labor, materials, equipment, test pits, and all incidental costs required to complete the work.

ITEM 960.2**STRUCTURAL STEEL-COATED STEEL**
BRIDGE NO. L-04-032 (C82)**POUND**

The work under this item shall conform to the relevant provision of Subsection 960 of the Standard Specifications

The work under this item consists of the furnishing, fabricating, transporting and erecting of new steel necessary to fully remove and dispose of the existing steel stringers and install the proposed steel stringers (including connection plates, bolts and surface preparation) as shown on the Plans. This work shall also include the replacement of all necessary rivets with high strength bolts.

Any temporary support of adjacent stringers needed to remove and install replacement stringers shall be considered incidental to this item.

All work shall be done as directed by and to the satisfaction of the Engineer in accordance with the details shown.

The replacement stringers shall be painted to match the repainted steel superstructure.

MATERIALS

All new structural steel and high strength bolts shall conform to the requirements of Sections M8.05.0 and M8.04.3 of the Standard Specifications respectively.

The proposed stringers shall be painted to match the repainted steel. The replacement stringers shall come to the site with a prime coat only. Intermediate and finish coats shall be applied in the field.

SUBMITTALS

The Contractor shall prepare and submit a plan indicating the proposed removal procedures, temporary support of adjacent stringers, surface preparation and installation of replacement stringers. The procedure and any necessary calculations and drawings shall be stamped by a Professional Engineer registered in the Commonwealth of Massachusetts.

All shop drawings for the replacement stringers shall be prepared and submitted to the Engineer for review and approval, in accordance with Section 960 of the Standard Specifications.

The contractor shall take care not to damage any portion of the structure to remain. If the Contractor's operations damage any member to remain, the member shall be repaired at the Contractor's expense to the satisfaction of the Engineer. Mechanical disassembly of steel shall conform to the requirements of Item 114.11.

ITEM 960.2 (Continued)**CONSTRUCTION**

High strength bolts shall be installed after nicks, burrs and foreign substances that might interfere with the seating of the bolt head and nut washers are removed. Light grinding may be ordered by the Engineer. No additional compensation will be made for required grinding, drilling and reaming. The Contractor should note that existing rivets are 7/8" in diameter. Replacement high strength bolts shall be generally the same size as the rivet replaced. Open rivet holes to receive new high strength bolts shall be standard size holes, 1/16" larger in diameter than the bolt diameter. In the event that upon removal of the existing rivets, the hole is found to be out of round or the connected elements have corroded to the extent that required fit cannot be made by cleaning, the hole shall be reamed smooth. Hole diameters exceeding the bolt size +1/16" shall require the use of oversized washers. Hole diameters shall be kept to the smallest diameter possible to install the bolt, and shall not exceed the bolt diameter +3/16". If deformations in adjacent holes require adjustment, the Engineer shall be contacted prior to widening the holes if less than 2" of steel would remain between holes after the holes have been reamed. If more than 3 holes in any single connection require reaming, the Engineer shall be contacted for direction.

Existing rivets may be removed by mechanical methods, that will not damage the members to remain and as approved by the Engineer. Flame cutting of existing rivets shall not be permitted. Existing rivets are to be removed by shearing the head using a pneumatic river breaker and driving out the shank with a pneumatic punch. If, in the opinion of the Engineer, punching will damage the base metal, the shank shall be removed by drilling.

METHOD OF MEASUREMENT

Item 960.2 – Structural Steel (Coated Steel) Bridge No., L-04-032 (C82) will be measured for payment by the actual net weight of new steel in Pounds, including nuts, bolt heads and permanent washers installed in the structure, completed and accepted by the Engineer. Any excess steel material ordered at the Contractor's discretion to facilitate fabrication and installation of the required finished product as defined to the limits on the drawings requirements shall not be measured for payment. The quantity of steel to be calculated and paid for shall only include the weight of the steel that meets the repair detail requirements for each location measured separately. The removal and disposal of the existing stringer shall be considered incidental to this item. The painting of the replacement stringers shall be considered incidental to this item.

BASIS OF PAYMENT

Item 960.2 will be paid for at the Contract unit bid price per Pound which price shall include all labor, materials, equipment, tools, submittals, testing and all incidental costs required to complete the work.

<u>ITEM 960.90</u>	<u>STRUCTURAL STEEL INSPECTION, BRIDGE NO. L-04-032 (C82)</u>	<u>LUMP SUM</u>
<u>ITEM 960.91</u>	<u>STRUCTURAL STEEL INSPECTION, BRIDGE NO. L-04-045 (C91)</u>	<u>LUMP SUM</u>

The work under these Items shall conform to the relevant provisions of Subsection 960 of the Standard Specifications and the following:

The work under these items shall include the visual inspection of the existing steel for Bridge No. L-04-032 (C82) and Bridge No. L-04-045 (C91). Steel shall be cleaned prior to inspection. The Contractor shall perform a visual bridge inspection, focusing on the condition of main superstructure members including girder, stringer, floor beam and truss. Any major structural deficiency or discrepancy against what is shown on the plans shall be immediately presented to the Engineer for confirmation.

No procurement of materials or fabrication can take place until this inspection is finalized and reviewed by the Engineer.

BASIS OF PAYMENT

Items 960.90 and 960.91 will be paid for at the respective Contract LUMP SUM bid price, which price shall include all labor, materials, equipment, and all incidental costs required to complete the work.

ITEM 961.201**CLEAN (FULL REMOVAL) AND PAINT
STEEL BRIDGE NO. L-04-032 (C82)****LUMP SUM**

The work under this Item shall conform to the relevant provisions of Subsections 960.63 and to 961, of the Standard Specifications, and the following:

The work under this Item shall cover the cleaning and painting of all existing steel including, but not limited to the beams, bracing, connections, and bearings.

The paint system shall consist of a spot coat of primer, and full intermediate and finish coats. The coating system shall be approved by the Engineer.

The intermediate and finish coats shall be applied after the stringer replacements have been completed. If primer is applied ahead of these activities, the Contractor shall blast clean and reprime. If painting operations are completed prior to placement of the bridge deck, all surfaces to be in contact with concrete shall be primed only.

All surfaces shall be cleaned in accordance with SSPC SP-15. During cleaning, if the Contractor observes any areas of excessive corrosion, section loss, or missing fasteners to any steel members or fasteners, he shall notify the Engineer immediately. The Engineer shall then determine if the member or fastener shall be repaired or replaced. Repair and replacement of existing steel after all surfaces have been cleaned and not identified in the Plans for replacement shall be paid for under Item 107.971. Areas where existing steel attachments are called to be removed and replaced for stringer repairs shall be cleaned in accordance with SSPC SP-11 and feathered back a minimum of 2" beyond the area of the faying surface and spot primed prior to the application of the full intermediate and finish coats.

The topcoat color shall be coordinated with the Engineer and the City of Lawrence. Contractor will be required to use the FED STD color fan 595 for selection of color samples for approval by the Engineer and City.

All Contractors or subcontractors performing containment, collection, surface preparation or coating of structural steel must be pre-qualified by MassDOT in the Painting – Structural category.

Incidental to this item are all costs associated with the design installation and removal of the required containment system/work platform. All costs associated with the safe removal and disposal of accumulated pigeon waste and other toxic contaminants are incidental to this item and no additional compensation will be made.

BASIS OF PAYMENT

Item 961.201 will be paid for at the Contract LUMP SUM bid price, which price shall include all labor, materials, equipment, and all incidental costs required to complete the work.

ITEM 961.201 (Continued)

SPECIAL NOTES REGARDING PREVAILING WAGE REQUIREMENTS

Note that the erection and dismantling of scaffolding, rigging and containment for bridge painting work is subject to the “Painter(Bridges/Tanks)” prevailing wage rate. This includes surface preparation, including removal of all types of paint on bridges, the application of paint and the clean-up of debris resulting from paint removal operation on bridges, pursuant to the determination by the Massachusetts Department of Labor Standards’ 12/23/2009 “Notice Concerning the Removal and Application of Paint on Bridges and Tanks.”

ITEM 961.202**CLEAN (FULL REMOVAL) AND PAINT
STEEL BRIDGE NO. L-04-045 (C91)****LUMP SUM**

The work under this Item shall conform to the relevant provisions of Subsections 960.63 and to 961, of the Standard Specifications, and the following:

The work under this Item shall cover the cleaning and painting of all existing steel including, but not limited to the girders, bracing, bearings, and connections.

The paint system shall consist of a spot coat of primer, and full intermediate and finish coats. The coating system shall be approved by the Engineer. The intermediate and finish coats shall be applied after the bolster beam is installed. If the prime coat is applied in advance of this work, the primer shall be blasted and reapplied as needed prior to applying the intermediate and top coats. If painting operations are completed prior to placement of the bridge deck, all surfaces to be in contact with concrete shall be primed only.

All surfaces shall be cleaned in accordance with SSPC SP-15. During cleaning, if the Contractor observes any areas of excessive corrosion, section loss, or missing fasteners to any steel members or fasteners, he shall notify the Engineer immediately. The Engineer shall then determine if the member or fastener shall be repaired or replaced. Repair and replacement of existing steel after all surfaces have been cleaned and not identified in the Plans for replacement shall be paid for under Item 107.972.

The topcoat color shall be coordinated with the Engineer and the City of Lawrence. The Contractor will be required to use the FED STD color fan 595 for selection of color samples for approval by the Engineer and the City.

All Contractors or Subcontractors performing containment, collection, surface preparation or coating of structural steel must be pre-qualified by MassDOT in the Painting – Structural category.

Incidental to this item are all costs associated with the design installation and removal of the required containment system/work platform. All costs associated with the safe removal and disposal of accumulated pigeon waste and other toxic contaminants are incidental to this item and no additional compensation will be made.

BASIS OF PAYMENT

Item 961.202 will be paid for at the Contract LUMP SUM bid price, which price shall include all labor, materials, equipment, and all incidental costs required to complete the work.

SPECIAL NOTES REGARDING PREVAILING WAGE REQUIREMENTS

Note that the erection and dismantling of scaffolding, rigging and containment for bridge painting work is subject to the “Painter(Bridges/Tanks)” prevailing wage rate. This includes surface preparation, including removal of all types of paint on bridges, the application of paint and the clean-up of debris resulting from paint removal operation on bridges, pursuant to the determination by the Massachusetts Department of Labor Standards’ 12/23/2009 “Notice Concerning the Removal and Application of Paint on Bridges and Tanks.”

ITEM 962.20**ANTI-GRAFFITI SURFACE COATING****SQUARE YARD**

The work under this Item shall conform to the relevant provisions of Subsection 961 of the Standard Specifications and the following:

Work under this item includes surface preparation and field application of anti-graffiti coating systems for precast, existing concrete and stone masonry vertical and horizontal surfaces. A newly constructed pre-fabricated concrete wall, existing concrete abutments and wingwalls, existing stone abutments and wingwalls and proposed boulders shall receive anti-graffiti coating.

Definitions

- a) General: Standard coating terms defined in ASTM D 16 apply to this Section.
- b) Low-sheen refers to a finish with a gloss range between 30 and 40 when measured at a 60-degree meter.

SUBMITTALS

- a) Product Data: For each coating system indicated.
- b) Material List: An inclusive list of required coating materials. Indicate each material and cross-reference the specific coating, finish system, and application. Identify each material by manufacturer's catalog number and general classification.
- c) Manufacturer's Information: Manufacturer's technical information, including label analysis and instructions for handling, storing, and applying each material specified. Certification by manufacturer that products supplied comply with requirements indicated that limit the amount of VOCs in coating products.
- d) Samples for Verification: For each material to be applied, on representative samples of the actual substrate.
 - i. Provide stepped Samples defining each separate coat. Resubmit until required sheen is achieved.
 - ii. List of material and application for each coat of each sample. Label each sample for location and application.
- e) Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of references, and other information specified.

Quality Assurance

- a) Source Limitations: Obtain all materials for each coating system from the same manufacturer as the finish coats.
- b) Benchmark Samples (Mockups): Provide a full-coat benchmark finish sample for each substrate required for approval by the Engineer. Duplicate finish of approved sample.
- c) Wall Surfaces: Provide samples on at least 50 sq. ft. of wall surface for each different substrate.
- d) Apply coatings to each surface as specified. Provide the required sheen of each surface.
- e) Final approval of coatings will be from benchmark samples.

ITEM 962.20 (Continued)

MATERIALS

Coatings Materials

- a) **Material Compatibility:** Provide materials that are compatible with one another and substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
- b) **Material Quality:** Provide manufacturer's highest grade of the various anti-graffiti surface coatings specified. Materials not displaying manufacturer's product identification are not acceptable.
- c) **Proprietary Names:** Use of manufacturer's proprietary product names to designate materials is not intended to imply that products named are required to be used to the exclusion of equivalent products of other manufacturers. Furnish manufacturer's material data and certificates of performance for proposed substitutions.
- d) **VOC Classification:** Provide anti-graffiti surface coating materials, including primers, undercoats, and finish-coat materials, that have a VOC classification of 450 g/L or less.

CONSTRUCTION METHODS

Delivery, Storage and Handling

Deliver materials to Project site in manufacturer's original, unopened packages and containers bearing manufacturer's name and label with the following information:

- a) Name or title of material.
- b) Product description (generic classification or binder type).
- c) Manufacturer's stock number and date of manufacture.
- d) Contents by volume, for vehicle constituents.
- e) Thinning instructions.
- f) Application instructions.
- g) Handling instructions and precautions.

Store materials not in use in tightly covered containers in a well-ventilated area at a temperature range between 40 and 95 degrees F. Maintain containers used in storage in a clean condition, free of foreign materials and residue.

Protect materials from freezing. Keep storage area neat and orderly. Remove oily rags and waste daily.

Take necessary measures to ensure that workers and work areas are protected from fire and health hazards resulting from handling, mixing, and applying coatings.

ITEM 962.20 (Continued)**Application Conditions**

Apply coatings only when temperature of surfaces to be coated and surrounding air temperatures are between 45 and 85 degrees F.

Limitations: Proceed with application only when the following existing and forecasted weather and substrate conditions permit coatings to be applied according to manufacturers' written instructions and warranty requirements:

- a) Concrete surfaces and mortar have cured for more than 28 days.
- b) Rain or snow is not predicted within 24 hours.
- c) Application proceeds more than 24 hours after surfaces have been wet, unless otherwise recommended by manufacturer.
- d) Windy conditions do not exist that may cause anti-graffiti surface coatings to be blown onto vegetation or surfaces not intended to be treated.
- e) Do not apply coatings in snow, rain, fog, or mist; when relative humidity exceeds 85 percent; at temperatures less than 5 deg F (3 deg C) above the dew point; or to damp or wet surfaces.

Allow wet surfaces to dry thoroughly and attain temperature and conditions specified before proceeding with or continuing coating operation. Work may continue during inclement weather only if areas and surfaces to be coated are enclosed and temperature within the area can be maintained within limits specified by manufacturer during application and drying periods.

Execution

- a) With Applicator present, examine substrates and conditions under which anti-graffiti surface coatings will be applied, for compliance with coating application requirements.
- b) Apply coatings only after unsatisfactory conditions have been corrected and surfaces to receive coatings are thoroughly dry.
- c) Start of application is construed as Applicator's acceptance of surfaces within that particular area.
- d) Coordination of Work: Review other Sections in which primers or other coatings are provided to ensure compatibility of total systems for various substrates. On request, furnish information on characteristics of specified finish materials to ensure compatible primers.

ITEM 962.20 (Continued)

Preparation

- a) **Cleaning:** Before applying anti-graffiti surface coatings, clean substrates of substances that could impair bond of coatings. Remove oil and grease before cleaning.
- b) Schedule cleaning and coating application so dust and other contaminants from cleaning process will not fall on wet, newly coated surfaces.
- c) **Surface Preparation:** Clean and prepare surfaces to be coated according to manufacturer's written instructions for each substrate condition and as specified.
- d) Prepare concrete, brick, concrete masonry block, and cast stone surfaces to be coated. Remove efflorescence, chalk, dust, dirt, grease, oils, and release agents. Roughen as required to remove glaze. If hardeners or sealers have been used to improve curing, use mechanical methods to prepare surfaces.
- e) Use abrasive blast-cleaning methods if recommended by coating manufacturer. Do not coat surfaces if moisture content exceeds that permitted in manufacturer's written instructions.
- f) **Material Preparation:** Carefully mix and prepare coating materials according to manufacturer's written instructions.
- g) Maintain containers used in mixing and applying coatings in a clean condition, free of foreign materials and residue. Stir materials before applying to produce a mixture of uniform density. Stir as required during application. Do not stir surface film into the material. Remove film and, if necessary, strain coating material before using.
- h) Use only the type of thinners approved by manufacturer and only within recommended limits.
- i) Protect adjoining work, including sealant bond surfaces, from spillage or blow-over of coating system components. Cover adjoining and nearby surfaces of aluminum and glass if there is the possibility of components being deposited on surfaces. Cover live plants and grass.
- j) Proceed with installation only after unsatisfactory conditions have been corrected

ITEM 962.20 (Continued)Application

- a) Manufacturer's Field Service: Engage a factory-authorized service representative to inspect the substrate before application of anti-graffiti surface coatings and to instruct Applicator on the product and application method to be used.
- b) General: Apply anti-graffiti surface coatings according to manufacturer's written instructions.
- c) Use applicators and techniques best suited for the material being applied. Do not apply anti-graffiti surface coatings over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to forming a durable coating film. Coating surface treatments and finishes are indicated in the coating system descriptions. Provide finish coats compatible with primers used.
- d) Scheduling Coating: Apply first coat to surfaces that have been cleaned, pretreated, or otherwise prepared for coating as soon as practicable after preparation and before subsequent surface deterioration. The number of coats and film thickness required is the same regardless of application method.
- e) Do not apply succeeding coats until previous coat has cured as recommended by manufacturer. Allow sufficient time between successive coats to permit proper drying.
- f) Give special attention to edges, corners, crevices, and similar surfaces to ensure that they receive a dry film thickness equivalent to that of flat surfaces.
- g) Spray Equipment: Use mechanical methods to apply coating as permitted by manufacturer's written instructions and governing regulations.
- h) Use spray equipment with orifice size recommended by manufacturer for material and texture required.
- i) Minimum Coating Thickness: Apply each material no thinner than manufacturer's recommended spreading rate. Provide total dry film thickness of the entire system as recommended by manufacturer.
- j) Prime Coats: Before applying finish coats, apply a prime coat of material, as recommended by manufacturer, to material required to be coated or finished that has not been prime coated by others.
- k) Recoat primed and sealed substrates immediately if there is evidence of suction spots or unsealed areas in first coat to ensure a finish coat with no burn-through or other defects caused by insufficient sealing.
- l) Completed Work: Match approved Samples for shade and coverage. Remove, refinish, or recoat work that does not comply with specified requirements.

Cleaning

Immediately clean anti-graffiti surface coatings from adjoining surfaces and surfaces soiled or damaged by application as work progresses. Repair damage caused by application. Comply with manufacturer's written cleaning instructions.

Protection

Protect work of other trades, whether being coated or not, against damage from coating operation. Correct damage by cleaning, repairing, replacing, and recoating, as approved by Engineer, and leave in an undamaged condition.

ITEM 962.20 (Continued)

METHOD OF MEASUREMENT

Item 962.20 will be measured for payment by the Square Yard of area applied with anti-graffiti surface coating, complete in place

BASIS OF PAYMENT

Item 962.20 will be paid for at the Contract unit price per Square Yard, which price shall include all labor materials, equipment and all incidental costs required to complete the work.

Anti-Graffiti Surface Coating applied on the cast-in-place concrete wingwalls and precast concrete headwalls of Bridge No. L-04-027 shall be paid for under Item 995.01.

ITEM 992.1**ALTERATION TO BRIDGE STRUCTURE**
NO. L-04-032 (C82)**LUMP SUM**

The work under this Item shall conform to the relevant provisions of Subsection 995 of the Standard Specifications and the following:

The work shall conform to the specific requirements stipulated below for component parts of this Item. For those component parts where no specific requirement is stipulated, the MassDOT Standard Specifications shall apply except for payment.

Work under this Item shall include all labor, materials, equipment, and incidental costs required to construct the following:

- Pre-Construction survey
- Bleeder (Bridge Deck) PVC
- Pre-compressed foam-supported bridge expansion joint
- Dense graded crushed stone
- Steel cable rail
- Steel Reinforcement for Structures – Epoxy Coated
- 5000 PSI, 3/4” 685 HP Cement Concrete
- Precast concrete deck panels
- Scupper and Downspout
- Membrane waterproofing for bridge decks – spray applied
- Drilled and Grouted #5 Dowels
- Diamond Steel Plate Expansion Joint

The work does not include any items listed separately in the proposal. Payment for materials shown on the Plans as being part of the 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 specialty pavers and landscape features, including pedestrian seating units and their connections, within the bridge footprint shall be paid for under their respective items and are not part of this lump sum.

Steel stringer replacements identified in the Plans shall be paid under Item 960.2. Additional repairs that have not been identified in the Plans shall be paid under Item 107.971. The cleaning and painting of the bridge structure shall be paid under Item 961.201.

ITEM 992.1 (Continued)**PRE-CONSTRUCTION SURVEY**

Prior to ordering materials or fabricating any pieces, the Contractor shall perform a detailed bridge survey, focusing on the location of main superstructure members including stringer, floor beam and truss. Any major structural deficiency or discrepancy against what is shown on the plans shall be immediately presented to the Engineer for confirmation.

This inspection shall also specifically locate existing rivet holes in the floorbeam in order to accurately locate hole locations in the replacement stringer connection angle. Stringer connection details as shown in the Plans shall be adjusted to meet field located rivet holes. Revised details shall be submitted to the Engineer for approval prior to ordering materials or fabrication.

Condition of members shall be evaluated after the steel has been cleaned under Item No. 961.201. No procurement of materials or fabrication can take place until this survey is finalized and reviewed by the Engineer.

DRILL AND GROUTED #5 DOWELS

The work under this Item shall consist of drilling and grouting holes in the existing stone masonry backwall for the installation of the cast-in-place backwall extension, as shown on the Plans, or as directed by the Engineer.

MATERIALS

The grout to be used for these dowels shall be a non-shrink cementitious mortar. Grouting material used to perform this work shall be listed on the MassDOT Qualified Construction Materials List. The minimum required compressive strength of the grout at 28 days shall be 6000psi.

The steel dowels shall meet the requirements of AASHTO M31 (ASM A 615) Grade 60 for reinforcement. All steel reinforcement dowels shall be epoxy coated. Steel dowels shall be incidental to the work under this Item.

CONSTRUCTION METHODS

Dowel hole diameter shall be as indicated on the Plans.

All dowel holes shall be air drilled provided that the minimum edge distance as shown on the plans is observed. Should, in the Engineer's opinion, air drilling be inappropriate due to questionable strength of the existing granite stone or insufficient edge distance, the dowel holes shall be diamond core drilled. The inner surfaces of diamond core drilled dowel holes shall be scored to develop sufficient keying action. The method of scoring of the dowel hole's inner surfaces shall be subject to the approval of the Engineer. The depth and diameter of the drilled dowel holes shall be as shown on the Plans, except that the depth of drilled hole shall be modified as required to comply with the minimum depth of hole specified in the product literature of the cementitious mortar by the Contractor to develop the full yield strength of the reinforcing bars. The holes shall be blown clear of any debris and shall have the approval of the Engineer prior to the placement of any grout material.

ITEM 992.1 (Continued)

The drilling operation shall be performed without damage to the portions of the structure that are to remain in place. The Contractor shall take care to avoid drilling through the existing reinforcing present in the existing wingwalls. Any damage to any existing portions of the structure that are to remain in place shall be repaired to a condition equal to or better than existing condition prior to the beginning of the Contractor's operations and shall be repaired at the Contractor's expense.

The Contractor shall follow the recommendations of the manufacturer for mixing and placing the grout material prior to the placement of the dowels. The Contractor shall, at a minimum, adhere to the latest version of ACI 318 code requirements and manufacturer requirements regarding minimum and maximum temperatures while placing the grout. Any excessive grout around the hole after placement of the dowel shall be struck off smooth while the grout is still fresh. Grout shall not be applied if it is raining or snowing, or if such conditions appear to be imminent.

SUBMITTALS

Prior to the commencement of any work under this item, the Contractor shall submit to the Engineer for review and approval a submittal containing the grout manufacturer's literature completely describing the products to be utilized including: product data sheet and appropriate material safety data sheets. The materials shall be delivered clearly marked with legible and intact labels containing the manufacturer's name, brand name, and identification of the areas where temperatures conform to manufacturer's instructions and recommendations. The Contractor shall also include details of the testing equipment used and locations of the test dowels.

BLEEDER BRIDGE DECK (PVC)

The work under this heading shall consist of furnishing and installing 1.5 inch Polyvinyl Chloride (PVC) Plastic Bleeder Schedule 80 deck drain pipes as shown on the drawings and as required by the Engineer.

The drain pipes shall be installed through the waterproof membrane and extended 12 inches below the bottom of the adjacent stringer. After completing the membrane waterproofing and before laying the dense graded crushed stone, the top end of the pipes shall be covered with a 6-in x 8-in section of 1/8-inch mesh galvanized wire screen. The drain pipes shall be pre-installed in the precast deck panel sections.

This heading includes all equipment, labor, and materials necessary to furnish and install the bleeders – including all connections, galvanized mesh screen, couplings, etc. as detailed on the Plans.

ITEM 992.1 (Continued)**STEEL CABLE RAIL****GENERAL**

This section specifies requirements for a pedestrian bridge railing consisting of galvanized posts, extruded aluminum top rail and stainless steel in-fill cables. The work under this item shall include all labor and materials necessary to procure, fabricate and install the steel cable rail along the safety curb at both sides of the bridge including all anchoring and anchoring hardware. The work shall be performed in accordance with the following sections of the Standard Specifications:

- Section 960. – Structural Steel and Miscellaneous Metal Products

REFERENCES

A. Aluminum Association (AA)

1. ABH-21 Aluminum Brazing Handbook
2. ASD-1 Aluminum Standards and Data
3. DAF-45 Designation System for Aluminum Finishes
4. SAA-46 Standards for Anodized Architectural Aluminum

B. American Architectural Manufacturers Association (AAMA)

1. AAMA 2604-05 Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Architectural Extrusions and Panels.

C. American Association of State and Highway Transportation Officials (AASHTO)

1. AASHTO M270 – Specification for Carbon and High Strength Low Alloy Structural Steel Shapes, Plates and Bars and Quenched-and-Tempered Alloy Structural Steel Plates for Bridges.

D. American Society for Testing and Materials (ASTM)

1. A 29 Specification for Steel Bars, Carbon and Alloy, Hot-Wrought and Cold-Finished, General Requirements for.
2. A 47 Specification for Ferritic Malleable Iron Castings.
3. ASTM A 53 – Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.
4. ASTM A 108 – Steel Bars, Carbon and Alloy, Cold Finished.
5. ASTM A 123 – Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel products.
6. A 276 Specification for Stainless Steel Bars and Shapes.
7. ASTM A 479 – Stainless Steel Bars and Shapes for Use in Boilers and Other Pressure Vessels.
8. B 26 Specification for Aluminum-Alloy Sand Castings.
9. ASTM B 211 – Specification for Aluminum and Aluminum-Alloy Bar, Rod, and Wire.

ITEM 992.1 (Continued)

10. B 221 Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wires, Profiles and Tubes.
11. B 429 Specification for Aluminum-Alloy Extruded Structural Pipe and Tube.
12. B 483 Specification for Aluminum and Aluminum-Alloy Drawn Tubes for General Purpose Applications.
13. D3451 – Guide for Testing Coating Powders and Powder Coatings.
- E. Military Specifications (MIL)
 1. MIL-W-87161 – Military specification for wire strand, non flexible, for aircraft control.
 2. MIL-C-5688 – Military specification for cable assemblies, aircraft, proof testing and prestretching.
- F. National Association of Architectural Metal Manufacturers (NAAMM)
 1. Metal Finishes Manual
 2. Pipe Railing Manual
 3. Stair Manual
- G. National Ornamental and Miscellaneous Metals Associations (NOMMA)
 1. Metal Rail Manual
- H. Society of Automotive Engineers
 1. SAE/AMS QQ-S-763 – Steel Bars, Wire, Shapes, and Forgings; Corrosion-Resistant

DESIGN REQUIREMENTS

- A. Top Rail shall withstand a minimum uniform load of 50 pounds per foot applied vertically down and horizontally, simultaneously along the top rail.

SUBMITTALS

- A. Product Data: Submit manufacturer's product data, including installation instructions.
- B. Shop Drawings: Submit fabricator's shop drawings showing sizes, dimensions, details, and installation of railing components, including: intermediate cable braces, cables, cable hardware, and grommets. Show details for anchoring cable railing system to mounting surface.
- C. Material Samples: Submit samples of the following:
 1. Post components by fabricator.
 2. Railing components by manufacturer or fabricator.
 3. Cables by manufacturer or fabricator.
 4. Cable hardware by manufacturer to fabricator.
 5. Grommets by manufacturer or fabricator.
- D. Fabricator's Quality Assurance: Submit fabricator's certification that materials comply with specified requirements and are suitable for intended application.
- E. Warranty: Submit manufacturers' standard warranty for cables and cable hardware. Submit fabricator's warranty for railing components.

ITEM 992.1 (Continued)

QUALITY ASSURANCE

A. Single Source Responsibility

1. Cables, connections, and components shall be product of a single source.
2. Top rail, connections, and components shall be product of single source.

B. Certifications

1. Furnish certification that all components and fittings are furnished by the same manufacturer or approved by the primary component manufacturer.
2. Furnish certification that components were installed in accordance with manufacturer's engineering data to meet the specified design loads.

C. Mock-Ups: Install at project site, or other approved location, a mock-up of the railing system using acceptable products and manufacturer-approved installation methods. Obtain Engineer's approval of product, application, and workmanship standards.

1. Schedule: Mock-up shall be constructed after shop drawings are approved but prior to fabrication and delivery.
2. Mock-up Size: Minimum 10 feet long with three (3) posts.
3. Mock-up Details: Mock-up shall include all railing components. Cables shall be tensioned.

D. Pre-Installation Meeting: Convene a pre-installation meeting two (2) weeks before start of construction of railing frame component mounting surfaces. Provide seven (7) calendar days advance written notice enduring the attendance by competent authorized representatives of the Fabricators, Engineer, installing Subcontract and Subcontractors whose work interfaces with the work of this Section. Review the following:

1. Specific method of installation of railing frame components onto mounting surfaces.
2. Installation, adjusting, cleaning, and protection of cable railing system.
3. Coordination with other work, including installation of deck.
4. Record the results of the meeting and furnish copies to all participants.

DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to the job site in good condition and properly protected against damage to finished surfaces with labels or other markings clearly identifying material name and contractor or fabricator.

B. Storage on site:

1. Store material in a location and in a manner to avoid damage. Stack rails and posts in a way to prevent bending.
2. Store material in a clean, dry location off the ground and away from uncured concrete and masonry. Cover with waterproof paper, tarpaulin, or polyethylene sheeting in a manner that will permit circulation of air inside the covering.

C. Keep on-site handling to a minimum. Exercise particular care to avoid damage to finishes of material.

ITEM 992.1 (Continued)

MATERIALS

Top Rail

- A. Top rail shall be fabricated to extruded aluminum, Alloy 6063-T52, conforming to ASTM B 221
- B. Fittings and connector sleeves shall be fabricated of extruded aluminum, Alloy 6063-T52, conforming to ASTM B 221
- C. Rail finish shall be powder coated in accordance with ASTM D3451. Color shall be grey.
- D. Diameter of top rail and shape of railing shall be as shown on the Drawings.

Railing Posts

- A. Fabricate posts and connection plates from AASHTO M270 Grade 36 structural steel as indicated on the Drawings.
- B. Welded Tab: ASTM A 108, Type 1018 carbon steel. Weld onto outside wall of an end post as shown on the Drawings
- C. Finish:
 1. Galvanized in accordance with ASTM A123
 2. Apply galvanized finish before installation of cable hardware, and cables.
- D. Grommets:
 1. Material: UV-resistant HDPE
 2. Cable Grommets: Provides barrier to abrasion of intermediate posts and cable braces bored for cables.
 3. Color: Grey

Cables and Cable Hardware:

- A. Cables:
 1. Material: 1X19 Type 316 stainless steel strand, left hand lay, per dimensional properties constrained in MIL-W-87161.
 2. Minimum Breaking Strength, MIL-C-5688: 4,000 pounds.
 3. Diameter: 3/16 inch.
 4. Orientation and Spacing: As indicated on the Drawings.
 5. Finish: Mill finish.
- B. Cable Hardware, General:
 1. Stainless Steel: ASTM A 276 and A 479, SAE/AMS QQ-S-763, Type 316 stainless steel.
 2. Swaging: Swage hardware onto ends of cables in field, using manufacturer's recommended methods.

ITEM 992.1 (Continued)

C. Cable Hardware Components:

1. All fittings to be of a high aesthetic quality with machined jaws, minimal exposed threads, and a generally smooth geometry. They shall be one of the following three products:
 - i. Ultra-Tec hardware distributed by The Cable Connection (52 Heppner Drive, Carson City, NV, 89706, Tel: 775-885-1443, Fax: 775-885-2734, E: info@thecableconnection.com, Web: www.thecableconnection.com)
 - ii. TriPyramid Standard Cable Fittings distributed by TriPyramid Structures, Inc. (59 Power Road, Westford, MA, 01866, Tel: 978-692-0555, Fax: 978-692-0666, E: info@tripyramid.com, Web: www.tripyramid.com)
 - iii. I-SYS SS Fittings distributed by Carl Stahl-DecorCable Innovations LLC (660 W. Randolph Street, Chicago, IL USA 60661, Tel: 800-444-6271, Fax: 312-474-1789, E: sales@decorcable.com, Web: www.decorcable.com)
2. Swaging Ferrule: Retains non-adjustable and adjustable clevis fittings onto cables
3. Swaging Stud: Use with receiver to provide a means of tensioning cables. Use with welded receiver to connect to end post, non-tensioning end. Threaded surface treated with baked-on moly-based surface treatment to prevent thread galling and sticking.
4. Non-adjustable Clevis Fitting: Fixed Jaw. Held onto cables by swaging ferrule. Connects to end post by means of welded tab, threaded tab or hole drilled in tee.
5. Adjustable Clevis Fitting, Turnbuckles: Provide a considerable amount of take-up in cables. Clevis connects to end post by means of welded tab, threaded tab, or hole drilled in tee.

Fabrication:

- A. Cut material square and remove burrs from all exposed edges, with no chamfer.
- B. Make exposed joints butt tight and flush.
- C. Close exposed ends of rail with appropriate end cap.
- D. For posts set in concrete, furnish matching sleeves or inserts not less than 18 inches long.
- E. Verify dimensions on site prior to shop fabrication.

CONSTRUCTION METHODS

Examination:

- A. Examine areas to receive cable railing system. Notify Engineer if areas are not acceptable. Do not begin installation until unacceptable conditions have been corrected.

Dissimilar Metals:

- A. Separate bronze, nickel, silver, steel, and aluminum components that come into contact with dissimilar metals with a plastic insulating pad.

ITEM 992.1 (Continued)

Installation:

- A. Install cable railing system in accordance with accepted shop drawings and manufacturer's instructions at locations indicated on the Drawings.
- B. Install railing posts perpendicular to walking surface and cables parallel to walking surface as indicated on the Drawings.
- C. Anchor cable railing system to mounting surface as indicated on the Drawings.
- D. Provide expansion joints in top rail as needed to allow for thermal expansion or contraction.
- E. Do not field weld components.
- F. Install specified cable hardware onto ends of cables using manufacturer's supplied swaging equipment in accordance with manufacturer's instructions.
- G. Use manufacturer's supplied cable hardware.
- H. Terminate and tension cables in accordance with manufacturer's instructions.
- I. Cables to be pre-tensioned to 600 pounds each in sequence in accordance with manufacturer's instructions.
- J. Turnbuckles or other take-ups shall be spaced evenly throughout the length of the bridge.
- K. Ensure cables are clean, parallel to each other, and without kinks or sags.
- L. Replace defective or damaged components as directed by Engineer.
- M. Repair damaged factory-applied finish as directed by Engineer.

Adjusting:

- A. Adjust cables and cable hardware as required to provide properly installed cables railing system as directed by Engineer.

Cleaning:

- A. Clean surfaces with soap and water or commercially available stainless steel cleaners.
- B. Do not use abrasive cleaners.

Protection:

- A. Protect cable railing system and finish from damage during construction.

Repair of Defective Work:

- A. Remove stained or otherwise defective work and replace with material that meets specification requirements.

COMPENSATION

Method of Measurement:

- A. No separate measurement will be made for the Work of this Section.

Basis of Payment:

- A. Payment for the Work of this Section will be included as part of the Contract price for the structure of which it forms a part.

ITEM 992.1 (Continued)**STEEL REINFORCEMENT FOR STRUCTURES – EPOXY COATED**

The work under this Heading shall conform to the applicable provisions of section 901.40, 901.62, 901.80 and 901.81 of the MassDOT Standard Specifications as modified by the following:

Special procedures shall be used during handling, storage, and installation to prevent damaging epoxy coating, as outlined in the Concrete Reinforcing Steel Institute (CRSI) report titled “Guidelines for Inspection and Acceptance of Epoxy Coated Reinforcing Steel at the Jobsite”. Any damage to the epoxy coating shall be repaired following this report. A copy of this report must be available at the jobsite for reference.

Accessories supporting epoxy coated bars or welded wire fabric shall be epoxy coated. Individual and continuous slab bolsters and chairs shall be of a type to suit various conditions encountered and must be capable of supporting a 300 lb. load without damage or permanent distortion.

CAST-IN-PLACE CONCRETE

The work under this Heading shall conform to the applicable provisions of Section 901 of the MassDOT Standard Specifications as modified by the following. The various classes of concrete and other materials shall be used as specified on the plans and generally described as follows:

5000 PSI, 3/4 IN, 685 HP cement concrete shall be used to construct the safety curbs, concrete retainers on the precast deck panels, closure pours between precast deck units, concrete backwall cap and timber seating footing.

Preformed or pre-molded filler, joint sealer, closed cell foam, mechanical splicers, and all other materials (complete in place) at joints shall be included. All other work considered as incidental to the work involved in furnishing and placing concrete for which payment is not provided elsewhere in the contract, shall be considered as included in the Lump Sum contract price for this item.

PRECAST CONCRETE BRIDGE DECK PANELS**A. General.**

The work under this Heading consists of fabricating, transporting and installing precast concrete bridge deck panels and includes all necessary labor, materials, and equipment to complete the work as shown on the Plans. The work shall conform with the MassDOT Standard, Supplemental, and Interim 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.

ITEM 992.1 (Continued)**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 Bridge Element(s) 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.

1. Plant.

Prior to the fabrication of 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 a given Precast Concrete Bridge Element shall be produced by a single company and plant, unless otherwise approved by the Engineer.

ITEM 992.1 (Continued)**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.

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

ITEM 992.1 (Continued)**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°F of the ambient temperature surrounding the Precast Concrete Bridge Element.

At a minimum, the temperature measuring devices shall record and report the temperature of the concrete to the nearest 2°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 increase 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.

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 Bridge Elements 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.

ITEM 992.1 (Continued)

Table 1: Quality Control Sampling and Testing

Quality Characteristic	Test Method	Sample Size	Specification Limit	Lot Size ^(c)	Sublot Size ^(d)	Frequency	Point of Sampling
Slump (in.) ^(a)	AASH TO 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 (%)	AASH TO T 152	Per AASHTO	5% ≤ % ≤ 8%				
Temperature (°F)	AASH TO T 309	Per AASHTO	50°F ≤ °F ≤ 90°F				
Compressive Strength (psi)	AASH TO T 22	Stripping Cylinder s: One (1) set of Three (3) 4 x 8 in.	≥ 80% f _c at Stripping				
		7-day Cylinder s: One (1) set of Three (3) 4 x 8 in.	For Information at 7 days				
		28-day Cylinder s: One (1) set of Three (3) 4 x 8 in.	≥ 100% f _c at 28 days				
		56-day Cylinder s: One (1) set of Three (3) 4 x 8 in.	≥ 100% f _c at 56 days ^(b)				

ITEM 992.1 (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 fabricated 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 992.1 (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 Element 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 Bridge Elements shall be determined by MassDOT.

1. Inspection.

A MassDOT 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 Element(s) 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 Element(s).

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.

ITEM 992.1 (Continued)**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 (c)	Sublot Size (d)	Frequency	Point of Sampling
Slump (in.) (a)	AASH TO 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 (%)	AASH TO T 152	Per AASHTO	5% ≤ % ≤ 8%				
Temperature (°F)	AASH TO T 309	Per AASHTO	50°F ≤ °F ≤ 90°F				
Compressive Strength (psi)	AASH TO T 22 AASH TO T 23	7-day Cylinder s: One (1) set of Three (3) 4 x 8 in.	For Information at 7 days				
		28-day Cylinder s: One (1) set of Three (3) 4 x 8 in.	≥ 100% f _c at 28 days				
		56-day Cylinder s: One (1) set of Three (3) 4 x 8 in.	≥ 100% f _c at 56 days (b)				

ITEM 992.1 (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.

MATERIALS**D. 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

ITEM 992.1 (Continued)**3. 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.

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 992.1 (Continued)**Table 3: Trial Batch Sampling and Testing for New Mix Designs**

Quality Characteristic	Test Method	Sample Size	Specification Limit	Performed By
Slump ^(a)	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 ^(b)	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	MassDOT
			Batch Mixed $f'_{cr} = 1.2 f'_c$ at 28 days	
Alkali-Silica Reaction (ASR) ^(d)	ASTM C 1567	Per ASTM	M4.02.00	Quality Control
Resistance to Chloride Ion Penetration Chloride Ion Penetration ^(e)	AASHTO T 358 ^(f)	28-day Cylinders: One (1) set of Three (3) 4 x 8 in.	Resistivity ≥ 21 k Ω -cm at 28 days	MassDOT
Freeze/Thaw Durability ^(c)	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.

ITEM 992.1 (Continued)**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.

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 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.

6. Corrugated Metal Pipe.

Corrugated Metal Pipe to be used for forming voids as specified on the plans shall be fabricated from steel and shall have a protective metallic coating of zinc (galvanizing).

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.

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.

Detailed shop drawings shall be prepared in accordance with the relevant provisions of Subsection 5.02 and shall, at a minimum, contain the following:

ITEM 992.1 (Continued)

- (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 (7th 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. Placement, Finishing and Curing Plan.

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 992.1 (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. 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.

F. 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.

G. 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.

H. 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.

ITEM 992.1 (Continued)

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.

I. 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.

J. 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.

K. 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 992.1 (Continued)**L. 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 sand paper. 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.

M. 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.

N. 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 sand paper.

O. 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 992.1 (Continued)**P. 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).

Q. 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_c 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 _c

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 992.1 (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 _c

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 _c

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 992.1 (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.

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*).

ITEM 992.1 (Continued)**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 _c

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.

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 ft²/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.

ITEM 992.1 (Continued)

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.

(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.

ITEM 992.1 (Continued)**(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 _c

(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.

R. 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.

S. 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

ITEM 992.1 (Continued)

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.

T. 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.

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

ITEM 992.1 (Continued)

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.

4. Category 4, Rejectable Defects.

Rejectable defects as determined by the MassDOT Inspector, RMS, and Engineer may 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

U. 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.

ITEM 992.1 (Continued)**V. 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.

W. 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:

ITEM 992.1 (Continued)

- (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:

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.

ITEM 992.1 (Continued)

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.

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 992.1 (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.

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.

ITEM 992.1 (Continued)**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.

F. 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.

MEMBRANE WATERPROOFING FOR BRIDGE DECKS – SPRAY APPLIED

The work under this heading shall conform to relevant provisions of Section 965. Materials used to perform this work shall be listed on the MassDOT Qualified Construction Materials List.

SCUPPER AND DOWNSPOUT

All steel plates for the scuppers shall be in conformance with AAHTO M270 Grade 36.

All steel tubing for the downspouts shall be in conformance with ASTM A500 Grade A or B.

All deck scuppers and downspouts shall be hot dip galvanized.

Scuppers and downspouts shall be located as stationed on the plans. All connections to the existing stringer needed shall be included.

ITEM 992.1 (Continued)**DIAMOND STEEL PLATE BRIDGE EXPANSION JOINT**

The work under this heading shall include the materials and labor required for the furnishing, transporting, and installation of the diamond plate expansion joint located at both bridge abutments and the piers. The installation of the countersunk anchor bolts shall be considered incidental to this item.

The steel for the diamond plate shall be in accordance with ASTM A793 and countersunk anchor bolts shall be in accordance with ASTM F3125 Grade A325S. The diamond plate shall be tapered as shown on the Plans.

PRE-COMPRESSED FOAM SUPPORTED BRIDGE EXPANSION JOINT**GENERAL**

The work shall consist of furnishing, placing, bonding and testing a pre-compressed, foam-supported silicone bridge expansion joint system. The joint system shall be bonded to adjacent material with an epoxy gel adhesive in accordance with the details shown on the plans and the requirements of these specifications. Components of the pre-compressed, foam-supported silicone bridge expansion joint system shall not be substituted and shall be supplied from one expansion joint manufacturer.

Expansion Joint Manufacturer shall have a minimum ten (10) years' experience specializing in the design and manufacture of silicone and foam technology expansion joint systems. A five (5) year minimum warranty shall be provided by both the Installer (Contractor) and Manufacturer covering both workmanship and materials.

MATERIALS

The joint shall consist of a pre-compressed, foam-supported silicone bridge expansion joint system that is capable of accommodating movements of +/-50% of joint opening and as shown in the Plans. The pre-compressed, foam-supported silicone bridge seal shall be comprised of a hydrophobic 100% acrylic impregnated polyurethane foam seal coated with a highway grade silicone. The pre-compressed, foam-supported silicone bridge seal shall be bonded to the joint interface with an epoxy adhesive.

The Contractor shall furnish the selected expansion joint manufacturer's certificate of compliance confirming that materials proposed will meet the requirements as set forth in these specifications:

ITEM 992.1 (Continued)*1. Seal Profile*

The pre-compressed, foam-supported silicone bridge seal shall be pre-compressed, hydrophobic acrylic foam seal manufactured without any vertical laminations. Material composition shall be free of inert fillers any waxes or wax compounds; asphalts or asphalt compounds meeting the following physical requirements:

PHYSICAL PROPERTY	TEST METHOD	REQUIRMENTS
Foam Core	N/A	Cellular, high density, polyurethane foam
Impregnation	N/A	Proprietary, modified, water-based, acrylic
Tensile Strength	ASTM D3574	21 psi min
Elongation	ASTM D3574	125% +/-20%
UV / Light & Moisture Resistance	DIN 18542	Pass
Compression Set	ASTM D3574	3% max
Density	ASTM D545	4-6 lb./cu. ft
Tear Resistance	ASTM D624	21.5 lbs/in
Vertical laminations		none
Water Absorption	ASTM D3574	<.02 lbs/ft ²
Temperature Service Range	ASTM C711	-40° F to 185° F

2. Seal Profile Silicon Coating

The highway grade Silicone Coating surface seal shall provide a uniform bellows appearance that provides for water and fuel resistance and shall meet the following physical properties.

PHYSICAL PROPERTY	TEST METHOD	REQUIRMENTS
Color	Visual	Gray
Durometer (Shore A)	ASTM C 661	20
Resilience	ASTM D5329	≥ 95%
Tensile Strength	ASTM D412	140 psi
Joint modulus at 50% 100% 150%	D3574 E	7 psi max 8 psi max 9 psi max
Elongation @ break	D3574 E	>1400%
Weatherability		Unaffected by climate extremes
Flexibility		Cured sealant stable from -50° F to 300° F

ITEM 992.1 (Continued)3. *Silicone Finish Bead*

A one component, medium modulus neutral cure highway grade silicone sealant and adhesive shall be used as a finish bead to the top edge of the pre-compressed, foam-supported silicone seal profile as well as the substrate on both sides. Tool silicone at joint connections and joint interfaces to avoid any excess silicone.

PHYSICAL PROPERTIES	TEST METHODS	REQUIREMENTS
Color	Visual	Gray
Durometer (Shore A)	ASTM C661	25 +/-5
Peel Strength	ASTM C 794	55 lbs/in min
Ozone and UV Resistance	ASTM C793	Excellent
Tensile Strength	ASTM D412	250 psi
Joint Movement Capability	ASTM C719	+/-50 %
Elongation	ASTM D412	700%

4. *Epoxy Adhesive*

The epoxy adhesive shall be a rapid curing, epoxy based, gel adhesive used to bond the precompressed, foam-supported silicone seal profile to concrete, steel or elastomeric and visco elastic concrete substrates. The epoxy gel adhesive shall meet the following physical properties:

PHYSICAL PROPERTIES	TEST METHODS	REQUIREMENTS
Tensile Strength	ASTM D 638	7100 psi (40 Mpa)
Elongation @ break	ASTM D 638	2%
Shear Strength	ASTM D 732	5700 psi (39 Mpa)
Bond Strength	ASTM C 882	2600 psi (17.9 Mpa)
Compressive Strength	ASTM D 579	9100 psi (62.7 Mpa)
Set Time F @70 @90 F	ASTM C 881	70 min. 40 min.
Gel Time @75 F	ASTM C 881	20 min.

ITEM 992.1 (Continued)**TESTING**

The pre-compressed, foam-supported silicone bridge seal shall be pre-qualified through cyclic testing by an independent laboratory. The cyclic testing procedure shall determine the durability of the pre-compressed, foam-supported silicone bridge expansion joint system after two hundred cycles in compression and tension. Any defects, tears or bond failure will be cause for rejection. After the installation of the expansion joint system, the system shall be tested to ensure watertightness. The joint shall be flooded for a minimum of one hour to a depth of one inch. If leakage is observed, the expansion joint system shall be repaired at the Contractor's expense. The repair procedure shall be as recommended by the manufacturer and approved by the Engineer.

CONSTRUCTION

Prior to furnishing materials, Contractor shall submit the proposed joint system to the Engineer for review and approval. At the discretion of the Engineer, the manufacturer may be required to furnish a representative sample of material to be supplied in accordance with these specifications.

Contractor shall store and handle all materials per manufacturer's recommendations. The Contractor shall prepare all joint interfaces in accordance with manufacturer installation guidelines prior to installation.

A representative from the manufacturer shall be present during the installation of the joint at no additional cost to the project.

Repair joint interfaces where needed and with materials approved by the expansion joint manufacturer. Pre-compressed, foam-supported silicone bridge expansion joint system shall be sized in accordance with manufacturer's recommendations and installed at locations shown on the Plans.

SCHEDULE OF BASIS OF PAYMENT

Within 10 days after the issuance of 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 992.1 as well as his/her total bridge structure Lump Sum cost for Bridge Structure No. L-04-032 (C82). 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 992.1 and no further compensation will be allowed.

ITEM 992.1 (Continued)

The schedule on the proposal form applies only to Bridge Structure No. L-04-032 (C82). 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.

Sub-Item	Description	Quantity	Unit	Unit Price	Total
100.9	PRE-CONSTRUCTION SURVEY	1	LS	_____	_____
106.15	BLEEDER (BRIDGE DECK) PVC	36	EA	_____	_____
402.1	DENSE GRADED CRUSHED STONE FOR SUB-BASE	460	TON	_____	_____
655.23	STEEL CABLE RAIL	1,150	FT	_____	_____
904.3	5000 PSI, ¾" 685 HP CEMENT CONCRETE	140	CY	_____	_____
904.31	PRECAST CONCRETE DECK PANELS	152	EA	_____	_____
910.1	STEEL REINFORCEMENT FOR STRUCTURES – EPOXY COATED	13535	LB	_____	_____
912.5	DRILLED AND GROUTED #5 DOWELS	95	EA	_____	_____
965.	MEMBRANE WATERPROOFING FOR BRIDGE DECKS	16,500	SF	_____	_____
968.1	SCUPPER AND DOWNSPOUT	12	EA	_____	_____
973.1	PRE-COMPRESSED FOAM- SUPPORTED BRIDGE EXPANSION JOINT	210	FT	_____	_____
973.12	DIAMOND STEEL PLATE EXPANSION JOINT	210	FT	_____	_____
	Total Cost of Item 992.1		\$		

ITEM 992.2**ALTERATION TO BRIDGE STRUCTURE
NO. L-04-045 (C91)****LUMP SUM**

The work under this Item shall conform to the relevant provisions of Subsection 995 of the Standard Specifications and the following:

The work shall conform to the specific requirements stipulated below for component parts of this Item. For those component parts where no specific requirement is stipulated, the MassDOT Standard Specifications shall apply except for payment.

Work under this Item shall include all labor, materials, equipment, and incidental costs required to construct the following:

- Timber railing
- 5000 PSI, ¾ IN., 685 HP Cement Concrete
- Steel Reinforcement for Structures – Epoxy Coated
- Structural Steel – Coated Steel
- Membrane waterproofing for the bridge decks
- Diamond steel plate expansion joint
- Drilling and Grouting Dowels #5
- Pre-compressed foam-supported bridge expansion joint

The work does not include any items listed separately in the proposal. Payment for materials shown on the Plans as being part of the 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.

TIMBER RAILING

The work under this heading shall include the detailing, fabrication, and installation of the timber railing on the bridge, as shown on the bridge plans.

All bolts, connection hardware, and fasteners for the railing shall be included, and shall be as specified herein and on the Plans.

This heading only includes the timber railing on the bridge, all approach railings shall be paid separately under the appropriate Items.

MATERIALS*Lumber for Railing*

The materials shall meet the requirements specified in the following subsection of the Standard Specifications, and as specified on the Plans, and the following:

ITEM 992.2 (Continued)

Wooden Rails	M9.05.1
Timber Preservatives	M9.05.5

Lumber for horizontal rails and rail caps shall be Ipe ironwood, *Tapebuaia* spp. Ipe lumber shall have a typical density of 69 to 75 pounds per cubic foot. Lumber dimensions shown on the Plans are nominal.

The mechanical properties of the Ipe lumber shall be verified using US Forest Product Laboratories testing methods (2-inch standard) and shall exceed the values listed below:

Modulus of Elasticity:	2,900,000 pounds per square inch
Bending Strength:	22,500 pounds per square inch
Crush Strength:	10,000 pounds per square inch

All Ipe lumber shall be air dried to a moisture content of 12%.

The Ipe lumber supplier shall provide proof of membership in the Certified Forest Products Council.

All cutting shall be made with premium carbide tipped saw blades. High quality drill bits shall be used for predrilling holes for fasteners.

Ends of the lumber shall be sealed within 24 hours after cutting using a clear aqueous wax end sealer appropriate for use with Ipe ironwood to reduce end checking.

Lumber for vertical rail posts shall be pressure treated visually graded Southern Yellow Pine, Select Structural Southern Yellow Pine lumber shall have a typical density of 31 to 37 pounds per cubic foot. Lumber dimensions shown on the Plans are nominal.

The mechanical properties of the Southern Yellow Pine lumber shall be verified using US Forest Product Laboratories testing methods (2-inch standard) and shall exceed the values listed below:

Modulus of Elasticity:	1,500,000 pounds per square inch
Bending Strength:	1,500 pounds per square inch
Tension Parallel to Grain:	1000 pounds per square inch
Shear Parallel to Grain:	165 pounds per square inch
Compression Perpendicular To Grain:	375 pounds per square inch
Compression Parallel to Grain:	950 pounds per square inch

All Southern Yellow Pine lumber shall be air dried to a moisture content of 19%.

The Southern Yellow Pine lumber supplier shall provide proof of membership in the Certified Forest Products Council.

ITEM 992.2 (Continued)*Connection Hardware*

All spikes, nails, bolts and related hardware connecting Ipe lumber shall be countersunk and composed of stainless steel in accordance with ASTM F593. Unless indicated otherwise on the Plans, all bolts shall receive two O.G. or dock washers and one nut. Carriage bolts and lag bolts shall receive one O.G. or dock washer and one nut.

All connections to the concrete safety curb shall be in accordance with the plans.

Unless indicated otherwise on the Plans, all nails shall be ring-shank. All nails and spikes shall conform to the requirements of Federal Specification FF-N-105B.

DRILLING AND GROUTING DOWELS

The work under this Heading shall include drilling and grouting dowels for proposed abutment cap.

MATERIALS

As shown on the Plans, dowels shall be size #5 AASHTO M31 Grade 60 epoxy coated reinforcing bars to anchor the proposed abutment cap into the existing abutments.

The grout to be used for this work shall be a non-shrink cementitious mortar. Materials used to perform this work shall be listed on the MassDOT Qualified Construction Materials List. The minimum required compressive strength of the grout at 28 days shall be 6000psi. The Contractor shall submit proposed materials to the Engineer for review and approval.

METHODS

All dowel holes shall be air drilled provided that the minimum edge distance as shown on the plans is observed. Should, in the Engineer's opinion, air drilling be inappropriate due to questionable strength of the existing masonry or insufficient edge distance, the dowel holes shall be diamond core drilled. The inner surfaces of diamond core drilled dowel holes shall be scored to develop sufficient keying action. The method of scoring of the dowel hole's inner surfaces shall be subject to the approval of the Engineer. The depth and diameter of the drilled dowel holes shall be as shown on the Plans, except that the depth of drilled hole shall be modified as required to comply with the minimum depth of hole specified in the product literature of the cementitious mortar by the Contractor to develop the full yield strength of the reinforcing bars. The holes shall be blown clear of any debris and shall have the approval of the Engineer prior to the placement of any grout material.

The drilling operation shall be performed without damage to the portions of the structure that are to remain in place.

ITEM 992.2 (Continued)

The Contractor shall follow the recommendations of the manufacturer for mixing and placing the grout material prior to the placement of the dowels. The Contractor shall, at a minimum, adhere to the latest version of ACI 318 code requirements and manufacturer requirements regarding minimum and maximum temperatures while placing the grout. Any excessive grout around the hole after placement of the dowel shall be struck off smooth while the grout is still fresh. Grout shall not be applied if it is raining or snowing, or if such conditions appear to be imminent.

SUBMITTALS

Prior to the commencement of any work under this item, the Contractor shall submit to the Engineer for review and approval a submittal containing the grout manufacturer's literature completely describing the products to be utilized including: product data sheet and appropriate material safety data sheets. The materials shall be delivered clearly marked with legible and intact labels containing the manufacturer's name, brand name, and identification of the areas where temperatures conform to manufacturer's instructions and recommendations.

STEEL REINFORCEMENT FOR STRUCTURES – EPOXY COATED

The work under this Heading shall conform to the applicable provisions of section 901.40, 901.62, 901.80 and 901.81 of the MassDOT Standard Specifications as modified by the following:

Special procedures shall be used during handling, storage, and installation to prevent damaging epoxy coating, as outlined in the Concrete Reinforcing Steel Institute (CRSI) report titled "Guidelines for Inspection and Acceptance of Epoxy Coated Reinforcing Steel at the Jobsite". Any damage to the epoxy coating shall be repaired following this report. A copy of this report must be available at the jobsite for reference.

Accessories supporting epoxy coated bars or welded wire fabric shall be epoxy coated. Individual and continuous slab bolsters and chairs shall be of a type to suit various conditions encountered and must be capable of supporting a 300 lb. load without damage or permanent distortion.

CAST-IN-PLACE CONCRETE

The work under this Heading shall conform to the applicable provisions of Section 901 of the MassDOT Standard Specifications as modified by the following. The various classes of concrete and other materials shall be used as specified on the plans and generally described as follows:

5000 PSI, 3/4 IN, 685 HP cement concrete shall be used to construct the bridge deck, bridge curbs, and abutment caps.

Preformed or pre-molded filler, joint sealer, closed cell foam, mechanical splicers, and all other materials (complete in place) at joints shall be included. All other work considered as incidental to the work involved in furnishing and placing concrete for which payment is not provided elsewhere in the contract, shall be considered as included in the Lump Sum contract price for this item.

ITEM 992.2 (Continued)**STRUCTURAL STEEL – COATED STEEL**

All proposed structural steel shall be hot dip galvanized.

All steel elements shall be painted to match the color of the topcoat applied within Item 961.202.

COATING OVER GALVANIZING*General*

The work under this heading shall include the surface preparation and the application of a duplex coating system to galvanized components including bolster beam and load plate.

Proposed coating systems shall be submitted by the Contractor for approval by the Engineer. Superstructure paint colors shall be coordinated with the Engineer and the City of Lawrence. Contractor to provide paint samples to the Engineer for review.

Surface preparation and application of the coating system shall be completed within 14 calendar days of galvanizing. The Contractor shall take all necessary measures to prevent wet storage stain and accumulation of dirt, dust, grease, or oil while being handled or staged prior to application of the coating.

All galvanized pieces shall be visually inspected to determine the cleanliness of the surface. All contaminated surfaces shall be cleaned in accordance with SSPC-SP-1.

All material shall be checked for wet storage stain. Wet storage stain shall be removed prior to abrasive blasting in accordance with SSPC-SP-16 Appendix A.

Prior to surface preparation, all components shall have a finish that is smooth and uniform. The surface shall be free of protrusions greater than 1/8 inch above the surrounding surface and meet the requirements of ASTM A123 section 6.2

The thickness of the galvanizing shall be checked before and after the completion of abrasive blasting using SSPC PA-2 to confirm that prepared surfaces still have the minimum thickness requirements of AASHTO M111 or AASHTO M232 as applicable.

Provide abrasives that are clean, dry, and sized properly to provide the specified surface profile. The profile shall be dense, uniform and of sufficient angularity to be acceptable for the application of the coating. Abrasives shall conform to the following as applicable:

- SSPC-AB 1 for mineral slag abrasives
- SSPC-AB 2 for recycled ferrous metal abrasives
- SSPC-AB 3 for new steel abrasives

ITEM 992.2 (Continued)

The abrasive shall be tested weekly for grease, oil or non-abrasive residue using ASTM D 7393 - Standard Practice for Indicating Oil in Abrasive. Contaminated abrasives shall be changed out and not be used for surface preparation. The use of steel shot abrasive is not allowed for final blasting prior to coating application.

All compressed air sources shall have properly sized and operational oil and moisture separators to allow for oil and moisture free air.

Surfaces to be painted shall be blast cleaned in accordance with requirements of SSPC SP16 "Brush-off Blast Cleaning Non-Ferrous Metals" producing a minimum surface profile of 1 mil. Profile shall meet the requirements of the manufacturer for the coating being applied. Abrasives, nozzle size, nozzle pressure and dwell time shall be sufficient and controlled to thoroughly clean and produce a uniform surface profile. Surface preparation shall not loosen, cause flaking or disbonding of the galvanized surface. Unacceptable thickness and damage shall be cause for rejection of the entire piece.

Surfaces unacceptable after abrasive blasting and approved for repair shall be repaired in accordance with ASTM A780. Surface preparation of approved repair areas shall be done in accordance with SSPC SP-10 or SP-11. Repairs to the galvanized surface in excess of one percent of the total surface area of the piece being repaired are not allowed. The repair coating shall be a zinc rich primer as specified by the coating manufacturer compatible with the coating system approved.

Prior to coating bolted connections, galvanized fasteners shall be cleaned of all lubricating wax. Cleaning shall be in accordance with SSPC-SP-1, Solvent Cleaning, method 4.1.1. The contractor is responsible to identify the solvent and method needed to remove all lubricant. Cleanliness will be determined by the use of a white cloth wipe test. The wipe test will be performed by the Engineer using a clean white cloth and the same solvent used for cleaning. The cloth shall be wetted and rung to a damp condition, placed on the selected fasteners and rubbed with a twisting motion around the entire surface of the previously waxed surfaces. Acceptance is with no color transfer to the cloth.

Coating application shall be completed within six hours after surface preparation has been accepted by the applicator and the Engineer.

Paint over Galvanizing

The coating system shall consist of a polyamide epoxy and an aliphatic polyurethane over galvanizing. All paint shall be applied in accordance with these specifications and the coating manufacturer's product datasheet.

Application of full coats of paint shall be accomplished by spray equipment. Spray equipment shall meet the requirements of the coating manufacturer and be in proper working order. Application by brush and roller will be limited to stripe coating, limited access areas and small touch up areas.

ITEM 992.2 (Continued)

Brushes and roller covers recommended by the coating manufacturer shall be used. Areas brushed and rolled will have a uniform thickness and be free of defects and excessive coating thickness. Spray or brush applied coatings shall not exhibit, runs, sags, holidays, wrinkling, pinholes, nap hair, topcoat color or gloss variations, or other discontinuities.

Application of coating shall be sequenced and components staged to minimize overspray and dry spray falling onto nearby surfaces. In process components shall be covered to provide protection from overspray and dry spray as needed.

Paint application shall not be performed when the relative humidity is above 85% or when the surface temperature of the steel is less than 5°F above the Dew Point. Paint shall not be applied when the surface temperature is below 40°F or when the surface temperature is above 120°F. All changes to ambient and surface parameters shall be approved by the Engineer. Ambient conditions should be closely monitored so that proper cure is achieved prior to recoat.

If force curing of applied coating is utilized, it shall be performed in accordance with the manufacturer's recommendations. The coating facility shall provide a letter of recommendation from the manufacturer to the Engineer stating the minimum and maximum temperature range and time required for cure. Exceeding the temperature range or time recommended by the manufacturer shall be cause for rejection by the Engineer. Curing ovens shall have instrumentation for monitoring both temperature and time and be suitable for the size of the oven. Instrument readings for temperature shall be able to provide an average temperature throughout the entire oven.

MEMBRANE WATERPROOFING FOR BRIDGE DECKS – SPRAY APPLIED

The work under this heading shall conform to relevant provisions of Section 965. Materials used to perform this work shall be listed on the MassDOT Qualified Construction Materials List.

PRE-COMPRESSED FOAM SUPPORTED BRIDGE EXPANSION JOINT**GENERAL**

The work shall consist of furnishing, placing, bonding and testing a pre-compressed, foam-supported silicone bridge expansion joint system. The joint system shall be bonded to adjacent material with an epoxy gel adhesive in accordance with the details shown on the plans and the requirements of these specifications. Components of the pre-compressed, foam-supported silicone bridge expansion joint system shall not be substituted and shall be supplied from one expansion joint manufacturer.

Expansion Joint Manufacturer shall have a minimum ten (10) years' experience specializing in the design and manufacture of silicone and foam technology expansion joint systems. A five (5) year minimum warranty shall be provided by both the Installer (Contractor) and Manufacturer covering both workmanship and materials.

ITEM 992.2 (Continued)**MATERIALS**

The joint shall consist of a pre-compressed, foam-supported silicone bridge expansion joint system that is capable of accommodating movements of +/-50% of joint opening and as shown in the Plans. The pre-compressed, foam-supported silicone bridge seal shall be comprised of a hydrophobic 100% acrylic impregnated polyurethane foam seal coated with a highway grade silicone. The pre-compressed, foam-supported silicone bridge seal shall be bonded to the joint interface with an epoxy adhesive.

The Contractor shall furnish the selected expansion joint manufacturer's certificate of compliance confirming that materials proposed will meet the requirements as set forth in these specifications:

1. Seal Profile

The pre-compressed, foam-supported silicone bridge seal shall be pre-compressed, hydrophobic acrylic foam seal manufactured without any vertical laminations. Material composition shall be free of inert fillers any waxes or wax compounds; asphalts or asphalt compounds meeting the following physical requirements:

PHYSICAL PROPERTY	TEST METHOD	REQUIREMENTS
Foam Core	N/A	Cellular, high density, polyurethane foam
Impregnation	N/A	Proprietary, modified, water-based, acrylic
Tensile Strength	ASTM D3574	21 psi min
Elongation	ASTM D3574	125% +/-20%
UV / Light & Moisture Resistance	DIN 18542	Pass
Compression Set	ASTM D3574	3% max
Density	ASTM D545	4-6 lb./cu. ft
Tear Resistance	ASTM D624	21.5 lbs/in
Vertical laminations		none
Water Absorption	ASTM D3574	<.02 lbs/ft ²
Temperature Service Range	ASTM C711	-40° F to 185 ° F

ITEM 992.2 (Continued)2. *Seal Profile Silicon Coating*

The highway grade Silicone Coating surface seal shall provide a uniform bellows appearance that provides for water and fuel resistance and shall meet the following physical properties.

PHYSICAL PROPERTY	TEST METHOD	REQUIRMENTS
Color	Visual	Gray
Durometer (Shore A)	ASTM C 661	20
Resilience	ASTM D5329	≥ 95%
Tensile Strength	ASTM D412	140 psi
Joint modulus at 50% 100% 150%	D3574 E	7 psi max 8 psi max 9 psi max
Elongation @ break	D3574 E	>1400%
Weatherability		Unaffected by climate extremes
Flexibility		Cured sealant stable from -50° F to 300° F

3. *Silicone Finish Bead*

A one component, medium modulus neutral cure highway grade silicone sealant and adhesive shall be used as a finish bead to the top edge of the pre-compressed, foam-supported silicone seal profile as well as the substrate on both sides. Tool silicone at joint connections and joint interfaces to avoid any excess silicone.

PHYSICAL PROPERTIES	TEST METHODS	REQUIREMENTS
Color	Visual	Gray
Durometer (Shore A)	ASTM C661	25 +/-5
Peel Strength	ASTM C 794	55 lbs/in min
Ozone and UV Resistance	ASTM C793	Excellent
Tensile Strength	ASTM D412	250 psi
Joint Movement Capability	ASTM C719	+/-50 %
Elongation	ASTM D412	700%

ITEM 992.2 (Continued)4. *Epoxy Adhesive*

The epoxy adhesive shall be a rapid curing, epoxy based, gel adhesive used to bond the precompressed, foam-supported silicone seal profile to concrete, steel or elastomeric and visco elastic concrete substrates. The epoxy gel adhesive shall meet the following physical properties:

PHYSICAL PROPERTIES	TEST METHODS	REQUIREMENTS
Tensile Strength	ASTM D 638	7100 psi (40 Mpa)
Elongation @ break	ASTM D 638	2%
Shear Strength	ASTM D 732	5700 psi (39 Mpa)
Bond Strength	ASTM C 882	2600 psi (17.9 Mpa)
Compressive Strength	ASTM D 579	9100 psi (62.7 Mpa)
Set Time F @70 @90 F	ASTM C 881	70 min. 40 min.
Gel Time @75 F	ASTM C 881	20 min.

TESTING

The pre-compressed, foam-supported silicone bridge seal shall be pre-qualified through cyclic testing by an independent laboratory. The cyclic testing procedure shall determine the durability of the pre-compressed, foam-supported silicone bridge expansion joint system after two hundred cycles in compression and tension. Any defects, tears or bond failure will be cause for rejection. After the installation of the expansion joint system, the system shall be tested to ensure watertightness. The joint shall be flooded for a minimum of one hour to a depth of one inch. If leakage is observed, the expansion joint system shall be repaired at the Contractor's expense. The repair procedure shall be as recommended by the manufacturer and approved by the Engineer.

CONSTRUCTION

Prior to furnishing materials, Contractor shall submit the proposed joint system to the Engineer for review and approval. At the discretion of the Engineer, the manufacturer may be required to furnish a representative sample of material to be supplied in accordance with these specifications.

Contractor shall store and handle all materials per manufacturer's recommendations. The Contractor shall prepare all joint interfaces in accordance with manufacturer installation guidelines prior to installation.

ITEM 992.2 (Continued)

A representative from the manufacturer shall be present during the installation of the joint at no additional cost to the project.

Repair joint interfaces where needed and with materials approved by the expansion joint manufacturer. Pre-compressed, foam-supported silicone bridge expansion joint system shall be sized in accordance with manufacturer's recommendations and installed at locations shown on the Plans.

DIAMOND STEEL PLATE BRIDGE EXPANSION JOINT

The work under this heading shall include the materials and labor required for the furnishing, transporting, and installation of the diamond plate expansion joint located at both bridge abutments. The installation of the countersunk anchor bolts shall be considered incidental to this item.

The steel for the diamond plate shall be in accordance with ASTM A793 and countersunk anchor bolts shall be in accordance with ASTM F3125 Grade A325S. The diamond plate shall be tapered as shown on the Plans.

SCHEDULE OF BASIS OF PAYMENT

Within 10 days after the issuance of 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 992.2 as well as his/her total bridge structure Lump Sum cost for Bridge Structure No. L-04-045 (C91). 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 992.2 and no further compensation will be allowed.

ITEM 992.2 (Continued)

The schedule on the proposal form applies only to Bridge Structure No. L-04-045 (C91). 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.

Sub-Item	Description	Quantity	Unit	Unit Price	Total
655.22	TIMBER RAILING	140	FT	_____	_____
904.3	5000 PSI, ¾ IN., 685 HP CEMENT CONCRETE	45	CY	_____	_____
910.1	STEEL REINFORCEMENT FOR STRUCTURES – EPOXY COATED	9,900	LB	_____	_____
912.5	DRILLING AND GROUTING DOWELS #5	50	EA	_____	_____
960.1	STRUCTURAL STEEL – COATED STEEL	15,200	LB	_____	_____
965.	MEMBRANE WATERPROOFING FOR BRIDGE DECKS – SPRAY APPLIED	1,300	SF	_____	_____
973.1	PRE-COMPRESSED FOAM- SUPPORTED BRIDGE EXPANSION JOINT	50	FT	_____	_____
973.12	DIAMOND STEEL PLATE EXPANSION JOINT	50	FT	_____	_____
Total Cost of Item 992.2				\$	_____

ITEM 994.111**TEMPORARY PROTECTIVE SHIELDING,
BRIDGE NO. L-04-032 (C82)****LUMP SUM**

The work under this item shall include designing, furnishing, installing, maintaining, removing and finally disposing the protective shielding system on and underneath Bridge No. L-04-032 (C82). The shielding shall protect the waterway below from debris from falling or flying debris during bridge demolition and construction. The shielding system shall be installed in-place prior to any demolition on the bridge.

Any proposed protective systems shall be stamped by a Massachusetts Registered Professional Engineer and shall be submitted to the Engineer for approval. The Contractor may be required to change or modify each protective system if it is not performing adequately as determined by the Engineer. No additional compensation will be made for changing or modifying each protective system. The Engineer's approval of the proposed protective systems does not relieve the Contractor of changing or modifying the protective systems.

If the Contractor's operations damage any existing portions of the bridge that have been designated to be retained in the proposed construction, such damage shall be repaired at the Contractor's expense.

All materials used in the shielding system shall become the property of the Contractor and shall be removed from the site at the completion of the project.

SUBMITTALS

Prior to the commencement of any work under this item, the Contractor shall submit to the Engineer for review and approval a submittal stamped by a Professional Engineer registered in the Commonwealth of Massachusetts. The submittal shall include calculations and detail drawings of the proposed shielding and shall conform to the following:

1. Shielding shall be in place prior to start of superstructure demolition and shall be inspected and approved by the City of Lawrence, MassDOT, and the Engineer after installation and prior to commencement of further construction activities.
2. Shielding shall have all spaces along the perimeter and at the seams sealed to prevent dust and debris from escaping and falling into the waterway below the bridge.
3. Shielding shall be designed to safely withstand all loads that it will be subjected to. The allowable design stresses shall be in accordance with AASHTO Construction Handbook for Bridge Temporary Works and the MassDOT Bridge Manual. The Design shall also include a complete description of the equipment and construction methods proposed for the bridge superstructure removal and bridge substructure repairs.
4. Shielding shall be installed or removed only upon approval of the Engineer.

ITEM 994.111 (Continued)

BASIS OF PAYMENT

Item 994.11 will be paid for at the contract LUMP SUM bid price, which price shall include all labor, materials, equipment, submittals, engineering services, and all incidental costs required to complete the work.

Payments for this Item will be made as follows:

1. The first payment of 70% of the Lump Sum bid price of this Item will be made upon completion of the installation of the shielding system to the satisfaction of the Engineer.
2. The second payment of 30% of the Lump Sum bid price for this Item will be made upon the removal and satisfactory disposal of the shielding system from the bridge.

ITEM 994.112**TEMPORARY PROTECTIVE SHIELDING,
BRIDGE NO. L-04-045 (C91)****LUMP SUM**

The work under this item shall include designing, furnishing, installing, maintaining, removing and finally disposing the protective shielding system on and underneath Bridge No.L-04-045 (C91). The shielding shall protect the waterway below from debris falling or flying debris during bridge demolition and construction. The shielding system shall be installed in-place prior to any demolition on the bridge.

Any proposed protective systems shall be stamped by a Massachusetts Registered Professional Engineer and shall be submitted to the Engineer for approval. The Contractor may be required to change or modify each protective system if it is not performing adequately as determined by the Engineer. No additional compensation will be made for changing or modifying each protective system. The Engineer's approval of the proposed protective systems does not relieve the Contractor of changing or modifying the protective systems.

If the Contractor's operations damage any existing portions of the bridge that have been designated to be retained in the proposed construction, such damage shall be repaired at the Contractor's expense.

All materials used in the shielding system shall become the property of the Contractor and shall be removed from the site at the completion of the project.

SUBMITTALS

Prior to the commencement of any work under this item, the Contractor shall submit to the Engineer for review and approval a submittal stamped by a Professional Engineer registered in the Commonwealth of Massachusetts. The submittal shall include calculations and detail drawings of the proposed shielding and shall conform to the following:

1. Shielding shall be in place prior to start of superstructure demolition and shall be inspected and approved by the City of Lawrence, MassDOT, and the Engineer after installation and prior to commencement of further construction activities.
2. Shielding shall have all spaces along the perimeter and at the seams sealed to prevent dust and debris from escaping and falling into the waterway below the bridge.
3. Shielding shall be designed to safely withstand all loads that it will be subjected to. The allowable design stresses shall be in accordance with AASHTO Construction Handbook for Bridge Temporary Works and the MassDOT Bridge Manual. The Design shall also include a complete description of the equipment and construction methods proposed for the bridge superstructure removal and bridge substructure repairs.
4. Shielding shall be installed or removed only upon approval of the Engineer.

ITEM 994.112 (Continued)

BASIS OF PAYMENT

Item 994.112 will be paid for at the Contract LUMP SUM bid price, which price shall include all labor, materials, equipment, submittals, engineering services, and all incidental costs required to complete the work.

Payments for this Item will be made as follows:

1. The first payment of 70% of the Lump Sum bid price of this Item will be made upon completion of the installation of the shielding system to the satisfaction of the Engineer.
2. The second payment of 30% of the Lump Sum bid price for this Item will be made upon the removal and satisfactory disposal of the shielding system from the bridge.

ITEM 995.**BRIDGE SUPERSTRUCTURE,
BRIDGE NO. L-04-030 (8JA)****LUMP SUM**

The work under this Item shall conform to the relevant provisions of Subsection 995 of the Standard Specifications and the following:

The work shall conform to the specific requirements stipulated below for component parts of this Item. For those component parts where no specific requirement is stipulated, the MassDOT Standard Specifications shall apply except for payment.

Work under this Item shall include all labor, materials, equipment, and incidental costs required to construct the following:

- 5000 PSI, $\frac{3}{4}$ inch, 685 cement concrete
- Drilled and grouted #5 dowels
- Steel reinforcement for structures – epoxy coated
- Damp-proofing
- Prefabricated Pedestrian Bridge Superstructure, Bridge No. L-04-030 (8JA)
- Diamond steel plates at deck joints
- Pre-compressed foam-supported bridge expansion joint

The work does not include any items listed separately in the proposal. Payment for materials shown on the Plans as being part of the 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.

CAST-IN-PLACE CONCRETE

The work under this heading shall conform to the applicable provisions of section 901 of the MassDOT Standard Specifications as modified by the following. The various classes of concrete and other materials shall be used as specified on the plans and generally described as follows:

5000 PSI, $\frac{3}{4}$ INCH, 685 HP cement concrete shall be used to construct the footings, abutment caps, wingwalls, backwalls and approach slab.

Preformed or pre-molded filler, joint sealer, closed cell foam, mechanical splicers, and all other materials (complete in place) at joints shall be included. All other work considered as incidental to the work involved in furnishing and placing concrete for which payment is not provided elsewhere in the contract, shall be considered as included in the Lump Sum contract price for this item.

ITEM 995. (Continued)**DRILLING AND GROUTING #5 DOWELS**

The work under this heading shall include drilling and grouting dowels for proposed abutment cap.

MATERIALS

As shown on the Plans, dowels shall be size #5 AASHTO M31 Grade 60 epoxy coated reinforcing bars to anchor the proposed abutment cap into the existing abutments.

The grout to be used for this work shall be a non-shrink cementitious mortar. Materials used to perform this work shall be listed on the MassDOT Qualified Construction Materials List. The minimum required compressive strength of the grout at 28 days shall be 6000psi. The Contractor shall submit proposed materials to the Engineer for review and approval.

METHODS

All dowel holes shall be air drilled provided that the minimum edge distance as shown on the plans is observed. Should, in the Engineer's opinion, air drilling be inappropriate due to questionable strength of the existing concrete or insufficient edge distance, the dowel holes shall be diamond core drilled. The inner surfaces of diamond core drilled dowel holes shall be scored to develop sufficient keying action. The method of scoring of the dowel hole's inner surfaces shall be subject to the approval of the Engineer. The depth and diameter of the drilled dowel holes shall be as shown on the Plans, except that the depth of drilled hole shall be modified as required to comply with the minimum depth of hole specified in the product literature of the cementitious mortar by the Contractor to develop the full yield strength of the reinforcing bars. The holes shall be blown clear of any debris and shall have the approval of the Engineer prior to the placement of any grout material.

The drilling operation shall be performed without damage to the portions of the structures that are to remain in place.

The Contractor shall follow the recommendations of the manufacturer for mixing and placing the grout material prior to the placement of the dowels. The Contractor shall, at a minimum, adhere to the latest version of ACI 318 code requirements and manufacturer requirements regarding minimum and maximum temperatures while placing the grout. Any excessive grout around the hole after placement of the dowel shall be struck off smooth while the grout is still fresh. Grout shall not be applied if it is raining or snowing, or if such conditions appear to be imminent.

ITEM 995. (Continued)**SUBMITTALS**

Prior to the commencement of any work under this item, the Contractor shall submit to the Engineer for review and approval a submittal containing the grout manufacturer's literature completely describing the products to be utilized including: product data sheet and appropriate material safety data sheets. The materials shall be delivered clearly marked with legible and intact labels containing

the manufacturer's name, brand name, and identification of the areas where temperatures conform to manufacturer's instructions and recommendations.

STEEL REINFORCEMENT FOR STRUCTURES - EPOXY COATED

The work under this Heading shall conform to the applicable provisions of section 901.40, 901.62, 901.80 and 901.81 of the MassDOT Standard Specifications as modified by the following:

Special procedures shall be used during handling, storage, and installation to prevent damaging epoxy coating, as outlined in the Concrete Reinforcing Steel Institute (CRSI) report titled "Guidelines for Inspection and Acceptance of Epoxy Coated Reinforcing Steel at the Jobsite". Any damage to the epoxy coating shall be repaired following this report. A copy of this report must be available at the jobsite for reference.

Accessories supporting epoxy coated bars or welded wire fabric shall be epoxy coated. Individual and continuous slab bolsters and chairs shall be of a type to suit various conditions encountered and must be capable of supporting a 300 lb. load without damage or permanent distortion.

DAMP-PROOFING

The work under this heading includes the furnishing and installation of damp-proofing at the locations shown on the bridge plans, or as directed by the Engineer.

All work to be done under this heading shall conform to the applicable provisions of Section 970 of the Standard Specifications.

DIAMOND STEEL PLATE BRIDGE EXPANSION JOINT

The work under this heading shall include the materials and labor required for the furnishing, transporting, and installation of the diamond plate expansion joint located at both bridge abutments. The installation of the countersunk anchor bolts shall be considered incidental to this item.

The steel for the diamond plate shall be in accordance with ASTM A793 and countersunk anchor bolts shall be in accordance with ASTM F3125 Grade A325S. The diamond plate shall be tapered as shown on the Plans.

ITEM 995. (Continued)**PRE-COMPRESSED FOAM SUPPORTED BRIDGE EXPANSION JOINT****GENERAL**

The work shall consist of furnishing, placing, bonding and testing a pre-compressed, foam-supported silicone bridge expansion joint system. The joint system shall be bonded to adjacent material with an epoxy gel adhesive in accordance with the details shown on the plans and the requirements of these specifications. Components of the pre-compressed, foam-supported silicone bridge expansion joint system shall not be substituted and shall be supplied from one expansion joint manufacturer.

Expansion Joint Manufacturer shall have a minimum ten (10) years' experience specializing in the design and manufacture of silicone and foam technology expansion joint systems. A five (5) year minimum warranty shall be provided by both the Installer (Contractor) and Manufacturer covering both workmanship and materials.

MATERIALS

The joint shall consist of a pre-compressed, foam-supported silicone bridge expansion joint system that is capable of accommodating movements of +/-50% of joint opening and as shown in the Plans. The pre-compressed, foam-supported silicone bridge seal shall be comprised of a hydrophobic 100% acrylic impregnated polyurethane foam seal coated with a highway grade silicone. The pre-compressed, foam-supported silicone bridge seal shall be bonded to the joint interface with an epoxy adhesive.

The Contractor shall furnish the selected expansion joint manufacturer's certificate of compliance confirming that materials proposed will meet the requirements as set forth in these specifications:

1. Seal Profile

The pre-compressed, foam-supported silicone bridge seal shall be pre-compressed, hydrophobic acrylic foam seal manufactured without any vertical laminations. Material composition shall be free of inert fillers any waxes or wax compounds; asphalts or asphalt compounds meeting the following physical requirements:

ITEM 995. (Continued)

PHYSICAL PROPERTY	TEST METHOD	REQUIRMENTS
Foam Core	N/A	Cellular, high density, polyurethane foam
Impregnation	N/A	Proprietary, modified, water-based, acrylic
Tensile Strength	ASTM D3574	21 psi min
Elongation	ASTM D3574	125% +/-20%
UV / Light & Moisture Resistance	DIN 18542	Pass
Compression Set	ASTM D3574	3% max
Density	ASTM D545	4-6 lb./cu. ft
Tear Resistance	ASTM D624	21.5 lbs/in
Vertical laminations		none
Water Absorption	ASTM D3574	<.02 lbs/ft ²
Temperature Service Range	ASTM C711	-40° F to 185° F

2. *Seal Profile Silicon Coating*

The highway grade Silicone Coating surface seal shall provide a uniform bellows appearance that provides for water and fuel resistance and shall meet the following physical properties.

PHYSICAL PROPERTY	TEST METHOD	REQUIRMENTS
Color	Visual	Gray
Durometer (Shore A)	ASTM C 661	20
Resilience	ASTM D5329	≥ 95%
Tensile Strength	ASTM D412	140 psi
Joint modulus at 50% 100% 150%	D3574 E	7 psi max 8 psi max 9 psi max
Elongation @ break	D3574 E	>1400%
Weatherability		Unaffected by climate extremes
Flexibility		Cured sealant stable from -50° F to 300° F

ITEM 995. (Continued)3. *Silicone Finish Bead*

A one component, medium modulus neutral cure highway grade silicone sealant and adhesive shall be used as a finish bead to the top edge of the pre-compressed, foam-supported silicone seal profile as well as the substrate on both sides. Tool silicone at joint connections and joint interfaces to avoid any excess silicone.

PHYSICAL PROPERTIES	TEST METHODS	REQUIREMENTS
Color	Visual	Gray
Durometer (Shore A)	ASTM C661	25 +/-5
Peel Strength	ASTM C 794	55 lbs/in min
Ozone and UV Resistance	ASTM C793	Excellent
Tensile Strength	ASTM D412	250 psi
Joint Movement Capability	ASTM C719	+/-50 %
Elongation	ASTM D412	700%

ITEM 995. (Continued)4. *Epoxy Adhesive*

The epoxy adhesive shall be a rapid curing, epoxy based, gel adhesive used to bond the precompressed, foam-supported silicone seal profile to concrete, steel or elastomeric and visco elastic concrete substrates. The epoxy gel adhesive shall meet the following physical properties:

PHYSICAL PROPERTIES	TEST METHODS	REQUIREMENTS
Tensile Strength	ASTM D 638	7100 psi (40 Mpa)
Elongation @ break	ASTM D 638	2%
Shear Strength	ASTM D 732	5700 psi (39 Mpa)
Bond Strength	ASTM C 882	2600 psi (17.9 Mpa)
Compressive Strength	ASTM D 579	9100 psi (62.7 Mpa)
Set Time @70 F @90 F	ASTM C 881	70 min. 40 min.
Gel Time @75 F	ASTM C 881	20 min.

TESTING

The pre-compressed, foam-supported silicone bridge seal shall be pre-qualified through cyclic testing by an independent laboratory. The cyclic testing procedure shall determine the durability of the pre-compressed, foam-supported silicone bridge expansion joint system after two hundred cycles in compression and tension. Any defects, tears or bond failure will be cause for rejection. After the installation of the expansion joint system, the system shall be tested to ensure watertightness. The joint shall be flooded for a minimum of one hour to a depth of one inch. If leakage is observed, the expansion joint system shall be repaired at the Contractor's expense. The repair procedure shall be as recommended by the manufacturer and approved by the Engineer.

CONSTRUCTION

Prior to furnishing materials, Contractor shall submit the proposed joint system to the Engineer for review and approval. At the discretion of the Engineer, the manufacturer may be required to furnish a representative sample of material to be supplied in accordance with these specifications.

Contractor shall store and handle all materials per manufacturer's recommendations. The Contractor shall prepare all joint interfaces in accordance with manufacturer installation guidelines prior to installation.

ITEM 995. (Continued)

A representative from the manufacturer shall be present during the installation of the joint at no additional cost to the project.

Repair joint interfaces where needed and with materials approved by the expansion joint manufacturer. Pre-compressed, foam-supported silicone bridge expansion joint system shall be sized in accordance with manufacturer's recommendations and installed at locations shown on the Plans.

PREFABRICATED THROUGH GIRDER SUPERSTRUCTURE**DESIGN**

The Contractor shall submit design computations for the prefabricated through girder superstructure, corrugated steel decking, and Ipe timber railing to the Engineer for review and approval. The computations shall be prepared in accordance with the latest AASHTO LRFD Guide Specifications for the Design of Pedestrian Bridges for the prescribed pedestrian load and H10 truck. Equestrian Load shall not be considered in the design.

Two independent sets of design computations shall be submitted for approval. To expedite the review and approval process, submissions containing computer computations shall include electronic copies of the actual input and output files. The design computations shall consider all loadings as are appropriate for each stage of fabrication, shipment, construction, and upon completion. Design computations and shop drawings shall be prepared by a Professional Engineer licensed to practice in the Commonwealth of Massachusetts.

All connections shall be bolted. All steel shall be galvanized and painted in accordance with the below specifications. Superstructure paint colors shall be coordinated with the Engineer and the City of Lawrence. Contractor to provide paint samples to the Engineer for review.

FABRICATION

1. The rolled W-beams used for the through girders shall conform to the requirements of ASTM A992 (50 ksi yield strength) with Supplemental Requirement S1 Heat Treatment and shall be hot-dipped galvanized, with best practices to limit heat related cracking in the corners, and painted in accordance with the Special Provisions below.
2. Steel for the corrugated steel deck shall conform to the requirements of ASTM A1011 (36ksi yield strength) and shall be hot dip galvanized in accordance with ASTM A123.
3. The shop drawings shall indicate Fracture Critical Members (FCM). The AASHTO/AWS Fracture Control Plan of Non redundant Members contained in AASHTO/AWS D1.5.
4. Fabricator of prefabricated steel truss bridge shall be certified by American Institute of Steel Construction (AISC) Quality Certification Program for Intermediate Bridges and shall be a MassDOT approved Fabricator.
5. Bolts shall conform to the ASTM F3125 Grade A325. Nuts and Washers shall be as recommended by A3125 and shall be hot-dip galvanized or mechanically cleaned and painted in accordance with the Special Provisions below.

ITEM 995. (Continued)**COATING OVER GALVANIZING***General*

The work under this heading shall include the surface preparation and the application of a duplex coating system to galvanized components including girders, floorbeams, diaphragms, cross frames, and all other steel components comprising the prefabricated through girder superstructure.

Proposed coating systems shall be submitted by the Contractor for approval by the Engineer. Superstructure paint colors shall be coordinated with the Engineer and the City of Lawrence. Contractor to provide paint samples to the Engineer for review.

Surface preparation and application of the coating system shall be completed within 14 calendar days of galvanizing. The Contractor shall take all necessary measures to prevent wet storage stain and accumulation of dirt, dust, grease, or oil while being handled or staged prior to application of the coating.

All galvanized pieces shall be visually inspected to determine the cleanliness of the surface. All contaminated surfaces shall be cleaned in accordance with SSPC-SP-1.

All material shall be checked for wet storage stain. Wet storage stain shall be removed prior to abrasive blasting in accordance with SSPC-SP-16 Appendix A.

Prior to surface preparation, all components shall have a finish that is smooth and uniform. The surface shall be free of protrusions greater than 1/8 inch above the surrounding surface and meet the requirements of ASTM A123 section 6.2

The thickness of the galvanizing shall be checked before and after the completion of abrasive blasting using SSPC PA-2 to confirm that prepared surfaces still have the minimum thickness requirements of AASHTO M111 or AASHTO M232 as applicable.

Provide abrasives that are clean, dry, and sized properly to provide the specified surface profile. The profile shall be dense, uniform and of sufficient angularity to be acceptable for the application of the coating. Abrasives shall conform to the following as applicable:

- SSPC-AB 1 for mineral slag abrasives
- SSPC-AB 2 for recycled ferrous metal abrasives
- SSPC-AB 3 for new steel abrasives

The abrasive shall be tested weekly for grease, oil or non-abrasive residue using ASTM D 7393 - Standard Practice for Indicating Oil in Abrasive. Contaminated abrasives shall be changed out and not be used for surface preparation. The use of steel shot abrasive is not allowed for final blasting prior to coating application.

ITEM 995. (Continued)

All compressed air sources shall have properly sized and operational oil and moisture separators to allow for oil and moisture free air.

Surfaces to be painted shall be blast cleaned in accordance with requirements of SSPC SP16 “Brush-off Blast Cleaning Non-Ferrous Metals” producing a minimum surface profile of 1 mil. Profile shall meet the requirements of the manufacturer for the coating being applied. Abrasives, nozzle size, nozzle pressure and dwell time shall be sufficient and controlled to thoroughly clean and produce a uniform surface profile. Surface preparation shall not loosen, cause flaking or disbonding of the galvanized surface. Unacceptable thickness and damage shall be cause for rejection of the entire piece.

Surfaces unacceptable after abrasive blasting and approved for repair shall be repaired in accordance with ASTM A780. Surface preparation of approved repair areas shall be done in accordance with SSPC SP-10 or SP-11. Repairs to the galvanized surface in excess of one percent of the total surface area of the piece being repaired are not allowed. The repair coating shall be a zinc rich primer as specified by the coating manufacturer compatible with the coating system approved.

Prior to coating bolted connections, galvanized fasteners shall be cleaned of all lubricating wax. Cleaning shall be in accordance with SSPC-SP-1, Solvent Cleaning, method 4.1.1. The contractor is responsible to identify the solvent and method needed to remove all lubricant. Cleanliness will be determined by the use of a white cloth wipe test. The wipe test will be performed by the Engineer using a clean white cloth and the same solvent used for cleaning. The cloth shall be wetted and rung to a damp condition, placed on the selected fasteners and rubbed with a twisting motion around the entire surface of the previously waxed surfaces. Acceptance is with no color transfer to the cloth.

Coating application shall be completed within six hours after surface preparation has been accepted by the applicator and the Engineer.

Paint over Galvanizing

The coating system shall consist of a polyamide epoxy and an aliphatic polyurethane over galvanizing. All paint shall be applied in accordance with these specifications and the coating manufacturer’s product datasheet.

Application of full coats of paint shall be accomplished by spray equipment. Spray equipment shall meet the requirements of the coating manufacturer and be in proper working order. Application by brush and roller will be limited to stripe coating, limited access areas and small touch up areas.

Brushes and roller covers recommended by the coating manufacturer shall be used. Areas brushed and rolled will have a uniform thickness and be free of defects and excessive coating thickness. Spray or brush applied coatings shall not exhibit, runs, sags, holidays, wrinkling, pinholes, nap hair, topcoat color or gloss variations, or other discontinuities.

ITEM 995. (Continued)

Application of coating shall be sequenced and components staged to minimize overspray and dry spray falling onto nearby surfaces. In process components shall be covered to provide protection from overspray and dry spray as needed.

Paint application shall not be performed when the relative humidity is above 85% or when the surface temperature of the steel is less than 5°F above the Dew Point. Paint shall not be applied when the surface temperature is below 40°F or when the surface temperature is above 120°F. All changes to ambient and surface parameters shall be approved by the Engineer. Ambient conditions should be closely monitored so that proper cure is achieved prior to recoat.

If force curing of applied coating is utilized, it shall be performed in accordance with the manufacturer's recommendations. The coating facility shall provide a letter of recommendation from the manufacturer to the Engineer stating the minimum and maximum temperature range and time required for cure. Exceeding the temperature range or time recommended by the manufacturer shall be cause for rejection by the Engineer. Curing ovens shall have instrumentation for monitoring both temperature and time and be suitable for the size of the oven. Instrument readings for temperature shall be able to provide an average temperature throughout the entire oven.

All surfaces coated prior to the Engineer's approval, shall require the complete removal of the applied coating. All labor, materials, and associated costs with the removal of any unapproved coating shall be done at the Contractor's expense to the satisfaction of the Engineer in accordance with these specifications.

Repair of unacceptable areas shall require surface preparation and coating equal to that specified. Repair procedures used for any unacceptable coating shall be those supplied by the manufacturer and approved by the Engineer. The finish coat for these areas shall be from the same batch as the coating originally applied.

Repair procedures used for any unacceptable coating shall be those recommended by the paint manufacturer and approved by the Engineer.

ERECTION

1. Complete erection and maintenance instructions shall be provided by the Fabricator.
2. Contractor shall be responsible for the final erection of the structure.
3. A qualified Professional Engineer, registered in the Commonwealth of Massachusetts, from the fabricator, shall be made available to advise the Contractor on site during erection for at least two (2) days.
4. Through girders too long to be shipped in one piece shall be supplied in two pieces that must be field connected with bolts before erection. Field connections shall be made in strict accordance with the plans and written instructions supplied with each through girder. All field connections of the trusses must be supervised by a qualified Professional Engineer registered in the Commonwealth of Massachusetts.
5. The Contractor shall be responsible for field touch-up of any galvanized coating and paint that is damaged during shipping and erection.

ITEM 995. (Continued)

The Contractor shall prepare and submit a plan indicating his/her proposed erection procedures and methods to be used including equipment, tools, crane capacity and location, schedule of operations, methods of utility protection, etc., to the Engineer for approval. The requirements for equipment and all procedures utilized shall be in conformance with Subsection 960. of the Standard Specification, and AASHTO LRFD Bridge Construction Specifications. The Erection procedures and any necessary calculations and drawings shall be stamped by a Professional Engineer, registered in the Commonwealth of Massachusetts, certifying that all structural members are suitably braced and supported throughout the erection process. The erection may not commence until the Engineer has given written approval.

CERTIFICATION

Fabricator shall certify the following:

1. All rolled W-beams shall conform to the requirements of ASTM A992 (50 ksi yield strength) including Supplemental Requirement S1 and shall be hot-dipped galvanized and painted as noted above.
2. Steel for the corrugated steel deck shall conform to the requirements of ASTM A1011 (36ksi yield strength) and shall be hot dip galvanized in accordance with ASTM A123.
3. All connection bolts shall be ASTM F3125 grade A325 hot-dip galvanized high strength bolts.
4. The fabricator's facility shall be open for inspection by The Department or his/her designated representative at any time during process of manufacture.

IPE PEDESTRIAN RAILING

The detailing, fabrication, and installation of the Ipe pedestrian railing on the bridge shall be included with the prefabricated through girder superstructure. Generally, the schematic details shown on the plans shall be incorporated into the Contractor's design and detailing to ensure the aesthetics of the Ipe rail are consistent with the other areas of the corridor.

All bolts, connection hardware, and fasteners for the railing shall be included.

This heading only includes the Ipe timber railing on the bridge, all approach railings shall be paid separately under the appropriate Items.

MATERIALS*Lumber for Railing*

The materials shall meet the requirements specified in the following subsection of the Standard Specifications, and as specified on the Plans, and the following:

Wooden Rails and Posts	M9.05.1
Timber Preservatives	M9.05.5

ITEM 995. (Continued)

Lumber for horizontal rails, rail caps, and rail posts shall be Ipe ironwood, *Tapebuaia* spp. Ipe lumber shall have a typical density of 69 to 75 pounds per cubic foot. Any lumber dimensions shown on the Plans are nominal.

The mechanical properties of the Ipe lumber shall be verified using US Forest Product Laboratories

testing methods (2-inch standard) and shall exceed the values listed below:

Modulus of Elasticity:	2,900,000 pounds per square inch
Bending Strength:	22,500 pounds per square inch
Crush Strength:	10,000 pounds per square inch

All Ipe lumber shall be air dried to a moisture content of 12%.

The Ipe lumber supplier shall provide proof of membership in the Certified Forest Products Council.

All cutting shall be made with premium carbide tipped saw blades. High quality drill bits shall be used for predrilling holes for fasteners.

Ends of the lumber shall be sealed within 24 hours after cutting using a clear aqueous wax end sealer appropriate for use with Ipe ironwood to reduce end checking.

Connection Hardware

All brackets, spikes, nails, bolts and related hardware connecting Ipe lumber shall be countersunk and composed of stainless steel in accordance with ASTM F593, unless otherwise noted on the Plans. All bolts shall receive two O.G. or dock washers and one nut. Carriage bolts and lag bolts shall receive one O.G. or dock washer and one nut.

Unless indicated otherwise on the Plans, all nails shall be ring-shank. All nails and spikes shall conform to the requirements of Federal Specification FF-N-105B.

SCHEDULE OF BASIS OF PAYMENT

Within 10 days after the issuance of 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. as well as his/her total bridge structure Lump Sum cost for Bridge Structure No. L-04-030 (8JA). 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.

ITEM 995. (Continued)

The cost of labor and materials for any Item not listed but required to complete the work shall be considered incidental to Item 995. and no further compensation will be allowed.

The schedule on the proposal form applies only to Bridge Structure No. L-04-030 (8JA). 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.

Sub-Item	Description	Quantity	Unit	Unit Price	Total
904.3	5000 PSI, ¾ INCH, 685 HP CEMENT CONCRETE	75	CY	_____	_____
910.1	STEEL REINFORCEMENT FOR STRUCTURES – EPOXY COATED	18,000	LB	_____	_____
912.5	DRILLED AND GROUTED #5 DOWELS	100	EA	_____	_____
970.1	DAMP-PROOFING	95	SY	_____	_____
973.1	PRE-COMPRESSED FOAM-SUPPORTED BRIDGE EXPANSION JOINT	45	FT	_____	_____
973.12	DIAMOND STEEL PLATE EXPANSION JOINT	45	FT	_____	_____
995.91	PREFABRICATED PEDESTRIAN BRIDGE SUPERSTRUCTURE	1	LS	_____	_____

Total Cost of Item 995.

\$ _____

ITEM 995.01**BRIDGE STRUCTURE,
BRIDGE NO. L-04-027 (C90)****LUMP SUM**

The work under this Item shall conform to the relevant provisions of Subsection 995 of the Standard Specifications and the following:

The work shall conform to the specific requirements stipulated below for component parts of this Item. For those component parts where no specific requirement is stipulated, the MassDOT Standard Specifications shall apply except for payment.

Work under this Item shall include all labor, materials, equipment, and incidental costs required to construct the following:

- Ornamental handrail
- Metal Bridge Rail, Steel (CM-TL3)
- Stone formliner
- 5000 psi, ¾ inch, 685 hp cement concrete
- Steel reinforcement for structures – epoxy coated
- Damp-proofing
- Membrane waterproofing for bridge decks
- Precast arch frame unit (4 feet or less wide – 35 to 39.99 foot span)
- Precast arch frame footing unit
- Precast headwall unit
- Anti-graffiti coating

The work does not include any items listed separately in the proposal. Payment for materials shown on the Plans as being part of the 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.

**ORNAMENTAL HANDRAIL
METAL BRIDGE RAILING, STEEL (CM-TL3)**

This work shall conform to the applicable provisions of Section 975 of the Standard Specifications and the following:

This work shall consist of furnishing and installing a galvanized and painted steel handrail and a galvanized and painted steel CM-TL3 traffic barrier, as shown on the Plans. Both the handrail and the CM-TL3 barrier shall have a finish coat color Black, Federal Color ID #17038. The heads of all bolts, nuts, or other connection hardware shall be field painted, as required.

All materials, labor, equipment, and incidentals required to furnish and completely install the handrail and steel CM-TL3 railing are included. All anchor bolts shall be set with template.

ITEM 995.01 (Continued)**CAST-IN-PLACE CONCRETE**

The work under this heading shall conform to the applicable provisions of Section 901 of the MassDOT Standard Specifications as modified by the following. The various classes of concrete and other materials shall be used as specified on the plans and generally described as follows:

5000 PSI, 3/4 IN, 685 HP cement concrete shall be used to construct the CM-TL3 pedestals, moment slab, terminus, wingwall footings and wingwall stems.

Preformed or pre-molded filler, joint sealer, closed cell foam, mechanical splicers, and all other materials (complete in place) at joints shall be included. All other work considered as incidental to the work involved in furnishing and placing concrete for which payment is not provided elsewhere in the contract, shall be considered as included in the Lump Sum contract price for this item.

STONE FORMLINER

The work under this heading shall conform to the applicable provisions of Section 901 of the MassDOT Standard Specifications and the following:

The precast headwall and cast-in-place concrete wingwall stems shall have an aesthetic formliner applied to match the appearance of the existing bridge abutments to the greatest extent practical. The limits of the formliner shall be the minimum area specified on the Plans. The Contractor shall coordinate with precast manufacturer and the Engineer to achieve this goal. The Contractor shall apply the formliner to a test area of concrete prior to and provide photos to the Engineer for review and approval.

The architectural formliner shall be manufactured of thermoformed rigid polymer alloy sheets. The liners shall accommodate form pressures to a maximum 1000 psf. Formliner manufacturer's data and finished concrete surface samples shall be submitted to the Engineer for approval.

All materials, labor, equipment and incidentals required to furnish and install the stone formliner are included. Once a system is agreed upon, the Contractor shall perform all work in strict adherence with manufacturer's specifications and recommendations.

ITEM 995.01 (Continued)**STEEL REINFORCEMENT FOR STRUCTURES - EPOXY COATED**

The work under this Heading shall conform to the applicable provisions of section 901.40, 901.62, 901.80 and 901.81 of the MassDOT Standard Specifications as modified by the following:

Special procedures shall be used during handling, storage, and installation to prevent damaging epoxy coating, as outlined in the Concrete Reinforcing Steel Institute (CRSI) report titled "Guidelines for Inspection and Acceptance of Epoxy Coated Reinforcing Steel at the Jobsite". Any damage to the epoxy coating shall be repaired following this report. A copy of this report must be available at the jobsite for reference.

Accessories supporting epoxy coated bars or welded wire fabric shall be epoxy coated. Individual and continuous slab bolsters and chairs shall be of a type to suit various conditions encountered and must be capable of supporting a 300 lb. load without damage or permanent distortion.

ANTI-GRAFFITI COATING

Anti-graffiti coating shall be applied to all exposed concrete surfaces throughout the cast-in-place wingwalls and precast headwalls. The anti-graffiti coating shall be a clear, non-yellowing, chemical and scratch resistant, fast curing, water-based, one-component silicone elastomer specifically formulated to protect the indicated surfaces that are subject to repeated graffiti attacks. It shall have no effect on the color of the concrete.

Two coats of anti-graffiti coating shall be applied by airless spray, brush, or roller. The Contractor may not proceed with any production coating operations until the samples and mock-ups are approved by the Engineer and City. All manufacturer's recommendations and procedures shall be strictly adhered to. Approved manufacturer's authorized representatives shall provide additional job site training in the proper mixing and application procedures of the anti-graffiti coating. The cost for sufficient involvement of the authorized representatives shall be considered incidental to this Item. All State, Federal and local safety and environmental protection requirements shall be strictly adhered to.

DAMP-PROOFING

The work under this heading includes the furnishing and installation of damp-proofing at the locations shown on the bridge plans, or as directed by the Engineer. All work to be done under this heading shall conform to the applicable provisions of Section 970 of the Standard Specifications.

MEMBRANE WATERPROOFING FOR BRIDGE DECKS

The work under this heading shall conform to relevant provisions of Section 965. Materials used to perform this work shall be listed on the MassDOT Qualified Construction Materials List. Membrane waterproofing shall be applied on the precast arch to the limits shown on the plans.

ITEM 995.01 (Continued)**PRECAST ARCH FRAME UNIT (4 FEET OR LESS WIDE – 35 TO 39.99 FOOT SPAN)****PRECAST ARCH FRAME FOOTING UNIT****PRECAST HEADWALL UNIT****A. General.**

The work under these Headings consists of fabricating, transporting and installing precast concrete arch frame, precast concrete culvert footing, and precast concrete headwalls with stone formliner finish and includes all necessary labor, materials, and equipment to complete the work as shown on the Plans. The work shall conform with the MassDOT Standard, Supplemental, and Interim 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.

QUALITY ASSURANCE**B. 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.

C. 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 Bridge Element(s) 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 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 a given Precast Concrete Bridge Element 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°F of the ambient temperature surrounding the Precast Concrete Bridge Element.

At a minimum, the temperature measuring devices shall record and report the temperature of the concrete to the nearest 2°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 increase 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 Bridge Elements 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 ^(c)	Sublot Size ^(d)	Frequency	Point of Sampling
Slump (in.) ^(a)	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 ^(b)				

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 fabricated 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)**D. 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 Element 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 Bridge Elements shall be determined by MassDOT.

10. Inspection.

A MassDOT 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 Element(s) 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 Element(s).

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.

ITEM 995.01 (Continued)**11. 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 ^(c)	Sublot Size ^(d)	Frequency	Point of Sampling
Slump (in.) ^(a)	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 _c at 28 days				
		56-day Cylinders: One (1) set of Three (3) 4 x 8 in.	≥ 100% f _c at 56 days ^(b)				

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.

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.

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.

ITEM 995.01 (Continued)

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).

Table 3: Trial Batch Sampling and Testing for New Mix Designs

Quality Characteristic	Test Method	Sample Size	Specification Limit	Performed By
Slump ^(a)	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	$50^{\circ}\text{F} \leq \text{°F} \leq 90^{\circ}\text{F}$	Quality Control
Compressive Strength ^(b)	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) ^(d)	ASTM C 1567	Per ASTM	M4.02.00	Quality Control
Resistance to Chloride Ion Penetration Chloride Ion Penetration ^(e)	AASHTO T 358 ^(f)	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 ^(c)	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.

ITEM 995.01 (Continued)

- (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.

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 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.

6. Corrugated Metal Pipe.

Corrugated Metal Pipe to be used for forming voids as specified on the plans shall be fabricated from steel and shall have a protective metallic coating of zinc (galvanizing).

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.

ITEM 995.01 (Continued)

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.

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 (7th 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.

ITEM 995.01 (Continued)**C. Placement, Finishing and Curing Plan.**

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

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, Three-Sided Frames and Arches.

The Contractor shall submit design computations for the arch 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 2013 MassDOT LRFD Bridge Design Manual with 2020 Part I Interims, 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.

ITEM 995.01 (Continued)

The frame dimensions provided on the plans are shown to establish the size of the proposed opening. The width and thickness of each frame unit may vary depending upon the manufacturer's specifications provided that the opening size is maintained. The Contractor shall be responsible for modifying the dimensions of the frame bridge 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.

The precast reinforced concrete three-sided frame shall be produced with grout-filled keyways per the details on the plans, the manufacturer's recommendations, and as approved by the Engineer. The ends shall be manufactured such that when the sections are laid together they will make a continuous line of frames with a smooth interior surface free of appreciable irregularities, and in compliance with the permissible variations.

2. Marking.

The following information shall be clearly marked on the interior of each frame 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

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.

ITEM 995.01 (Continued)**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.

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.

ITEM 995.01 (Continued)**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.

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 sand paper. 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 sand paper.

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.

ITEM 995.01 (Continued)**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.

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'c is attained (see *Handling and Storage* section below).

ITEM 995.01 (Continued)**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 _c

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.

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 _c

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*).

ITEM 995.01 (Continued)**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'_c

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.

(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.

ITEM 995.01 (Continued)

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.

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 _c

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 ft²/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.

(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

ITEM 995.01 (Continued)**(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_c

(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.

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.

ITEM 995.01 (Continued)**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.

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

ITEM 995.01 (Continued)**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.

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

ITEM 995.01 (Continued)**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.

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 sublot.
- (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.

ITEM 995.01 (Continued)**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:

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.

ITEM 995.01 (Continued)

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.

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.

ITEM 995.01 (Continued)

- (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.
- (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.

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.

ITEM 995.01 (Continued)**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.

F. Box Culverts, Three-Sided Frames and Arches.

Backfilling operations shall not begin until the following checks have been made:

- (a) The frame to footing key joints are grouted as shown on the plans;
- (b) The joints between exterior frame bridge elements and wingwall stems 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:

ITEM 995.01 (Continued)

- (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 footing;
- (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.

SCHEDULE OF BASIS OF PAYMENT

Within 10 days after the issuance of 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 Structure No. L-04-027 (C90). 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 Structure No. L-04-027(C90). 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 (Continued)

Sub-Item	Description	Quantity	Unit	Unit Price	Total
655.2	ORNAMENTAL HANDRAIL	200	FT	_____	_____
899.	STONE FORMLINER	800	SF	_____	_____
904.3	5000 PSI, 3/4 INCH, 685 HP CEMENT CONCRETE	270	CY	_____	_____
910.1	STEEL REINFORCEMENT FOR STRUCTURES – EPOXY COATED	62,000	LB	_____	_____
915.43	PRECAST ARCH FRAME UNIT (4 FEET OR LESS WIDE – 35 TO 39.99 FOOT SPAN)	13	EA	_____	_____
931.210	PRECAST ARCH FRAME FOOTING UNIT	8	EA	_____	_____
931.211	PRECAST HEADWALL UNIT	6	EA	_____	_____
962.2	ANTI-GRAFFITI COATING	500	SY	_____	_____
965.	MEMBRANE WATERPROOFING FOR BRIDGE DECKS	2200	SF	_____	_____
970.1	DAMP-PROOFING	440	SY	_____	_____
975.11	METAL BRIDGE RAIL, STEEL (CM-TL3)	180	FT	_____	_____

Total Cost of Item 995.01 \$ _____

END OF DOCUMENT

THIS PAGE IS INTENTIONALLY LEFT BLANK

DOCUMENT A00802

DETAIL SHEETS

THIS PAGE INTENTIONALLY LEFT BLANK

THE COMMONWEALTH OF MASSACHUSETTS
 MassDOT - HIGHWAY DIVISION
 TEN PARK PLAZA, BOSTON, MA

PRELIMINARY ESTIMATE OF QUANTITIES - DETAIL SHEETS

City/Town: Lawrence **Road:** Lawrence Manchester Rail Corridor (LMRC) Rail Trail
Station: 1+60 to 15+00 +/- Merrimack Bridge/Broadway **Class:** Transportation Improvement
 110+48 to 112+10 +/- Water Street/Canal Street
 90+43 to 92+65 +/- Essex Street

Date: July 25, 2024

Earth Excavation	7,250	CY	Gravel for Driveways	101	CY
Class "A" Rock Excavation	650	CY	Gravel for Sidewalks & Ramps	329	CY
Class "A" Trench Excavation	350	CY	Gravel for Bridge Foundation	896	CY
Class "B" Rock Excavation	35	CY	Embankment + 15%	5,393	CY
Class "B" Trench Excavation	125	CY	Dense Graded Crushed Stone	170	CY
Gravel for Subbase	3622	CY			

PROPOSED HOT MIX ASPHALT (HMA) MILL & OVERLAY

AREA = 1931 SY

SURFACE: 1½" SUPERPAVE SURFACE COURSE – 9.5 POLYMER (SSC – 9.5 – P) OVER
 1½" PAVEMENT FINE MILLING

PROPOSED HOT MIX ASPHALT (HMA) DRIVEWAY & HOT MIX ASPHALT (HMA) SIDEWALK AT DRIVEWAYS

AREA = 255 SY

SURFACE: 1½" SUPERPAVE SURFACE COURSE – 9.5 (SSC – 9.5) OVER
 2½" SUPERPAVE SURFACE COURSE – 12.5 (SSC – 12.5) OVER

BASE: 8" GRAVEL BORROW, TYPE b
 ADD GRAVEL BOROW, TYPE b AS REQUIRED

PROPOSED HOT MIX ASPHALT (HMA) SIDEWALK/WALK

AREA = 19 SY

SURFACE: 1¼" SUPERPAVE SURFACE COURSE – 9.5 (SSC – 9.5) OVER
1¾" SUPERPAVE SURFACE COURSE – 12.5 (SSC – 12.5) OVER

BASE: 8" GRAVEL BORROW, TYPE b

**PROPOSED FULL DEPTH PAVEMENT (ROADWAY – SOUTH BROADWAY/
CANAL STREET / WATER STREET**

AREA = 304 SY

SURFACE: 1½" SUPERPAVE SURFACE COURSE – 9.5 POLYMER (SSC – 9.5 – P) OVER
2¼" SUPERPAVE INTERMEDIATE COURSE – 19.0 (SIC – 19.0) OVER

BASE: 4½" SUPERPAVE BASE COURSE – 37.5 (SBC – 37.5) OVER

SUBBASE: 12" GRAVEL BORROW, TYPE b

PROPOSED FULL DEPTH PAVEMENT (ROADWAY- LOWELL STREET)

AREA = 555 SY

SURFACE: 1¼" SUPERPAVE SURFACE COURSE – 9.5 POLYMER (SSC – 9.5 – P) OVER
1¾" SUPERPAVE INTERMEDIATE COURSE – 12.5 (SIC – 12.5)

BASE: 4½" SUPERPAVE BASE COURSE – 37.5 (SBC – 37.5) OVER

SUBBASE: 8" GRAVEL BORROW, TYPE b

PROPOSED FULL DEPTH PAVEMENT (OVER LOWELL STREET BRIDGE)

AREA = 139 SY

SURFACE: 1½" SUPERPAVE SURFACE COURSE – 9.5 POLYMER (SSC – 9.5 – P) OVER
1¾" SUPERPAVE INTERMEDIATE COURSE – 12.5 (SIC – 12.5)

BASE: 4½" SUPERPAVE BASE COURSE – 37.5 (SBC – 37.5)

SUBBASE: 4" DENSE GRADED CRUSHED STONE OVER
8" (MIN) GRAVEL BORROW, TYPE b

PROPOSED FULL DEPTH PAVEMENT (TRAIL)

AREA = 10155 SY

SURFACE: 1½" SUPERPAVE SURFACE COURSE – 9.5 (SSC – 9.5) OVER
2½" SUPERPAVE INTERMEDIATE COURSE – 12.5 (SIC – 12.6) OVER

BASE: 12" (MIN) GRAVEL BORROW, TYPE b

PROPOSED PERMANENT TRENCH PATCH

AREA = 66 SY

SURFACE: 1½" SUPERPAVE SURFACE COURSE – 9.5 POLYMER (SSC – 9.5 – P) OVER
2¼" SUPERPAVE INTERMEDIATE COURSE – 19.0 (SIC – 19.0) OVER
VARIABLE DEPTH (SEE GENERAL NOTE 5) SUPERPAVE INTERMEDIATE COURSE –
19.0 (SIC – 19.0)
COMPACTED IN 2¼" (MIN) AND 3" (MAX) LIFTS OVER

BASE: 8" GRAVEL BORROW, TYPE b OVER

SUBBASE: EXISTING MATERIAL SUITABLE FOR RE-USE SUPPLEMENTED WITH GRAVEL
BORROW AS NECESSARY TO MATCH GRADE (SEE VARIOUS TRENCH DETAILS)

PROPOSED CEMENT CONCRETE SIDEWALK / CURB RAMP / MEDIAN

AREA = 1307 SY

SURFACE: 4" CEMENT CONCRETE (4000 PSI, ¾", 610), AIR ENTRAINED

BASE: 8" GRAVEL BORROW, TYPE b

PROPOSED CEMENT CONCRETE SIDEWALK AT DRIVEWAYS

AREA = 169 SY

SURFACE: 6" CEMENT CONCRETE (4000 PSI, ¾", 610), AIR ENTRAINED

BASE: 8" GRAVEL BORROW, TYPE b

PROPOSED GRAVEL WALK

AREA = 38 SY

SURFACE: 4" PROCESSED GRAVEL OVER

BASE: 8" GRAVEL BORROW, TYPE b

GENERAL PAVEMENT NOTES

1. ASPHALT EMULSION FOR TACK COAT SHALL BE APPLIED BETWEEN ALL ASPHALT SURFACES AND SAWCUT JOINTS BEFORE PAVING. HMA JOINT ADHESIVE SHALL BE APPLIED TO ALL COLD JOINTS (LONGITUDINAL AND TRANSVERSE) BEFORE PAVING SURFACE COURSE. ASPHALT EMULSION FOR TACK COAT SHALL BE APPLIED IN ACCORDANCE WITH SUBSECTION 450.43. ALL SURFACES SHALL BE CLEAN OF ALL ORGANICS, DEBRIS, AND SAND PRIOR TO PAVING.
2. ALL HMA SHALL BE IN ACCORDANCE WITH SECTION 450.
3. HMA FOR WALKS AND DRIVEWAYS SHALL BE IN ACCORDANCE WITH SECTION 700.
4. ALL GRAVEL BORROW MEETING SPECIFICATION DETERMINED BY THE ENGINEER SHALL BE RETAINED IN PLACE, COMPACTED, AND LEVELED WITH GRAVEL BORROW TYPE b AS REQUIRED.
5. TOTAL DEPTH OF PROPOSED PAVEMENT IN PERMANENT TRENCH PATCH SHALL BE 8.25" OR SHALL MATCH THE EXISTING PAVEMENT DEPTH, WHICHEVER DEPTH IS DEEPER.

ITEM 101.

CLEARING AND GRUBBING

Lawrence Rail Trail A

<u>Station</u>	<u>Offset</u>
2+07 to 5+14	0' - 26' LT
10+36 to 10+55	12' - 24' LT
10+45 to 10+65	4' - 24' RT

Lawrence Rail Trail B

<u>Station</u>	<u>Offset</u>
43+78 to 47+21	23' - 42' LT
50+37 to 50+60	8' - 15' RT
57+53 to 59+31	42' LT - 6' RT
59+48 to 62+41	9' LT - 38 RT
62+03 to 64+34	38' - 58' LT
62+63 to 64+60	9' LT - 42' RT
64+61 to 64+94	38' - 49' LT
70+17 to 71+95	5' - 34' RT
72+15 to 73+59	16' - 49' RT
74+49 to 75+48	13' - 26' RT
81+14 to 82+02	12' - 17' RT
82+15 to 83+62	10' - 15' RT
83+67 to 84+41	11' - 15' RT

Spicket River Greenway

<u>Station</u>	<u>Offset</u>
303+36 to 303+63	10' - 11' LT
305+75 to 306+30	18' - 21' LT
307+48 to 308+81	3' - 22' LT

ITEM 102.01

SELECTIVE CLEARING AND GRUBBING

To be used as directed by the Engineer near the area of Manchester Street Park.

ITEM 102.1

TREE TRIMMING

Lawrence Rail Trail A

<u>Station</u>	<u>Offset</u>
2+06 to 5+15	26' - 17' LT

Lawrence Rail Trail B

<u>Station</u>	<u>Offset</u>
43+77 to 47+23	42' - 26' LT
50+35 to 50+63	14' - 16' RT
57+54 to 59+04	24' - 47' LT
59+44 to 62+35	15' RT
62+00 to 64+36	40' - 53' LT
64+59 to 64+96	50' - 45' LT
70+16 to 71+95	30' - 34' RT
72+15 to 73+51	34' - 35' RT

ITEM 102.1 (Continued)**Lawrence Rail Trail B**

<u>Station</u>	<u>Offset</u>
74+48 to 75+50	26' – 20' RT
81+16 to 82+02	16' – 15' RT
82+15 to 83+51	15' – 13' RT
83+67 to 84+42	13' – 14' RT
86+53 to 88+43	13' – 10' RT

Spicket River Greenway

<u>Station</u>	<u>Offset</u>
303+36 to 303+63	11' – 12' LT
305+75 to 306+30	19' – 18' LT
307+48 to 308+83	13' – 12' LT

ITEM 102.511**TREE PROTECTION – ARMORING AND PRUNING****Lawrence Rail Trail B**

<u>Station</u>	<u>Offset</u>
48+97	44' LT
54+92	38' LT
57+10	27' LT
57+58	22' LT
64+23	56' LT
69+10	17' RT
75+19	23' LT

ITEM 102.513**AIR EXCAVATION AND ROOT PRUNING****Lawrence Rail Trail B**

<u>Station</u>	<u>Offset</u>
34+12	49' LT
71+30	30' RT
71+59	33' RT
73+41	40' RT
73+48	39' RT
75+19	22' LT

ITEM 102.522

TREE & PLANT PROTECTION FENCE – CHAIN LINK

Lawrence Rail Trail B

<u>Station</u>	<u>Offset</u>
26+80	44' LT
63+28	16' RT
71+30	30' RT
71+59	33' RT
73+41	40' RT
73+48	39' RT
73+81	23' LT
73+82	25' LT
74+89	29' LT
75+19	22' LT
80+58	115' RT
80+64	83' RT

Spicket River Greenway

<u>Station</u>	<u>Offset</u>
302+26 to 302+33	53' – 88' RT

ITEM 103.

TREE REMOVED – DIAMETER UNDER 24 INCHES

Lawrence Rail Trail B

<u>Station</u>	<u>Offset</u>	<u>Size (in)</u>
49+00	14' LT	14
57+90	17' LT	16
60+54	7' RT	8
60+55	7' RT	8
60+95	6' RT	12
61+52	13' RT	18
61+64	1' LT	14
62+69	1' LT	10
62+71	4' LT	14
62+79	9' RT	10
62+81	8' RT	14
63+63	20' RT	14
63+79	4' LT	18
64+06	20' RT	16
67+95	42' LT	20
69+83	38' LT	14
69+85	42' LT	8
71+54	27' RT	8
72+07	16' RT	10
73+00	13' RT	10
73+01	14' RT	10

ITEM 103. (Continued)

Lawrence Rail Trail B

<u>Station</u>	<u>Offset</u>	<u>Size (in)</u>
73+60	19' RT	14
78+56	15' RT	8
78+74	16' RT	8
79+22	15' RT	10

Manchester Street Park

<u>Station</u>	<u>Offset</u>	<u>Size (in)</u>
401+12	4' RT	18
401+43	6' RT	18

ITEM 104. **TREE REMOVED – DIAMETER 24 INCHES AND OVER**

Lawrence Rail Trail B

<u>Station</u>	<u>Offset</u>	<u>Size (in)</u>
63+28	16' RT	36
And as required by the Engineer.		

ITEM 107.98 **FOUNDATION AND WALL SURFACE REPAIR**

L-04-027 (C90) – Lowell Street

<u>Station</u>	<u>Offset</u>
510+02 to 510+13	RT

ITEM 120. **EARTH EXCAVATION**

To be used for all excavation not otherwise classified.

ITEM 121. **CLASS A ROCK EXCAVATION**

To be used for excavation of rock in roadway or channel excavation.

ITEM 129.5

TRACK EXCAVATION

Lawrence Rail Trail A

<u>Station</u>	<u>Offset</u>
1+38 to 11+96	9' LT – 1' RT
3+90 to 4+80	14' LT – 7' RT
4+98 to 10+51	1' LT
15+02 to 15+11	91' LT

Lawrence Rail Trail B

<u>Station</u>	<u>Offset</u>
25+53 to 32+35	8' LT – 21' RT
33+25 to 49+08	12' LT – 28' RT
33+27 to 49+09	30' LT – 30' RT
36+17 to 37+37	27' – 31' RT
38+67 to 39+68	10' – 17' RT
47+40 to 49+08	10' – 17' RT
49+88 to 73+70	23' LT – 10' RT
55+73 to 57+54	25' – 37' RT
58+77 to 70+07	10' LT – 13' RT
71+81 to 73+70	0' – 9 RT

ITEM 140.

BRIDGE EXCAVATION

To be used as directed by the Engineer for bridge excavation.

ITEM 141.

CLASS A TRENCH EXCAVATION

Lawrence Rail Trail B

<u>Station</u>	<u>Offset</u>
74+42 to 75+20	13' LT
41+00 to 41+75	10' LT

ITEM 144.

CLASS B ROCK EXCAVATION

To be used as directed by the Engineer.

ITEM 145.

DRAINAGE STRUCTURE ABANDONED

Haverhill Street

<u>Station</u>	<u>Offset</u>	<u>Type</u>
52+25	44' LT	OMH

ITEM 146. **DRAINAGE STRUCTURE REMOVED**

Haverhill Street

<u>Station</u>	<u>Offset</u>	<u>Type</u>
100+69	16' LT	CB

Water Street

<u>Station</u>	<u>Offset</u>	<u>Type</u>
111+31	10' RT	DMH
111+34	16' RT	CB
111+64	22' LT	CB

Spicket River Greenway

<u>Station</u>	<u>Offset</u>	<u>Type</u>
304+90	6' RT	DMH
304+91	19' RT	DMH
305+87	17' RT	DMH
305+88	4' RT	DMH

ITEM 156.01 **CRUSHED STONE FOR MAINTENANCE STRIP**

Lawrence Rail Trail B

<u>Station</u>	<u>Offset</u>
25+60 to 32+60	26' – 25' LT
25+50 to 32+60	25' – 24' RT
52+75 to 53+25	20' – 20' RT

ITEM 156.1 **CRUSHED STONE FOR BRIDGE FOUNDATIONS**

To be used as directed by the Engineer for foundations for Bridge L-04-027 at Lowell Street and Bridge L-04-030 at Manchester Street, and for the cemented stone masonry wall.

ITEM 156.21 **DUMPED RIPRAP – 50 LB STONE**

Lawrence Rail Trail B

<u>Station</u>	<u>Offset</u>
40+90 to 41+45	5' – 24' LT
40+90 to 41+45	5' – 24' RT

ITEM 182.1 **INSPECTION AND TESTING FOR ASBESTOS**
ITEM 182.2 **REMOVAL OF ASBESTOS**

To be used at Lowell Street for removal of existing Verizon ducts.

ITEM 184.1 **DISPOSAL OF TREATED WOOD PRODUCTS**

To be used for the disposal of railroad ties and the wood pile at STA 71+00 RT.

ITEM 201. **CATCH BASIN**

Water Street (Lawrence Rail Trail B)

<u>Station</u>	<u>Offset</u>	<u>Struct. #</u>
25+13	48' LT	1
25+29	13' LT	2

Haverhill Street

<u>Station</u>	<u>Offset</u>	<u>Struct. #</u>
100+87	17' LT	8

ITEM 202. **MANHOLE**

Lawrence Rail Trail B

<u>Station</u>	<u>Offset</u>	<u>Struct. #</u>
25+16	4' LT	3
26+41	5' LT	4

ITEM 203.12 **STOMWATER BASIN OUTLET STRUCTURE**

Lawrence Rail Trail B

<u>Station</u>	<u>Offset</u>	<u>Struct. #</u>
29+39	20' LT	5
61+92	13' LT	14

ITEM 220. **DRAINAGE STRUCTURE ADJUSTED**

Lawrence Rail Trail A

<u>Station</u>	<u>Offset</u>	<u>Type</u>
15+52	24' LT	Exist DMH
15+75	2' LT	Exist CB

Water Street

<u>Station</u>	<u>Offset</u>	<u>Type</u>
112+00	12' RT	Exist CB
112+02	22' LT	Exist CB

ITEM 220.3 **DRAINAGE STRUCTURE CHANGE IN TYPE**

For the conversion of catch basins to manholes as needed.

ITEM 220.5 **DRAINAGE STRUCTURE REMODELED**

Haverhill Street

<u>Station</u>	<u>Offset</u>	<u>Type</u>
100+86	16' RT	CB

ITEM 220.7 **SANITARY STRUCTURE ADJUSTED**

L-04-027 – Lowell Street

<u>Station</u>	<u>Offset</u>
511+37	1' RT
511+41	1' RT

ITEM 222.3 **FRAME AND GRATE (OR COVER) MUNICIPAL STANDARD**

Lawrence Rail Trail B

<u>Station</u>	<u>Offset</u>	<u>Type</u>
25+13	48' LT	FRAME & GRATE – CB
25+16	4' LT	FRAME & COVER – DMH
25+29	13' LT	FRAME & GRATE – CB
26+52	8' LT	FRAME & COVER – DMH

Haverhill Street

<u>Station</u>	<u>Offset</u>	<u>Type</u>
100+87	17' LT	FRAME & GRATE – GI

ITEM 222.31 **BEEHIVE GRATE**

Lawrence Rail Trail B

<u>Station</u>	<u>Offset</u>
56+80	LT

ITEM 223.1 **FRAME AND GRATE (OR COVER) REMOVED AND STACKED**

Lawrence Rail Trail B

<u>Station</u>	<u>Offset</u>	<u>Type</u>
25+13	48' LT	FRAME & GRATE
25+29	13' LT	FRAME & GRATE

Haverhill Street

<u>Station</u>	<u>Offset</u>	<u>Type</u>
100+69	15' LT	FRAME & GRATE
100+86	15' RT	FRAME & GRATE

ITEM 224.12**12 INCH HOOD**Lawrence Rail Trail B

<u>Station</u>	<u>Offset</u>	<u>Struct. #</u>
24+98	21' RT	1
25+32	24' RT	2

ITEM 238.12**12 INCH DUCTILE IRON PIPE**Haverhill Street

<u>Station</u>	<u>Offset</u>
100+69 to 100+86	15' – 16' LT

ITEM 234.12**12 INCH DRAINAGE PIPE-OPTION**Lawrence Rail Trail B

<u>Station</u>	<u>Offset</u>
25+16 to 25+28	4'-14' LT
59+44 to 59+77	14' LT

ITEM 235.12**12 INCH DRAINAGE PIPE FLARED END - OPTION**Lawrence Rail Trail B

<u>Station</u>	<u>Offset</u>
56+46	14' LT
59+44	17' LT
59+77	12' LT
60+88	15' LT

ITEM 243.12**12 INCH REINFORCED CONCRETE PIPE CLASS IV**Lawrence Rail Trail B

<u>Station</u>	<u>Offset</u>
25+16 to 26+52	8' LT – 7' RT
26+52 to 29+39	20' LT – 2' RT
60+88 to 61+82	12' – 15' LT

ITEM 252.12

12 INCH CORRUGATED PLASTIC PIPE

Lawrence Rail Trail B

<u>Station</u>	<u>Offset</u>
56+48 to 56+79	14' LT

Also paid for under this item:

Lawrence Rail Trail B

<u>Station</u>	<u>Offset</u>	<u>Struct. #</u>
59+79	13' LT	10

ITEM 258.

STONE FOR PIPE ENDS

Lawrence Rail Trail B

<u>Station</u>	<u>Offset</u>
36+73	RT
37+61	RT
39+42	RT
56+43	LT
59+41	LT
59+80	LT
60+86	LT

ITEM 269.06

6 INCH SLOT-PERORATED CORRUGATED PLASTIC PIPE (SUBDRAIN)

Lawrence Rail Trail B

<u>Station</u>	<u>Offset</u>
29+41 to 31+18	17' - 24' LT
52+27 to 53+57	14' - 17' LT
55+62 to 56+43	14' - 16' LT
58+68 to 59+48	10' - 18' LT
59+80 to 60+76	12' - 16' LT
61+87 to 62+26	12' - 22' LT

Lawrence Rail Trail B

<u>Station</u>	<u>Offset</u>
63+17 to 64+20	15' - 20' LT
70+88 to 71+60	15' - 16' LT

ITEM 303.08 **8 INCH DUCTILE IRON WATER PIPE (MECHANICAL JOINT)**L-04-027 – Lowell Street

<u>Station</u>	<u>Offset</u>
509+11 to 511+16	7' – 22' RT

ITEM 309. **DUCTILE IRON FITTINGS FOR WATER PIPE**L-04-027 – Lowell Street

<u>Station</u>	<u>Offset</u>	<u>Type</u>
509+75	7' RT	45 Degree Bend
509+90	22' RT	45 Degree Bend
510+96	22' RT	45 Degree Bend
511+11	8' RT	45 Degree Bend
511+16	8' RT	8" x 6" Tee
511+20	8' RT	8" x 6" Reducer
511+43	10' RT	6" Cap

ITEM 347.1 **1 INCH COPPER TUBING TYPE K**L-04-027 – Lowell Street

<u>Station</u>	<u>Offset</u>
509+56	RT
509+69	RT/LT

ITEM 350.08 **8 INCH GATE AND GATE BOX**L-04-027 – Lowell Street

<u>Station</u>	<u>Offset</u>
509+11	8' RT
511+06	12' RT

ITEM 357.06 **6 INCH GATE BOX****ITEM 357.08** **8 INCH GATE BOX**

To be used for the replacement of gate boxes unable to be adjusted.

ITEM 358.**GATE BOX ADJUSTED**Lawrence Rail Trail B

<u>Station</u>	<u>Offset</u>	<u>Type</u>
15+48	8' LT	WG
15+86	9' LT	WG

L-04-027 – Lowell Street

<u>Station</u>	<u>Offset</u>	<u>Type</u>
511+16	12' RT	WG
511+26	8' RT	WG
511+29	11' RT	WG
511+52	8' LT	WG

And as required by the Engineer.

ITEM 373.08**8 INCH WATER PIPE INSULATION**L-04-027 – Lowell Street

<u>Station</u>	<u>Offset</u>
509+85 to 11+02	7' – 22' RT

ITEM 376.5**HYDRANT – ADJUSTED**L-04-027 – Lowell Street

<u>Station</u>	<u>Offset</u>
511+16	20' RT

ITEM 381.3**SERVICE BOX ADJUSTED**Essex Street

<u>Station</u>	<u>Offset</u>
91+65	31' LT

L-04-027 – Lowell Street

<u>Station</u>	<u>Offset</u>
509+56	21' RT
509+69	18' LT

ITEM 451. **HMA FOR PATCHING**

To be used for mill & overlay areas that are in disrepair and cannot be milled out, and for permanent pavement trench patches.

ITEM 472. **TEMPORARY ASPHALT PATCHING**

To be used for temporary patching for access and drainage at driveways, temporary utility patching, and temporary curb ramps.

ITEM 504. **GRANITE CURB TYPE VA4 – STRAIGHT**Lawrence Rail Trail B

<u>Station</u>	<u>Offset</u>
81+00 to 82+40	26' LT – 39' RT

Merrimack Street

<u>Station</u>	<u>Offset</u>
0+80 to 0+80	15' – 22' LT
0+81 to 0+82	1' – 9' RT
0+82 to 0+84	28' – 49' RT
1+19 to 1+19	12' – 19' LT
1+21 to 1+21	12' – 21' RT

Lawrence Rail Trail A

<u>Station</u>	<u>Offset</u>
12+08 to 13+09	7' LT
12+75 to 13+44	53' – 54' LT
13+53 to 13+53	8' – 28' RT
13+58 to 13+58	8' – 28' RT
13+85 to 14+02	5' LT
15+68 to 15+96	52' LT

Water/Canal Street

<u>Station</u>	<u>Offset</u>
111+41 to 112+03	12' RT
111+53 to 112+09	22' LT

Essex Street

<u>Station</u>	<u>Offset</u>
90+58 to 91+71	21' RT
90+61 to 91+23	20' LT
91+20 to 91+23	16' RT
91+49 to 91+58	22' LT
91+49 to 91+55	16' LT
91+84 to 91+94	16' RT
92+05 to 92+12	26' LT

ITEM 504. (Continued)Haverhill Street

<u>Station</u>	<u>Offset</u>
100+63 to 100+83	16' RT
100+63 to 100+83	18' LT
100+96 to 100+94	13' RT
101+22 to 101+24	13' RT
101+35 to 101+51	17' RT
101+35 to 101+45	18' LT
101+89 to 101+94	18' LT

Railroad Street

<u>Station</u>	<u>Offset</u>
600+97 to 601+06	17' RT
601+25 to 601+30	17' RT
601+44 to 601+49	17' LT

L-04-027 – Lowell Street

<u>Station</u>	<u>Offset</u>
509+13 to 510+11	RT
509+66 to 509+81	LT
510+86 to 511+08	LT
510+96 to 511+76	RT
511+32 to 511+37	LT

ITEM 504.1**GRANITE CURB TYPE VA4 – CURVED**Lawrence Rail Trail A

<u>Station</u>	<u>Offset</u>
11+89 to 12+08	7' – 10' LT
13+09 to 13+22	7' LT
13+53 to 13+58	8' RT
13+53 to 13+58	28' RT

Water/Canal Street

<u>Station</u>	<u>Offset</u>
110+67 to 110+76	22' – 29' RT
110+71 to 110+82	16' – 24' LT
112+04 to 112+10	12' – 13' RT

Essex Street

<u>Station</u>	<u>Offset</u>
91+15 to 91+20	16' – 18' RT
92+12 to 92+30	26' – 37' LT

Haverhill Street

<u>Station</u>	<u>Offset</u>
100+83 to 100+94	13' – 16' RT
100+83 to 100+96	13' – 18' RT

ITEM 504.1 (Continued)Haverhill Street

<u>Station</u>	<u>Offset</u>
100+83 to 100+94	13' – 16' RT
100+83 to 100+96	13' – 18' RT
101+24 to 101+35	13' – 17' RT
101+22 to 101+35	13' – 18' RT

Railroad Street

<u>Station</u>	<u>Offset</u>
600+99 to 601+05	16' LT

ITEM 509.**GRANITE TRANSITION CURB FOR PEDESTRIAN CURB RAMPS-STRAIGHT**Lawrence Rail Trail A

<u>Station</u>	<u>Offset</u>
0+80 to 0+80	15' – 22' LT
0+81 to 0+81	1' RT – 2' LT
0+81 to 0+81	6' – 9' RT
0+82 to 0+82	25' – 28' RT
0+83 to 0+84	41' – 48' RT
1+19 to 1+20	5' – 12' LT
1+20 to 1+21	7' – 13' RT

Broadway

<u>Station</u>	<u>Offset</u>
13+22 to 13+29	7' LT
13+85 to 13+93	5' LT

Lawrence Rail Trail B

<u>Station</u>	<u>Offset</u>
14+97 to 15+04	50' LT
15+66 to 15+68	52' LT
15+86 to 15+93	3' LT

Water/Canal Street

<u>Station</u>	<u>Offset</u>
110+50 to 110+57	22' RT
110+62 to 110+65	15' LT
111+41 to 111+45	12' RT
111+46 to 111+53	22' LT

Essex Street

<u>Station</u>	<u>Offset</u>
90+71 to 91+77	21' RT
91+23 to 91+30	16' RT
91+23 to 91+30	20' – 21' LT
91+42 to 91+49	22' LT
91+43 to 91+49	16' RT

ITEM 509. (Continued)Essex Street

<u>Station</u>	<u>Offset</u>
91+55 to 91+66	16' RT
91+58 to 91+69	22' - 23' LT
91+78 to 91+64	16' RT
91+99 to 92+05	25' - 26' RT

Haverhill Street

<u>Station</u>	<u>Offset</u>
100+96 to 101+03	13' RT
100+97 to 101+03	13' LT
101+15 to 101+22	13' RT
101+15 to 101+22	13' LT
101+45 to 101+53	18' LT
101+83 to 101+89	18' LT

Railroad Street

<u>Station</u>	<u>Offset</u>
601+05 to 601+10	16' - 17' LT
601+06 to 601+09	17' RT
601+16 to 601+20	17' LT
601+18 to 601+25	17' RT

L-04-027 – Lowell Street

<u>Station</u>	<u>Offset</u>
511+08 to 511+14	LT
511+29 to 511+32	LT

ITEM 509. 1**GRANITE TRANSITION CURB FOR PEDESTRIAN CURB RAMPS-CURVED**Essex Street

<u>Station</u>	<u>Offset</u>
91+07 to 91+15	18' - 21' RT
92+12 to 92+31	26' - 37' LT

ITEM 516.**GRANITE CURB CORNER TYPE A**Railroad Street

<u>Station</u>	<u>Offset</u>
600+96	17' RT
601+21	18' LT
601+37	17' LT

ITEM 570.2**HOT MIX ASPHALT CURB TYPE 2**Lawrence Rail Trail B

<u>Station</u>	<u>Offset</u>
72+98 to 73+74	6' LT
72+98 to 73+67	6' RT
74+32 to 74+79	6' RT
74+39 to 74+79	6' LT

L-04-030 – Manchester Street

<u>Station</u>	<u>Offset</u>
73+72 to 74+34	6' LT

ITEM 580.**CURB REMOVED AND RESET**Lawrence Rail Trail A

<u>Station</u>	<u>Offset</u>
1+20 to 1+21	18' – 41' LT
1+22 to 1+23	21' – 40' RT

L-04-027 – Lowell Street

<u>Station</u>	<u>Offset</u>
509+13 to 510+11	RT
509+66 to 509+81	LT
510+86 to 511+14	LT
510+96 to 511+76	RT

ITEM 638.22**VERTICAL WELDED WIRE SCREEN FENCE (PIPE TOP RAIL)**Lawrence Rail Trail B

<u>Station</u>	<u>Offset</u>
25+53 to 28+10	25' – 32' RT
24+64 to 27+70	28' – 11' LT

ITEM 645.048**48 INCH CHAIN LINK FENCE (PIPE TOP RAIL) (LINE POST OPTION)**L-04-027 – Lowell Street

<u>Station</u>	<u>Offset</u>
510+79 to 511+11	24' – 29' LT
511+08 to 511+76	25' – 27' RT

ITEM 645.172 **72 INCH CHAIN LINK FENCE (PIPE TOP RAIL) VINYL COATED (LINE POST OPTION)**

Lawrence Rail Trail B

<u>Station</u>	<u>Offset</u>
28+10 to 32+60	31' - 27' RT

ITEM 655.3 **WOODEN SAFETY RAIL**

Lawrence Rail Trail A

<u>Station</u>	<u>Offset</u>
1+28 to 1+38	10' - 27' LT
1+31 to 1+39	10' - 28' RT
2+04 to 2+36	11' - 25' RT
2+07 to 4+99	10' - 25' LT
4+47 to 5+01	15' - 25' RT
10+40 to 10+56	15' - 31' LT
10+40 to 10+52	15' - 33' RT

Lawrence Rail Trail B

<u>Station</u>	<u>Offset</u>
62+23 to 64+45	8' RT
70+77 to 73+73	7' - 8' LT
72+98 to 73+65	7' - 8' RT
74+33 to 75+18	7' - 8' RT
74+40 to 79+71	7' - 8' LT
78+73 to 84+63	8' RT

Spicket river Greenway

<u>Station</u>	<u>Offset</u>
300+08 to 302+85	100' - 22' RT
302+98 to 307+56	7' - 16' RT

ITEM 655.4 **WOOD RAIL FENCE WITH GUARDRAIL**

Lawrence Rail Trail B

<u>Station</u>	<u>Offset</u>
27+62 to 32+61	16' - 27' LT

ITEM 657. **TEMPORARY FENCE**

To be used for site security on Lowell Street during closure and as directed by the Engineer.

ITEM 657.5**TEMPORARY FENCE REMOVED AND RESET**

To be used as directed by the Engineer.

ITEM 665.**CHAIN LINK FENCE REMOVED AND STACKED**Lawrence Rail Trail B

<u>Station</u>	<u>Offset</u>
25+50 to 30+39	10' – 35' LT
33+57 to 33+72	19' RT – 2' LT
35+52 to 37+78	15' – 31' LT
38+11 to 39+75	34' – 42' LT
43+64 to 46+51	33' – 34' RT

Lawrence Rail Trail B

<u>Station</u>	<u>Offset</u>
49+72 to 50+47	14' – 20' RT
54+90 to 56+77	27' – 39' RT
58+22 to 59+09	47' – 36' RT
59+31 to 61+56	33' – 17' RT
62+18 to 69+49	16' – 19' RT
65+13 to 67+28	42' – 60' LT
69+16 to 69+47	48' – 49' LT
70+51 to 71+02	45' – 46' LT
71+20 to 72+35	40' – 43' LT
72+81 to 73+52	34' – 38' LT
73+73 to 74+00	34' – 72' LT
76+76 to 77+90	9' – 13' RT
78+37 to 79+65	15' – 18' RT

L-04-027 – Lowell Street

<u>Station</u>	<u>Offset</u>
510+77 to 511+11	25' – 29' LT
511+09 to 511+76	24' – 27' RT

ITEM 666.**CHAIN LINK FENCE REMOVED AND RESET**L-04-027 – Lowell Street

<u>Station</u>	<u>Offset</u>
509+64 to 509+82	25' LT

Lawrence Rail Trail B

<u>Station</u>	<u>Offset</u>
52+09 to 52+31	25' – 45' RT
54+18 to 54+94	25' – 45' RT

ITEM 669.**FENCE REMOVED AND STACKED**Lawrence Rail Trail B

<u>Station</u>	<u>Offset</u>	<u>Type</u>
54+18 to 54+85	30' – 40' RT	Wood
72+56 to 72+69	36' – 44' LT	Wood

Spicket River Greenway

<u>Station</u>	<u>Offset</u>	<u>Type</u>
300+11 to 300+63	10' – 16 RT	Wood
300+11 to 300+63	10' – 16' LT	Wood

ITEM 670.**FENCE REMOVED AND RESET**Lawrence Rail Trail B

<u>Station</u>	<u>Offset</u>	<u>Type</u>
52+70 to 53+22	20' – 30' RT	Wood

ITEM 671.**FENCE GATE AND GATE POSTS REMOVED AND STACKED**Lawrence Rail Trail B

<u>Station</u>	<u>Offset</u>
31+98 to 32+36	33' – 34' RT

ITEM 685.**STONE MASONRY WALL IN CEMENT MORTAR**Lawrence Rail Trail B

<u>Station</u>	<u>Offset</u>
74+45 to 75+20	8' – 12' LT

ITEM 697.**SEDIMENTATION FENCE**Lawrence Rail Trail B

<u>Station</u>	<u>Offset</u>
38+70 to 40+41	16' – 74' LT
39+53 to 40+69	10' – 41' RT
41+50 to 48+40	10' – 34' RT
41+62 to 48+59	10' – 36' LT

Spicket River Greenway

<u>Station</u>	<u>Offset</u>
307+58 to 308+57	12' – 19' RT
308+49 to 309+44	6' – 27' LT
308+55 to 309+44	10' – 30' RT

ITEM 703.1**CONCRETE WHEEL STOP**Lawrence Rail Trail B

<u>Station</u>	<u>Offset</u>
56+60	49' LT
56+60	57' LT
56+60	65' LT
56+60	73' LT
56+60	82' LT
56+60	91' LT
56+60	99' LT
56+60	108' LT
56+60	116' LT
56+60	125' LT
56+60	133' LT
56+60	142' LT
56+61	151' LT

Lawrence Rail Trail B

<u>Station</u>	<u>Offset</u>
56+61	159' LT

ITEM 704.3**SPECIAL CONCRETE SEAT WALLS – PRECAST WITH TIMBER SEAT**Lawrence Rail Trail B

<u>Station</u>	<u>Offset</u>
25+88	30' LT
32+00	16' RT
32+52	24' RT
33+32	23' LT
33+68	18' LT
48+50	8' RT
49+90	9' RT
49+79	9' LT
50+21	29' LT

ITEM 707.11**TIMBER BENCH**Lawrence Rail Trail A

<u>Station</u>	<u>Offset</u>
2+40	9' LT
3+20	9' LT
3+30	9' LT
4+54	11' LT
5+28	4' RT
5+58	4' RT
6+19	4' RT
6+49	4' RT
8+88	4' RT
9+19	4' RT
9+78	4' RT
10+10	4' RT

Lawrence Rail Trail B

<u>Station</u>	<u>Offset</u>
25+66	21' LT
25+77	24' LT
26+46	34' LT

ITEM 707.18**STACKED TIMBER SEATING STRUCTURE**Lawrence Rail Trail A

<u>Station</u>	<u>Offset</u>
6+99	1.25' RT
7+88	1.25' RT

ITEM 707.2**TRASH RECEPTACLE**Lawrence Rail Trail A

<u>Station</u>	<u>Offset</u>
4+60	7' RT
10+81	7' RT

Lawrence Rail Trail B

<u>Station</u>	<u>Offset</u>
26+00	19' LT
26+36	35' LT
32+50	25' RT
33+40	7' RT
49+03	36' RT
50+17	12' RT

ITEM 755.45

WETLAND RESTORATION

Lawrence Rail Trail B

<u>Station</u>	<u>Offset</u>	
40+60 to 40+85		RT
40+75 to 40+98		LT
41+34 to 41+56		RT
41+45 to 41+68		LT

ITEM 767.121

SEDIMENT CONTROL BARRIER

Lawrence Rail Trail B

<u>Station</u>	<u>Offset</u>
1+29 to 1+38	30' – 12' LT
1+31 to 1+39	31' – 12' RT
2+03 to 2+03	11' – 36' RT
2+03 to 2+14	10' – 25' LT
4+93 to 5+01	24' – 15' LT
5+02 to 5+02	15' – 36' RT
10+34 to 10+49	15' – 28' LT
10+40 to 10+51	15' – 35' RT

Spicket River Greenway

<u>Station</u>	<u>Offset</u>
307+58 to 308+57	12' – 19' RT
308+49 to 309+44	6' – 27' LT
308+55 to 309+44	10' – 30' RT

ITEM 767.122

SEDIMENT CONTROL BARRIER – COIR LOG

Lawrence Rail Trail B

<u>Station</u>	<u>Offset</u>	<u>Basin</u>
29+09 to 29+68	8.5' LT	1
29+71 to 30+35	8.5' LT	1
30+38 to 31+07	8.5' LT	1
31+14 to 31+51	8.5' LT	1
34+62 to 37+96	8.5' RT	2
51+57 to 53+77	7.5' LT	3
55+55 to 56+52	7.5' LT	4
56+77 to 57+95	8.5' LT	4
58+62 to 60+93	6.5' – 9' LT	5
61+71 to 62+37	7.5' – 35' LT	6
63+13 to 66+21	8.5' LT	7
70+67 to 72+12	7' – 9' LT	8

ITEM 801.72 **2 INCH ELECTRICAL CONDUIT TYPE FRE**

Lawrence Rail Trail

Station

2+29 to 2+40

2+29 to 2+40

73+70 to 64+75

ITEM 804.2 **2 INCH ELECTRICAL CONDUIT TYPE NM – PLASTIC (UL)**

Lawrence Rail Trail B

Station

2+07 to 88+30

Spicket River Greenway

Station

308+78 to 308+48

Manchester Street Park

Station

400+30 to 401+20

ITEM 804.3 **3 INCH ELECTRICAL CONDUIT TYPE NM – PLASTIC - (UL)**

Lawrence Rail Trail A

Station

Offset

15+01 to 15+08

LT

15+07 to 15+11

LT

15+08 to 15+26

LT/RT

15+08 to 15+12

LT

15+12 to 15+58

LT

15+57 to 15+58

LT

15+58 to 15+59

LT

Lawrence Rail Trail A

Station

Offset

15+62 to 15+74

LT

15+74 to 15+81

LT/RT

15+74 to 15+81

RT

ITEM 804.4 **4 INCH ELECTRICAL CONDUIT TYPE NM- PLASTIC - (UL)**

Lawrence Rail Trail A

Station

4+41 to 4+98

10+50 to 12+50

L-04-027 – Lowell Street

Station

508+79 to 511+40

508+79 to 509+09

513+58 to 513+73

ITEM 804.41 **4 INCH ELECTRICAL CONDUIT TYPE NM- FIBERGLASS (UL)**

L-04-027 – Lowell Street

Station

5+00 to 10+50 (2) Lawrence

5+00 to 10+50 (2) AT&T

5+00 to 10+50 (2) Comcast

ITEM 804.42 **36 INCH SWEEP AND MANHOLE CONNECTION**

To be used for connection of proposed utility conduit on Lowell Street.

ITEM 811.13 **ELECTRIC HANDHOLE – SD2.013**

Lawrence Rail Trail

Station

Offset

4+56 20' RT

11+40 24' RT

ITEM 811.22 **ELECTRIC HANDHOLE – SD2.022**

Lawrence Rail Trail A

Station

4+87

Lawrence Rail Trail B

Station

74+73

78+63

Spicket River Greenway

Station

302+70

And as required by the Engineer.

ITEM 811.23

ELECTRIC HANDHOLE – SD2.023

Lawrence Rail Trail A

<u>Station</u>	<u>Offset</u>
10+86	RT

ITEM 811.24

ELECTRIC HANDHOLE – SD2.024

Lawrence Rail Trail B

<u>Station</u>
74+40

ITEM 811.30

PULL BOX 8 X 23 INCHES – SD2.030

Lawrence Rail Trail A

<u>Station</u>	<u>Offset</u>
2+10	16' LT
2+18	17' RT
2+88	12' LT
3+60	12' RT
4+26	14' LT
4+89	15' RT
4+93	18' RT
10+52	20' LT
11+26	14' LT

Lawrence Rail Trail B

<u>Station</u>	<u>Offset</u>
26+07	30' LT
26+70	13' RT
27+53	14' LT
28+25	14' LT
28+97	12' LT
29+70	9' LT
30+41	8' LT
31+12	8' LT
31+83	13' LT
32+49	9' LT
33+30	9' LT
33+87	11' LT
34+56	12' LT
35+27	11' LT
35+95	12' LT
36+64	13' LT

ITEM 811.30 (Continued)Lawrence Rail Trail B

<u>Station</u>	<u>Offset</u>
37+33	12' LT
38+03	12' LT
38+73	10' LT
39+44	14' LT
40+15	7' RT
40+85	7' RT
41+54	7' RT
42+25	6' RT
42+95	7' RT
43+64	7' RT
44+33	7' RT
45+03	7' RT
45+73	7' RT
46+42	7' RT
47+12	7' RT
47+81	7' RT
48+45	12' RT
49+17	12' RT
49+74	13' RT
50+52	12' RT
51+25	13' RT
51+99	7' RT
52+66	7' RT
53+36	7' RT
54+03	12' RT
54+77	12' RT
55+45	12' RT
56+16	15' RT
56+86	15' RT
57+52	11' RT
58+32	12' RT
59+03	12' RT
59+73	12' RT
60+46	7' RT
61+17	7' RT
61+81	12' RT
62+50	12' RT
63+14	12' RT
63+91	12' RT
64+61	12' RT
65+31	12' RT
66+01	12' RT
66+66	12' RT
67+41	13' RT
68+11	13' RT
68+80	13' RT

ITEM 811.30 (Continued)Lawrence Rail Trail B

<u>Station</u>	<u>Offset</u>
69+50	13' RT
70+20	13' RT
70+87	12' RT
71+57	13' RT
72+27	12' RT
72+97	13' RT
73+58	12' RT
74+33	11' RT
74+46	13' RT
75+16	12' RT
75+85	12' RT
76+52	11' RT
78+65	10' RT
78+75	11' RT
79+44	13' RT
80+20	12' RT
80+95	12' RT
81+69	12' RT
82+50	8' RT
83+24	8' RT
84+00	8' RT
84+70	12' RT
85+45	12' RT
86+24	7' RT
86+95	7' RT
87+62	11' RT
88+25	7' RT

Spicket River Greenway

<u>Station</u>	<u>Offset</u>
303+06	12' RT
303+73	9' RT
304+42	10' RT
305+12	10' RT
305+81	10' RT
306+50	10' RT
307+21	11' RT
307+88	9' RT
308+55	7' RT

Manchester Street Park

<u>Station</u>	<u>Offset</u>
400+48	11' RT
400+22	7' RT

ITEM 811.36 **ELECTRIC MANHOLE ADJUSTED**

L-04-027 – Lowell Street

<u>Station</u>	<u>Offset</u>
509+40	21' LT
511+40	11' LT

ITEM 811.37 **ELECTRIC HANDHOLE ADJUSTED**

Lawrence Rail Trail B

<u>Station</u>	<u>Offset</u>
25+34	15' LT
32+58	25' RT
32+66	25' RT
33+81	51' LT

ITEM 811.39 **ELECTRIC HANDHOLE REMOVED AND STACKED**

Lawrence Rail Trail A

<u>Station</u>	<u>Offset</u>
15+73	12' RT

Lawrence Rail Trail B

<u>Station</u>	<u>Offset</u>
24+93	36' LT
25+37	81' LT
25+35	1' LT

And as required by the Engineer.

ITEM 811.41 **JUNCTION BOX 6 X 7 X 4 INCHES**

Lawrence Rail Trail

<u>Station</u>
1+20 to 2+50
5+00 to 10+50
73+66 to 74+31

A total of 23 junction box structures are included in the above locations.

ITEM 811.63 **JUNCTION BOX 12 X 12 X 10 INCHES**

Lawrence Rail Trail

<u>Station</u>
1+20 to 2+50
5+00 to 10+50
14+50 to 15+10
73+00 to 75+00

A total of 25 junction box structures are included in the above locations.

ITEM 812.09 **LIGHT STANDARD FOUNDATION PRECAST**

To be used at each pole for Path Light Pole Mounted Fixture Assembly.

ITEM 813.32 **WIRE TYPE 7 NO. 6 GENERAL PURPOSE**

Lawrence Rail Trail

Station
2+70 to 88+30
308+78 to 308+48
400+30 to 401+20

ITEM 813.521 **WIRE TYPE 10 NO. 6 GROUNDING AND BONDING**

To be used as directed by the Engineer at each pullbox for Light Path Pole Mounted Fixture Assembly.

ITEM 813.72 **GROUND ROD 10 FEET LONG**

To be used as directed by the Engineer at each pullbox for Light Path Pole Mounted Fixture Assembly.

ITEM 813.801 **SERVICE CONNECTION (OVERHEAD) LOCATION NO. 1**

Lawrence Rail Trail

<u>Station</u>	<u>Offset</u>
1+28	15' RT

ITEM 813.802 **SERVICE CONNECTION (OVERHEAD) LOCATION NO. 2**

Lawrence Rail Trail

<u>Station</u>	<u>Offset</u>
25+49	21' RT

ITEM 813.803 **SERVICE CONNECTION (OVERHEAD) LOCATION NO. 3**

Lawrence Rail Trail

<u>Station</u>	<u>Offset</u>
49+64	39' RT

ITEM 813.811 **ELECTRIC SERVICE RISER RELOCATION NO. 1**

Lawrence Rail Trail

<u>Station</u>	<u>Offset</u>
25+55	11' LT

ITEM 819.9**TRAFFIC SIGNAL CONTROLLER REMOVED AND DISCARDED**Lawrence Rail Trail A

<u>Station</u>	<u>Offset</u>
12+37	2' RT
12+50	2' RT

ITEM 820.15**HIGHWAY LIGHTING – OVERHEAD REMOVED AND RESET**Lawrence Rail Trail

<u>Station</u>	<u>Offset</u>
12+00	RT

ITEM 821.992**PATH LIGHT POLE MOUNTED FIXTURE ASSEMBLY**Lawrence Rail Trail A

<u>Station</u>	<u>Offset</u>
2+19	13' RT
2+88	10' LT
3+60	9' RT
4+26	11' LT
4+94	16' RT
10+52	17' LT
11+26	11' LT

Lawrence Rail Trail B

<u>Station</u>	<u>Offset</u>
26+06	26' LT
26+70	10' RT
27+53	10' LT
28+26	11' LT
28+95	9' LT
29+65	10' LT
30+36	9' LT
31+08	8' LT
31+82	9' LT
32+47	8' LT
33+26	8' LT
33+87	8' LT
34+56	9' LT
35+26	9' LT
35+95	9' LT
36+64	9' LT
37+33	9' LT
38+03	9' LT
38+73	10' LT
39+44	9' LT
40+11	8' RT
40+81	9' RT
41+51	9' RT
42+21	8' RT
42+90	8' RT

ITEM 821.992 (Continued)

43+60	8' RT
44+29	8' RT
44+99	8' RT
45+68	8' RT
46+38	8' RT

Lawrence Rail Trail B

<u>Station</u>	<u>Offset</u>
47+08	7' RT
47+78	8' RT
48+46	9' RT
49+16	9' RT
49+71	9' RT
50+54	9' RT
51+25	9' RT
51+95	8' RT
52+63	7' RT
53+32	8' RT
54+04	9' RT
54+77	9' RT
55+45	9' RT
56+16	11' RT
56+86	11' RT
57+49	10' RT
58+31	9' RT
59+03	9' RT
59+73	8' RT
60+43	9' RT
61+13	8' RT
61+81	8' RT
62+50	9' RT
63+14	9' RT
63+91	9' RT
64+61	9' RT
65+31	9' RT
66+01	9' RT
66+67	9' RT
67+41	9' RT
68+11	9' RT
68+80	9' RT
69+50	9' RT
70+19	9' RT
70+87	9' RT
71+57	9' RT
72+27	9' RT
72+97	9' RT
73+59	10' RT
74+46	10' RT
75+17	9.0' RT
75+86	9' RT
76+55	9' RT
78+70	9' RT
79+45	9' RT
80+21	9' RT

ITEM 821.992 (Continued)

Lawrence Rail Trail B

<u>Station</u>	<u>Offset</u>
80+95	9' RT
81+70	9' RT
82+45	9' RT
83+20	9' RT
83+96	9' RT
84+71	9' RT
85+46	9' RT
86+21	9' RT
86+91	8' RT
87+62	7' RT
88+30	8' RT

Spicket River Greenway

<u>Station</u>	<u>Offset</u>
303+08	9' RT
303+77	8' RT
304+46	9' RT
305+16	9' RT
305+85	9' RT
306+54	9' RT
307+25	9' RT
307+91	7' RT
308+60	7' RT

Manchester Street Park

<u>Station</u>	<u>Offset</u>
400+49	11' RT
400+24	10' RT

ITEM 821.993

BRIDGE LIGHT COLUMN FIXTURE ASSEMBLY

Lawrence Rail Trail

<u>Station</u>	<u>Offset</u>
5+19	0.3' LT
5+49	0.3' LT
5+79	0.3' LT
6+09	0.3' LT
6+39	0.3' LT
6+69	0.3' LT
6+99	0.3' LT
7+29	0.3' LT
7+59	0.3' LT
7+89	0.3' LT
8+19	0.3' LT
8+49	0.3' LT
8+79	0.3' LT

ITEM 821.993 (Continued)

Lawrence Rail Trail A

<u>Station</u>	<u>Offset</u>
9+09	0.3' LT
9+39	0.3' LT
9+69	0.3' LT
9+88	0.3' LT
10+29	0.3' LT

ITEM 823.61

HIGHWAY LIGHTING LOAD CENTER NO. 1

Lawrence Rail Trail

Station
1+27

ITEM 823.62

HIGHWAY LIGHTING LOAD CENTER NO. 2

Lawrence Rail Trail

Station
25+37

ITEM 823.63

HIGHWAY LIGHTING LOAD CENTER NO. 3

Lawrence Rail Trail

Station
49+62

ITEM 823.64

EXISTING HIGHWAY LIGHTING LOAD CENTER ADDITIONS

Lawrence Rail Trail

Station
74+40

ITEM 823.71

HIGHWAY LIGHTING POLE AND LUMINAIRE REMOVED AND STACKED

Lawrence Rail Trail

Station
12+80

ITEM 825.21

RRFB (2-POST ASSEMBLY SYSTEM) LOCATION 1

Lawrence Rail Trail

<u>Station</u>	<u>Offset</u>
0+73	4' LT
1+29	7' LT

ITEM 825.22

RRFB (2-POST ASSEMBLY SYSTEM) LOCATION 2

Essex Street

<u>Station</u>	<u>Offset</u>
33+60	7' LT
33+22	7' RT

ITEM 825.23

RRFB (2-POST ASSEMBLY SYSTEM) LOCATION 3

Haverhill Street

<u>Station</u>	<u>Offset</u>
49+19	7' RT
49+70	7' LT

ITEM 832.

WARNING-REGULATORY AND ROUTE MARKER – ALUMINUM PANEL (TYPE A)

Lawrence Rail Trail A

<u>Sign</u>	<u>Station</u>	<u>Offset</u>
W4-2L	13+87	52' LT
R3-8 (14)	13+27	11' RT
R9-6	4+45	12' LT
	11+16	11' RT
R9-7a	4+30	11' RT
R9-7b	11+04	12' LT
R10-11b	15+03	46' LT
	15+28	6' RT

Lawrence Rail Trail B

<u>Sign</u>	<u>Station</u>	<u>Offset</u>
R1-1	32+57	11' RT
	33+25	7' LT
	49+15	11' RT
	49+74	7' LT
	56+58	10' LT
	78+60	8' RT
R5-3	32+57	11' LT
	33+30	11' RT
	49+17	11' LT
	49+79	8' RT
R10-11b	25+28	8' LT
MA-R10-12a	25+02	35' RT
	25+18	17' LT

ITEM 832. (Continued)Water / Canal Street

<u>Sign</u>	<u>Station</u>	<u>Offset</u>
R3-8 (25)	112+17	24' LT

Essex Street

<u>Sign</u>	<u>Station</u>	<u>Offset</u>
W11-15	90+30	23' RT
	93+43	40' LT
W11-15p	90+30	23' RT
	93+43	40' LT
W16-9p	90+30	23' RT
	93+43	40' LT

Haverhill Street

<u>Sign</u>	<u>Station</u>	<u>Offset</u>
W11-15	100+03	18' RT
	102+13	19' LT
W11-15p	100+03	18' RT
	102+13	19' LT
W16-9p	100+03	18' RT
	102+13	19' LT

Manchester Street Park

<u>Sign</u>	<u>Station</u>	<u>Offset</u>
R1-1	401+52	6' RT

Railroad Street

<u>Sign</u>	<u>Station</u>	<u>Offset</u>
W11-2	601+05	19' RT
	601+19	19' LT
W16-7pL	601+05	19' RT
	601+19	19' LT

ITEM 847.1 **SIGN SUP (N/GUIDE) + ROUTE MKR W/ 1 BRKWAY POST ASSEMBLY – STEEL**
Lawrence Rail Trail A

<u>Station</u>	<u>Offset</u>	<u>Type</u>
4+30	11' RT	New
4+45	12' LT	New
11+04	12' LT	New
11+16	11' RT	New
13+27	11' RT	New
13+87	52' RT	New

Lawrence Rail Trail B

<u>Station</u>	<u>Offset</u>	<u>Type</u>
32+57	11' LT	New
33+30	11' RT	New
49+17	11' LT	New
49+79	8' RT	New
56+58	10' LT	New

Lawrence Rail Trail B

<u>Station</u>	<u>Offset</u>	<u>Type</u>
78+59	8' RT	New

Water Street

<u>Station</u>	<u>Offset</u>	<u>Type</u>
112+17	24' LT	New

Essex Street

<u>Station</u>	<u>Offset</u>	<u>Type</u>
90+30	23' RT	New
90+66	22' LT	R&R
91+89	35' RT	R&R
92+43	40' LT	New

Haverhill Street

<u>Station</u>	<u>Offset</u>	<u>Type</u>
100+03	18' RT	New
102+13	19' LT	New

Manchester Street Park

<u>Station</u>	<u>Offset</u>	<u>Type</u>
401+52	6' RT	New

Railroad Street

<u>Station</u>	<u>Offset</u>	<u>Type</u>
601+05	19' RT	New
601+19	19' LT	New

Additional 2 locations at the intersection of Essex Street and Broadway

ITEM 848.1 **SIGN SUP (N/GUIDE) + ROUTE MKR W/ 2 BRKWAY POST ASSEMBLIES – STEEL**

Lawrence Rail Trail B

<u>Station</u>	<u>Offset</u>	<u>Type</u>
32+57	11' RT	New
33+25	7' LT	New
49+15	11' RT	New
49+74	7' LT	New

ITEM 864.04 **PAVEMENT ARROWS AND LEGENDS REFLECTORIZED WHITE (THERMOPLASTIC)**

Lawrence Rail Trail A

<u>Station</u>	<u>Offset</u>	<u>Type</u>
14+20	13' LT	THRU/LEFT TURN
14+23	21' LT	LEFT TURN
14+47	21' LT	ONLY
14+76	13' LT	THRU/LEFT TURN

Lawrence Rail Trail A

<u>Station</u>	<u>Offset</u>	<u>Type</u>
14+79	21' LT	LEFT TURN
15+00	9' LT	BIKE DETECTOR
15+00	22' LT	BIKE DETECTOR
15+82	34' LT	BIKE DETECTOR
15+82	47' LT	BIKE DETECTOR
15+93	34' LT	THRU/LEFT TURN
15+93	43' LT	THRU/RIGHT TURN

Water/Canal Street

<u>Station</u>	<u>Offset</u>	<u>Type</u>
110+35	16' RT	THRU/RIGHT TURN
110+39	6' LT	LEFT TURN
110+46	19' RT	BIKE DETECTOR
110+46	6' RT	BIKE DETECTOR
111+51	6' LT	BIKE DETECTOR
111+51	19' LT	BIKE DETECTOR
111+72	16' LT	RIGHT TURN
111+77	7' LT	THRU/LEFT TURN
112+13	17' LT	ONLY

ITEM 864.04 (Continued)Lawrence Rail Trail B

<u>Station</u>	<u>Offset</u>	<u>Type</u>
31+90	0' LT/RT	STOP AHEAD
33+85	0' LT/RT	STOP AHEAD
48+40	0' LT/RT	STOP AHEAD
50+35	0' LT/RT	STOP AHEAD
50+80	6' RT	BIKE YIELD
51+20	6' RT	BIKE YIELD
70+55	6' LT	BIKE YIELD
71+05	6' LT	BIKE YIELD

Spicket River Greenway

<u>Station</u>	<u>Offset</u>	<u>Type</u>
301+15	0' LT/RT	STOP AHEAD

Manchester Street Park

<u>Station</u>	<u>Offset</u>	<u>Type</u>
401+00	0' LT/RT	STOP AHEAD

ITEM 866.106**6 INCH REFLECTORIZED WHITE LINE (THERMOPLASTIC)**Lawrence Rail Trail A

<u>Station</u>	<u>Offset</u>	<u>Type</u>
13+90 to 15+03	LT	SWL
13+93 to 15+04	LT	BWL
13+98 to 15+04	RT	SWL
14+01 to 15+05	RT	SWL
15+76 to 15+96	LT	SWL
15+80 to 15+96	LT	SWL
15+88 to 15+99	RT	SWL

Water Street

<u>Station</u>	<u>Offset</u>	<u>Type</u>
110+15 to 110+50	RT	SWL
111+47 to 112+09	LT	SWL

Lawrence Rail Trail B

<u>Station</u>	<u>Offset</u>	<u>Type</u>
32+78 to 32+78	LT	SWL
32+78 to 32+78	RT	SWL
33+00 to 33+04	RT	SWL
33+06 to 33+10	LT	SWL
49+33 to 49+33	RT	SWL
49+33 to 49+33	LT	SWL
49+55 to 49+55	LT	SWL
49+55 to 49+55	RT	SWL
56+47 to 56+62	LT	SWL
56+61 to 56+62	LT	SWL

L-04-027 – Lowell Street

<u>Station</u>	<u>Offset</u>	<u>Type</u>
509+56 to 511+76	LT/RT	SWL

ITEM 866.112**12 INCH REFLECTORIZED WHITE LINE (THERMOPLASTIC)**Lawrence Rail Trail A

<u>Station</u>	<u>Offset</u>	<u>Type</u>
0+84 to 1+15	LT/RT	CW
15+03 to 15+03	LT	SL
15+05 to 15+51	LT	CW
15+17 to 15+52	LT	CW
15+17 to 15+39	LT	SL
15+34 to 15+68	RT	CW
15+36 to 15+69	RT	CW
15+49 to 15+71	RT	SL
15+51 to 15+75	LT	CW
15+64 to 15+87	LT	CW
15+80 to 15+80	LT	SL

Lawrence Rail Trail B

<u>Station</u>	<u>Offset</u>	<u>Type</u>
32+73 to 33+10	LT/RT	CW
49+31 to 49+57	LT/RT	CW
55+33 to 55+67	LT/RT	CW
57+73 to 58+26	LT/RT	CW

Railroad Street

<u>Station</u>	<u>Offset</u>	<u>Type</u>
601+08 to 601+19	LT/RT	CW

ITEM 867.106**6 INCH REFLECTORIZED YELLOW LINE (THERMOPLASTIC)**Lawrence Rail Trail A

<u>Station</u>	<u>Offset</u>	<u>Type</u>
13+96 to 15+03	LT	DBYL
15+80 to 15+96	LT	DBYL

Water / Canal Street

<u>Station</u>	<u>Offset</u>	<u>Type</u>
110+15 to 110+49	LT/RT	DBYL
111+48 to 112+10	LT/RT	DBYL

Essex Street

<u>Station</u>	<u>Offset</u>	<u>Type</u>
90+43 to 90+63	LT	DBYL
90+44 to 91+28	LT	DBYL
90+63 to 91+28	LT	DBYL
90+78 to 91+28	LT	DBYL
91+44 to 92+34	LT	DBYL
91+45 to 92+65	LT/RT	DBYL

Haverhill Street

<u>Station</u>	<u>Offset</u>	<u>Type</u>
100+63 to 101+01	LT/RT	DBYL
101+17 to 101+51	LT/RT	DBYL

L-04-027 – Lowell Street

<u>Station</u>	<u>Offset</u>	<u>Type</u>
509+56 to 511+76	LT/RT	DBYL

ITEM 874. **STREET NAME SIGN**Lawrence Rail Trail B

<u>Sign</u>	<u>Station</u>	<u>Offset</u>
MA-D3-1a	32+57	11' RT
MA-D3-1a	33+25	7' LT
MA-D3-1b	49+15	11' RT
MA-D3-1b	49+74	7' LT

L-04-027 – Lowell Street

<u>Sign</u>	<u>Station</u>	<u>Offset</u>
MA-D3-1c	40+88	0' LT/RT
MA-D3-1c	41+42	0' LT/RT

ITEM 874.2 **TRAFFIC SIGN REMOVED AND RESET**Lawrence Rail Trail A

<u>Sign</u>	<u>Station</u>	<u>Offset</u>
“KELLEY’S...”	13+00	13' RT
“CANAL STREET”	15+74	6' RT
“BROADWAY”	15+74	6' LT

Lawrence Rail Trail B

<u>Sign</u>	<u>Station</u>	<u>Offset</u>
“PARKING RESTRICTIONS”	25+33	8' LT

Essex Street & Broadway Street Intersection

<u>Sign</u>	<u>Station</u>	<u>Offset</u>
R10-12	--	--

Essex Street

<u>Sign</u>	<u>Station</u>	<u>Offset</u>
“DO NOT BLOCK...”	90+66	22' LT
“DO NOT BLOCK...”	91+82	35' RT

Railroad Street

<u>Sign</u>	<u>Station</u>	<u>Offset</u>
“SCHOOL ZONE”	601+20	19' RT

L-04-027 - Lowell Street

<u>Sign</u>	<u>Station</u>	<u>Offset</u>
“SQUARE DEDICATED TO...”	509+15	18' RT

ITEM 874.4 **TRAFFIC SIGN REMOVED AND STACKED**

Lawrence Rail Trail A

<u>Sign</u>	<u>Station</u>	<u>Offset</u>
“LEFT LANE FOR...”	14+93	3’ LT

Lawrence Rail Trail B

<u>Sign</u>	<u>Station</u>	<u>Offset</u>
“PARKING FOR...”	32+19	19’ RT
“PARKING FOR...”	32+33	16’ RT
“PARKING FOR...”	33+37	14’ RT

ITEM 874.71 **MISCELLANEOUS SIGNS 'TRAIL SIGNS AND POSTS'**

Spicket River Greenway

<u>Sign</u>	<u>Station</u>	<u>Offset</u>
Wayfinding Sign	300+22	7’ LT
Wayfinding Sign	303+03	8’ RT
Wayfinding Sign	309+41	7’ RT

Lawrence Rail Trail B

<u>Sign</u>	<u>Station</u>	<u>Offset</u>
Wayfinding Sign	88+35	8’ RT

ITEM 874.8 **WEATHERING STEEL BRIDGE RAIL SIGNAGE**

Lawrence Rail Trail A

<u>Station</u>	<u>Offset</u>
1+38 to 2+04	10’ LT
1+38 to 2+04	10’ RT

ITEM 986. **MODIFIED ROCKFILL**

Lawrence Rail Trail B

<u>Station</u>	<u>Offset</u>
73+70 to 73+80	LT

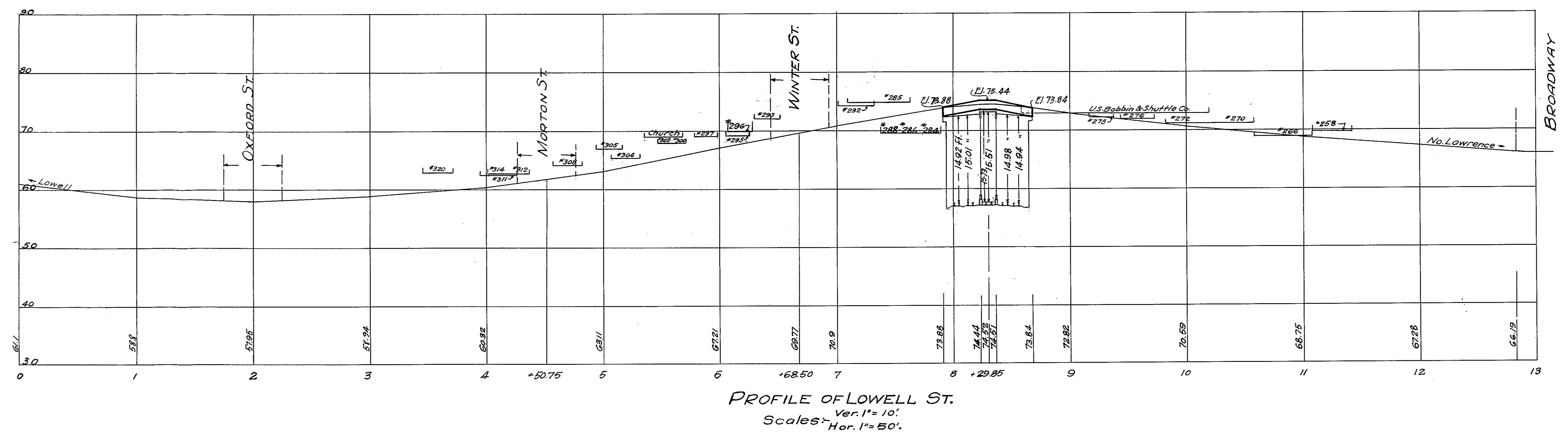
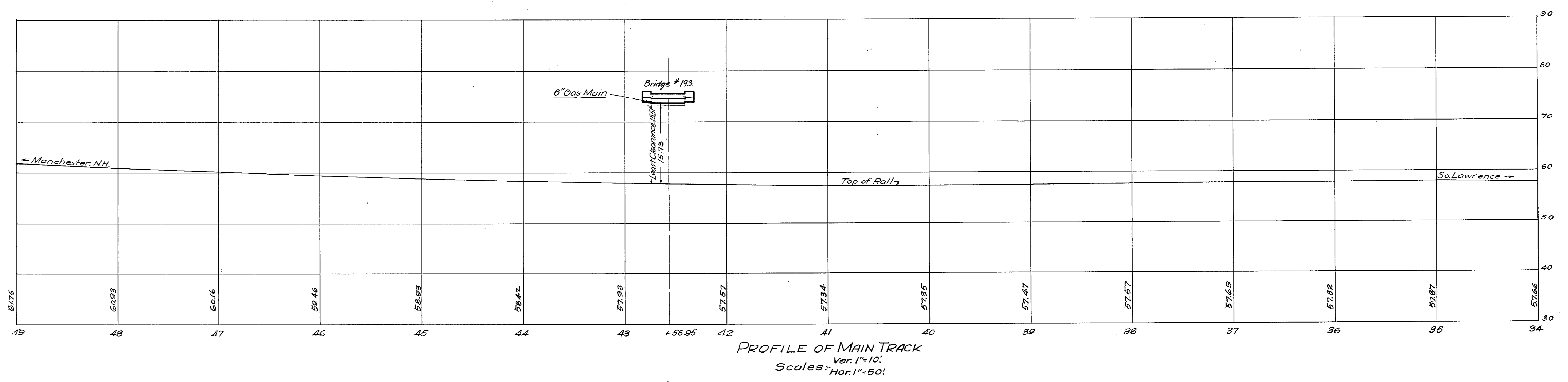
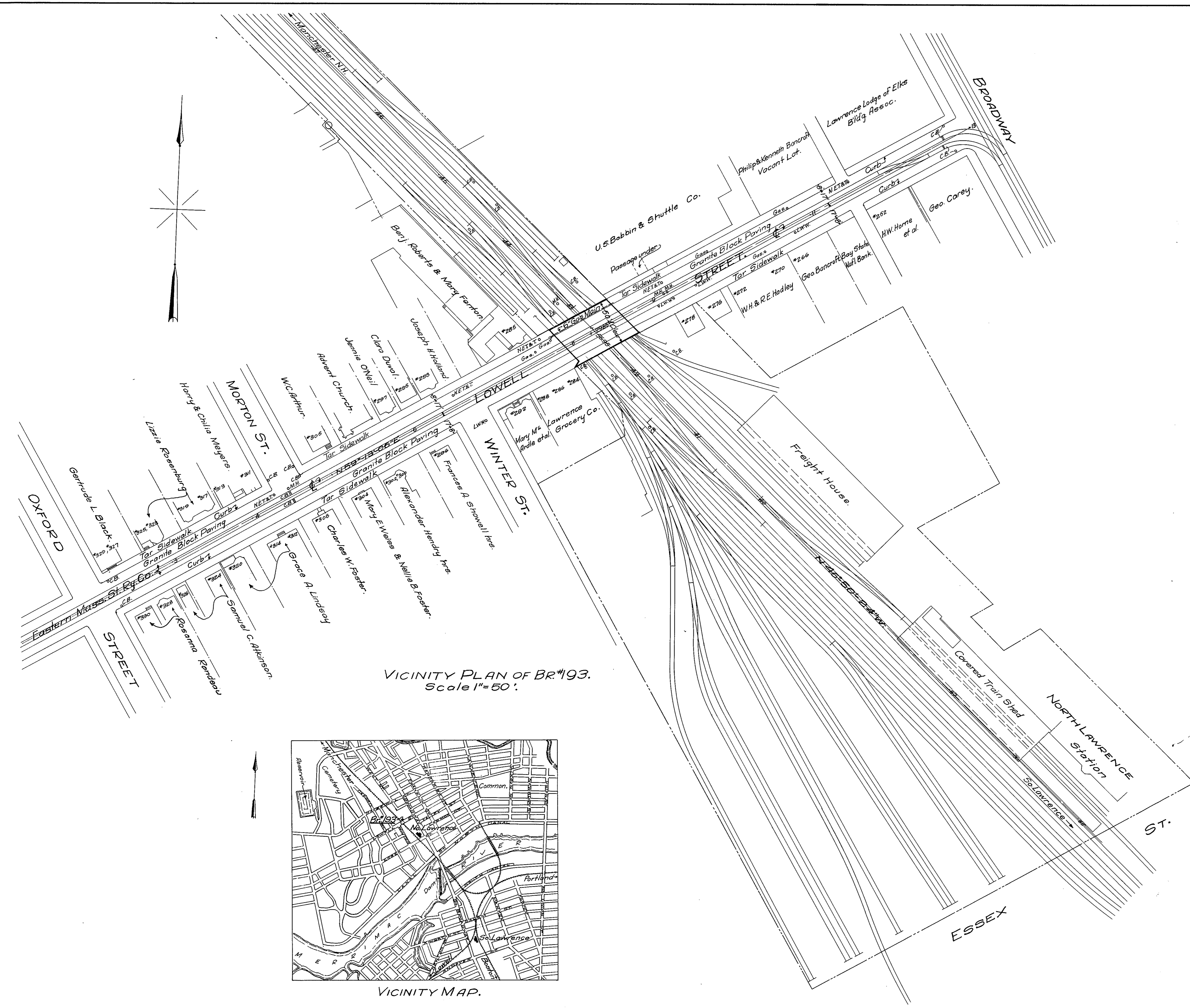
<<<<<< END OF DOCUMENT A00802 >>>>>>

DOCUMENT A00803

DRAWINGS AND SKETCHES

Existing Bridge Plans

THIS PAGE INTENTIONALLY LEFT BLANK



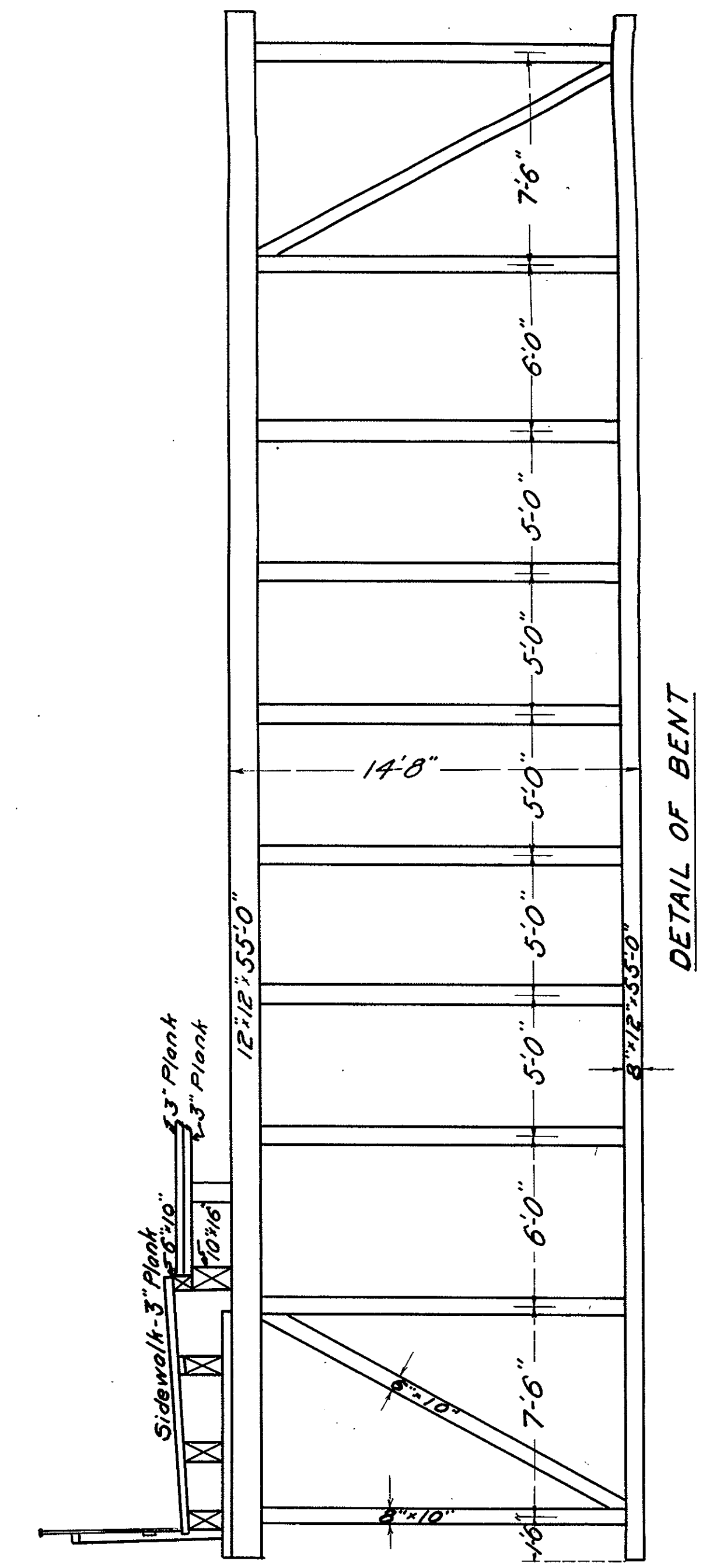
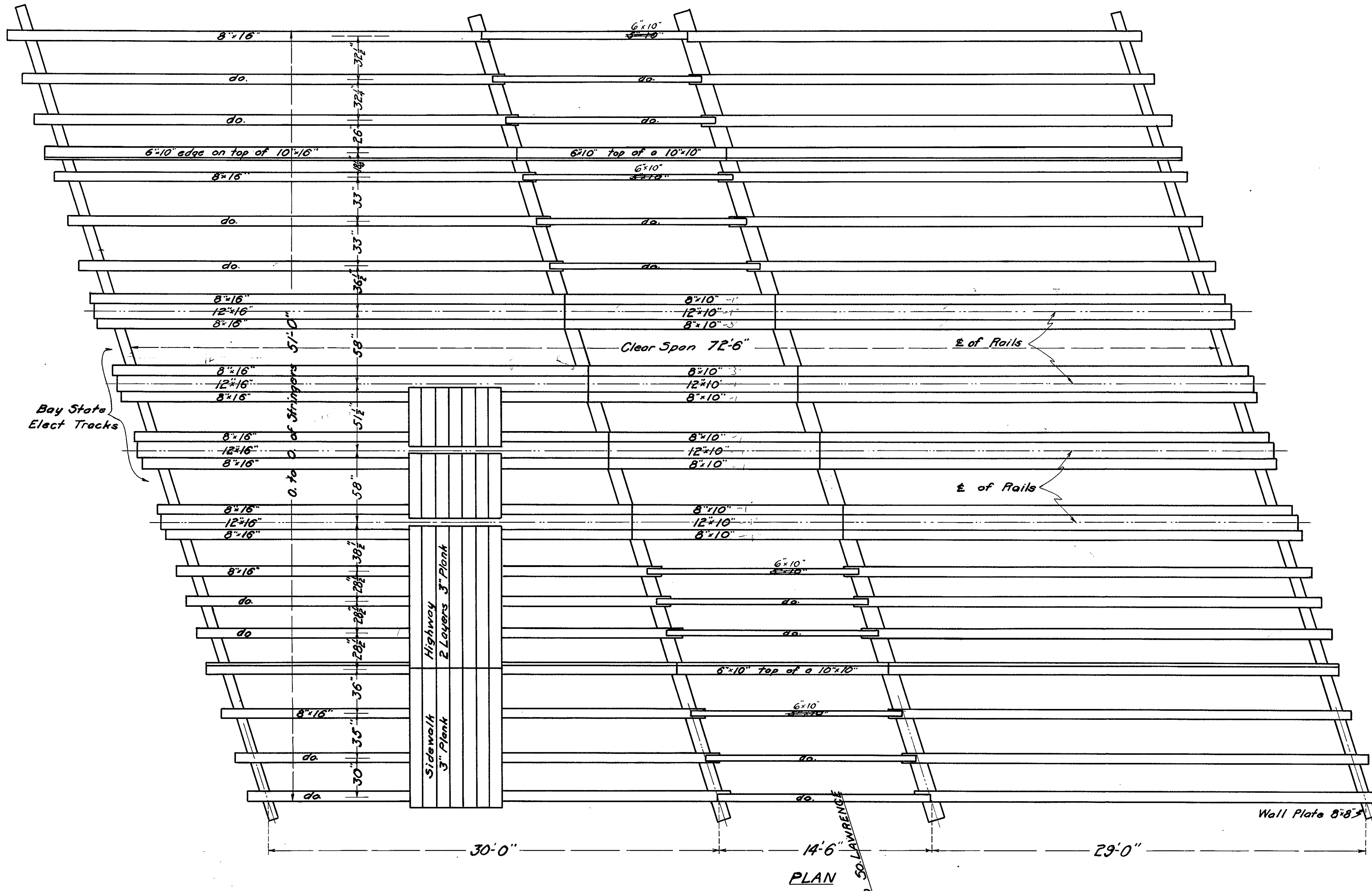
CITY OF LAWRENCE, COUNTY OF ESSEX.

County Commissioners: _____

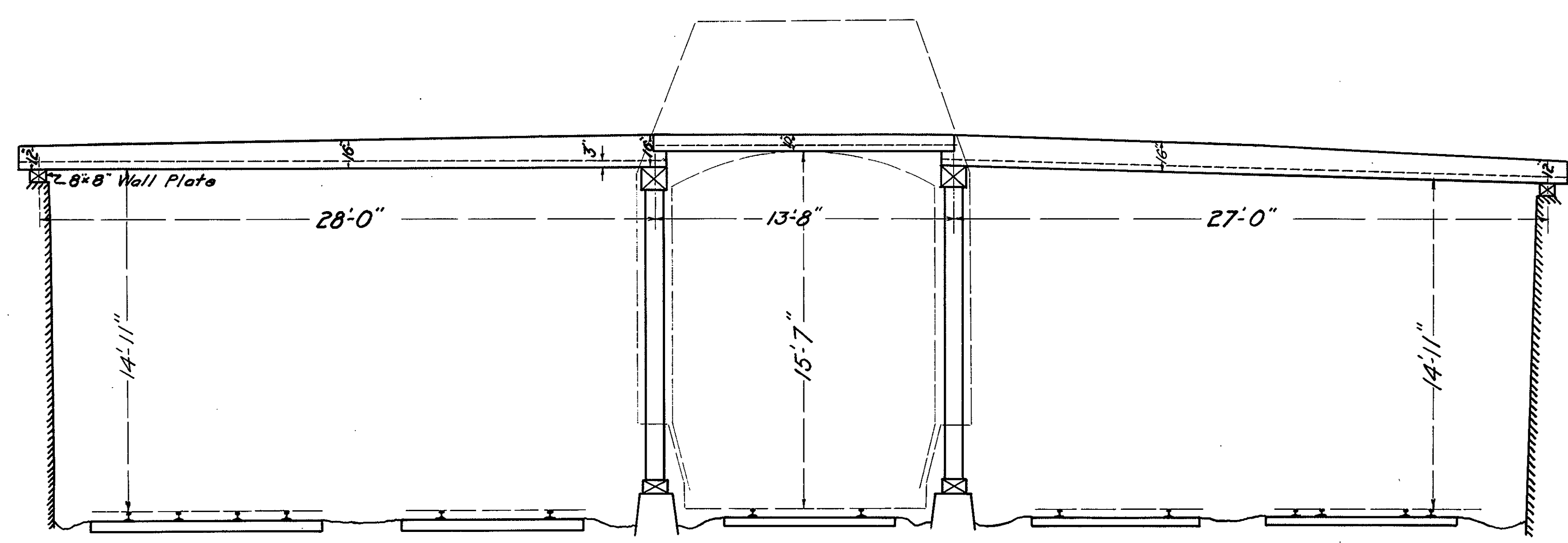
Boston and Maine Railroad
Portland Div.-Manchester & Lawrence Br.
VALUATION SECTION No. 7-A-1.
BRIDGE NO. 193
LOWELL STREET
0.1 MILE NORTH OF No. LAWRENCE STATION
LAWRENCE MASS.
Scale as shown.
From Office of Chief Engineer.

ISSUE	Drawn by	Approved
A 11-15-21	Traced by BSE	
B 12-9-21	Checked by SCM	
C 7-18-25	Checked by SCM	
	Correct: P.P.	Approved: _____ Asst. Chief Engineer

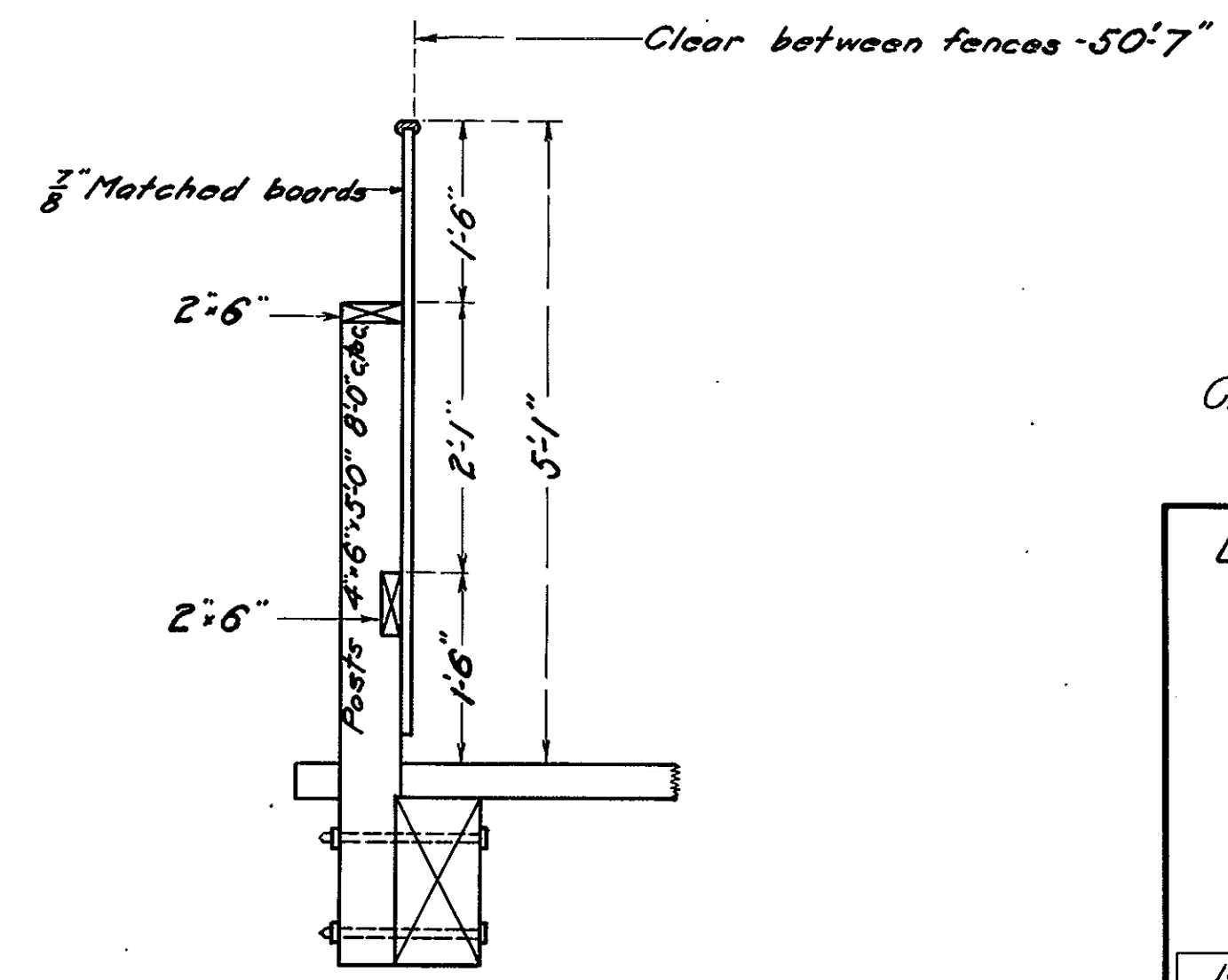
MASS. D.P.W. BRIDGE No. L-4-27



PLAN
TO 50' LAWRENCE



ELEVATION PERPENDICULAR TO BENTS



DETAIL OF FENCE
Scale 3/4" = 1'-0"

BR. No. L-4-27

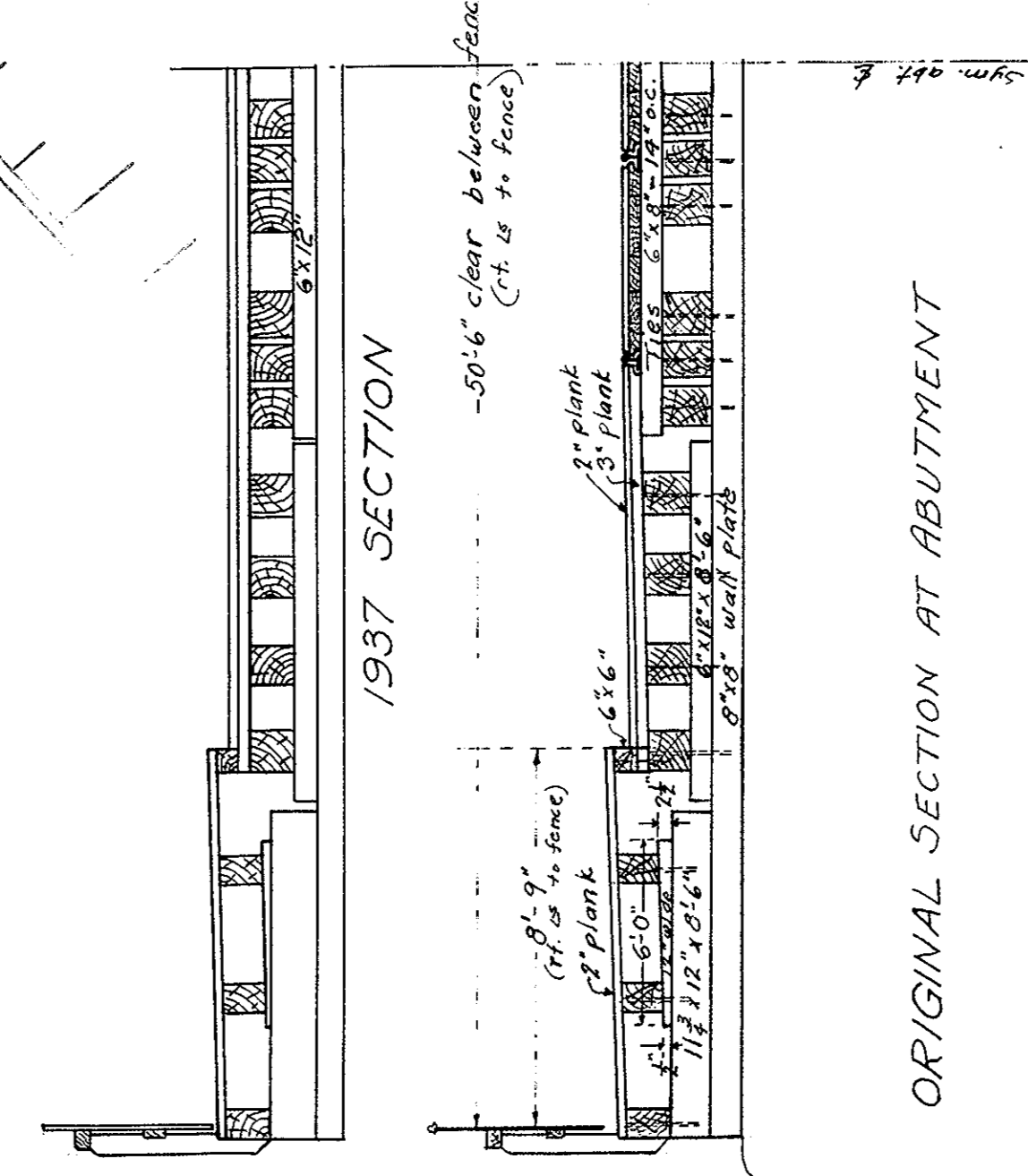
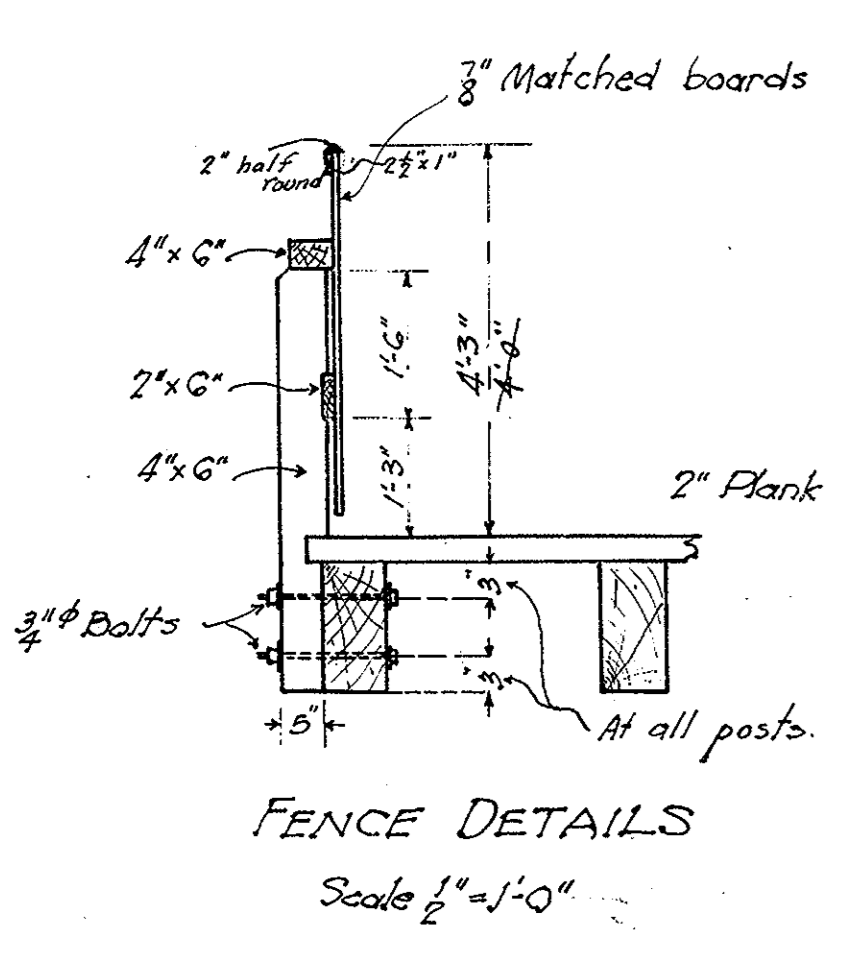
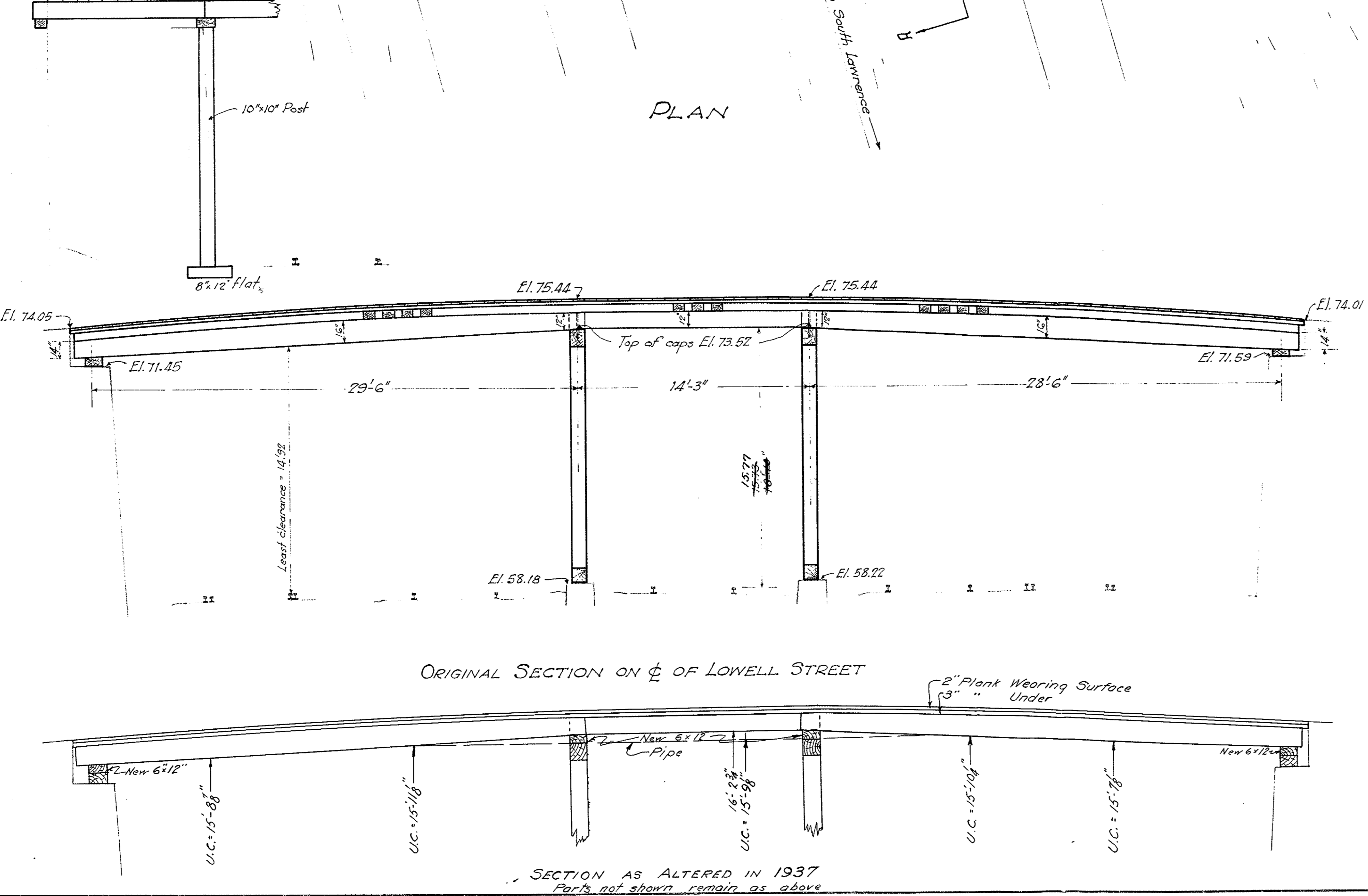
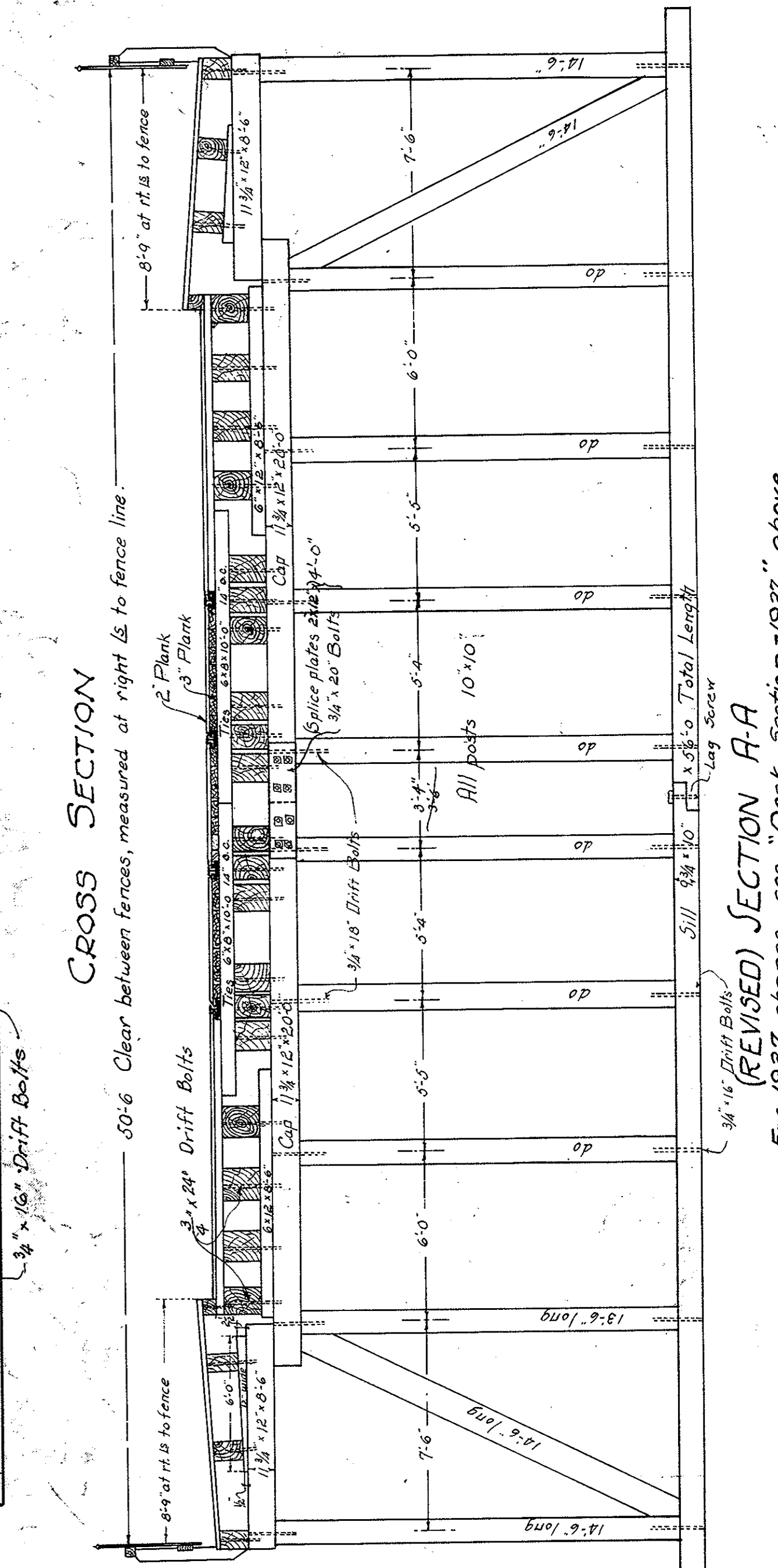
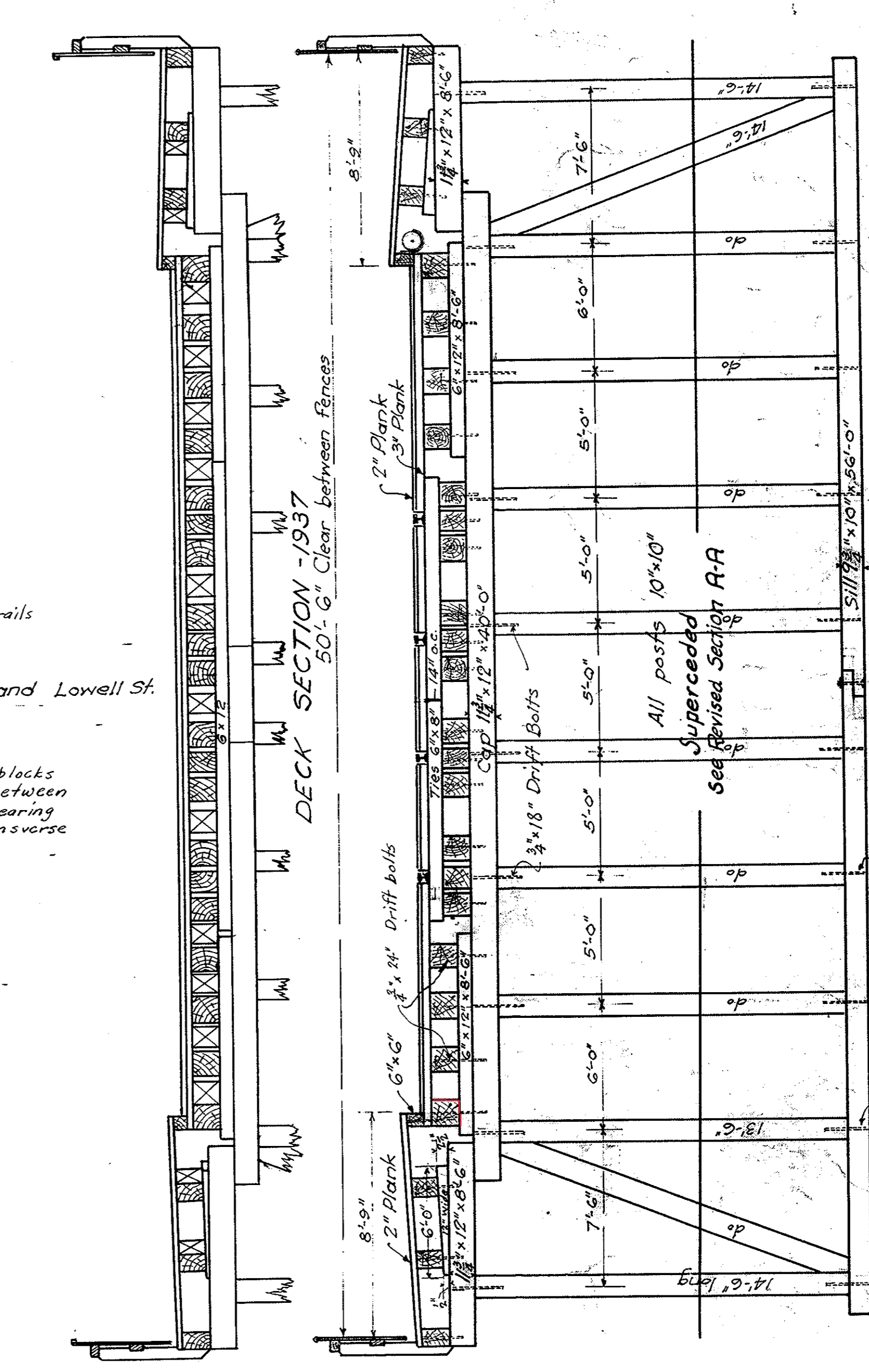
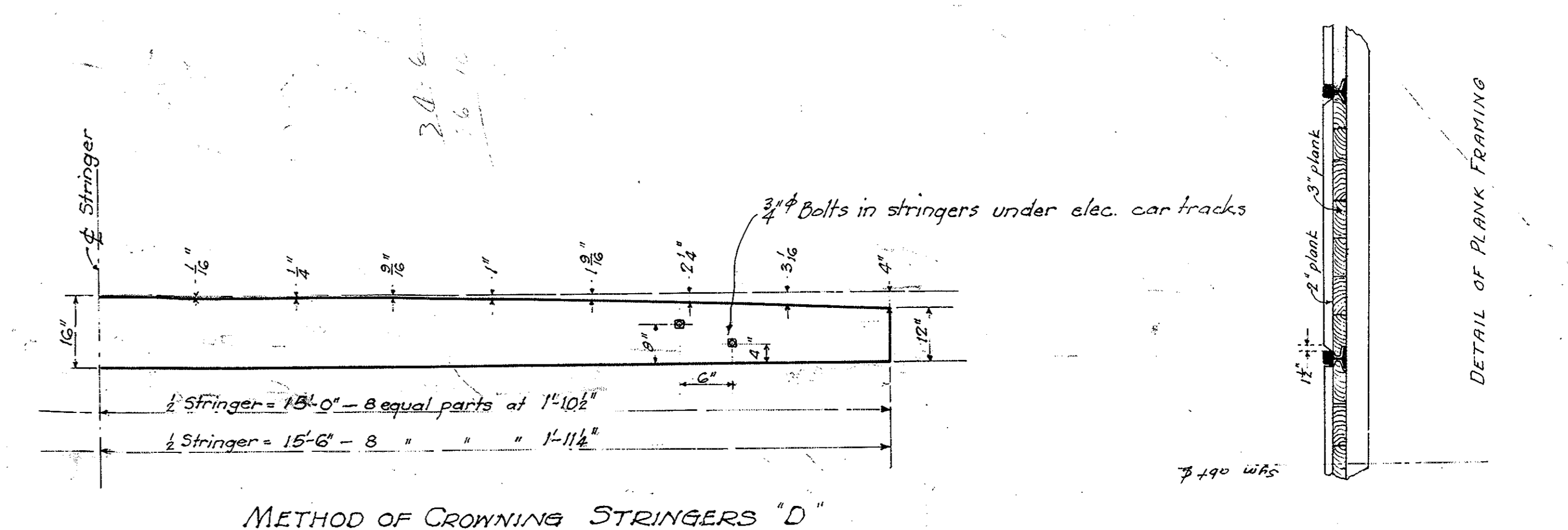
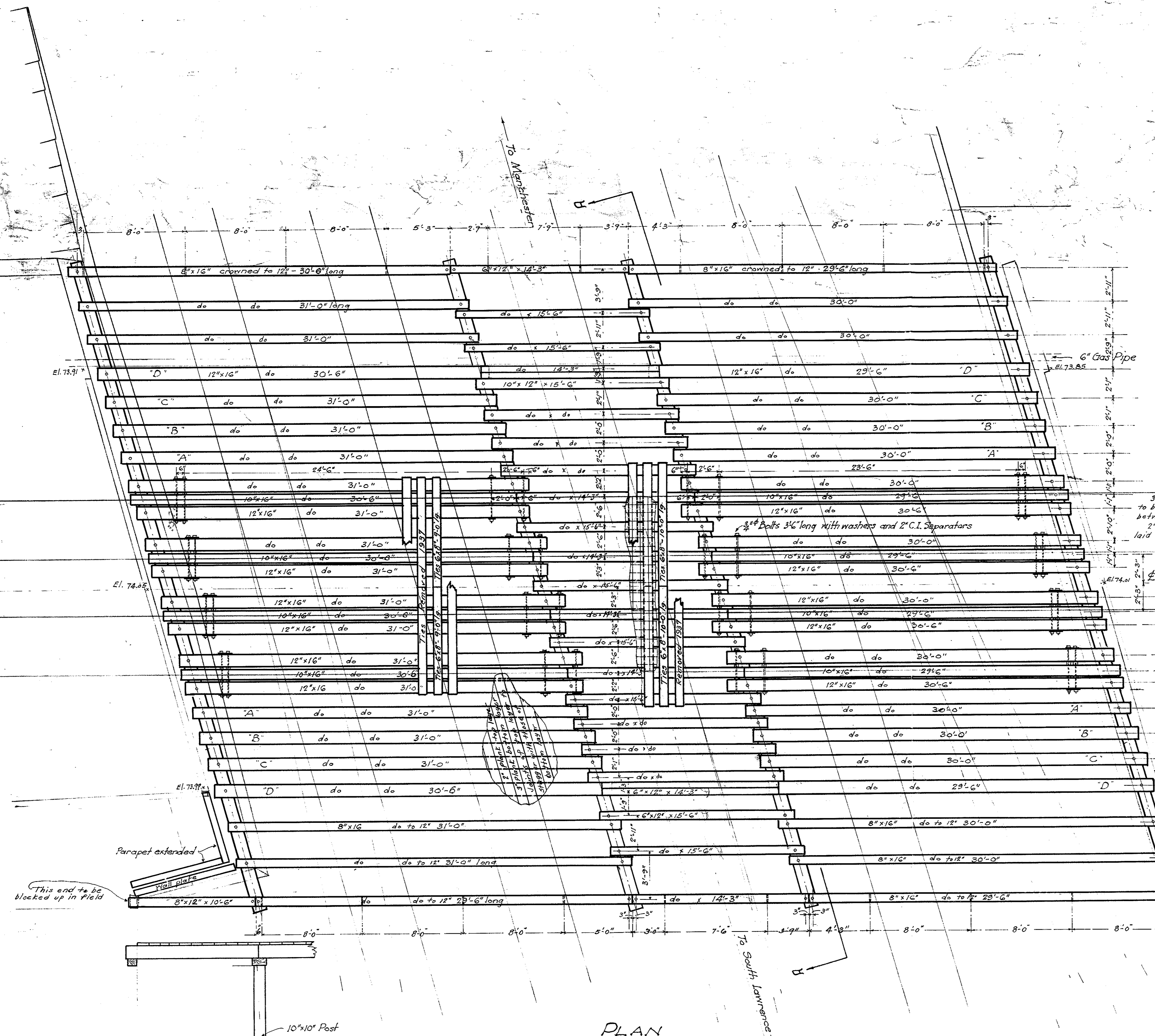
CAPACITY.
8 1/2 TON AUTO TRUCKS SIGN 1

Sheet	3
Plan	21

BOSTON AND MAINE RAILROAD
Portland Div. Manch. & Lawrence Br.
Valuation Section No. 74
BRIDGE No. 193
Lowell St. No. Lawrence, Mass.
General Plan
Drawn from field measurements
Scales 1/4" & 1/8" = 1'-0"
From Office of Chief Engineer

ISSUE
3-6-17 Drawn by C.M.H.
4-20-21 Traced by E.E.A. Approved—
Checked by _____
Correct _____ Chief Engineer

Earlier Issues Obsolete Sheet No. 1 of 1 Sheet



GENERAL NOTES
 Old work shown by light lines
 New work shown by heavy lines
 All timber, except 2\"/>

PLAN FOR REBUILDING

Boston & Maine Railroad
 Portland Div. (West) Manchester & Lawrence Branch
 Valuation Section # 74-1
BRIDGE No 193
 1/2 Mile North of North Lawrence at
LOWELL ST.

Scale 1/4\"/>

BR. No. L-4-27

SOUND CAPACITY:
 As Designed 20 TON TRUCK
 1939 RATING - H 17.5

ISSUE 1
 A 7-18-26 Drawn by [Signature]
 B 7-17-26 Traced - H.S.
 C 6-2-26 Checked - [Signature]
 D 11-18-29 Corrected - [Signature]

Approved: [Signature] Chief Engineer
 Approved: [Signature] Chief Engineer

Sheet #1 of 1 Sheet

Issue B 3-17-28
 Issue of proposal
 at Lowell Street
 revised 2
 Steel #2 added

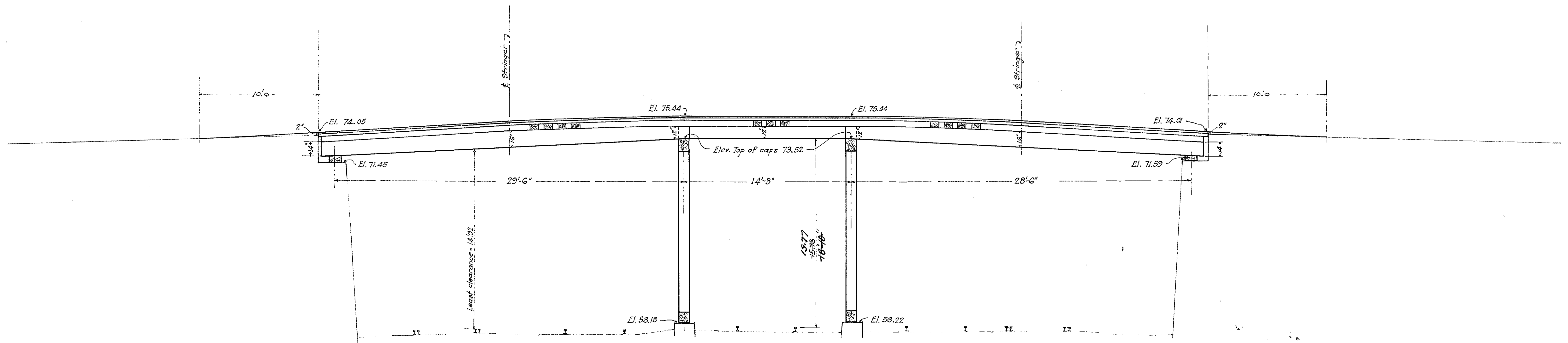
Issue C 4-1-28
 Section 11/20/28
 detail added
 Dimensions
 changed

Issue D 1-23-28
 Section 11/20/28
 detail added
 Dimensions
 changed

Issue E 1-23-28
 Section 11/20/28
 detail added
 Dimensions
 changed

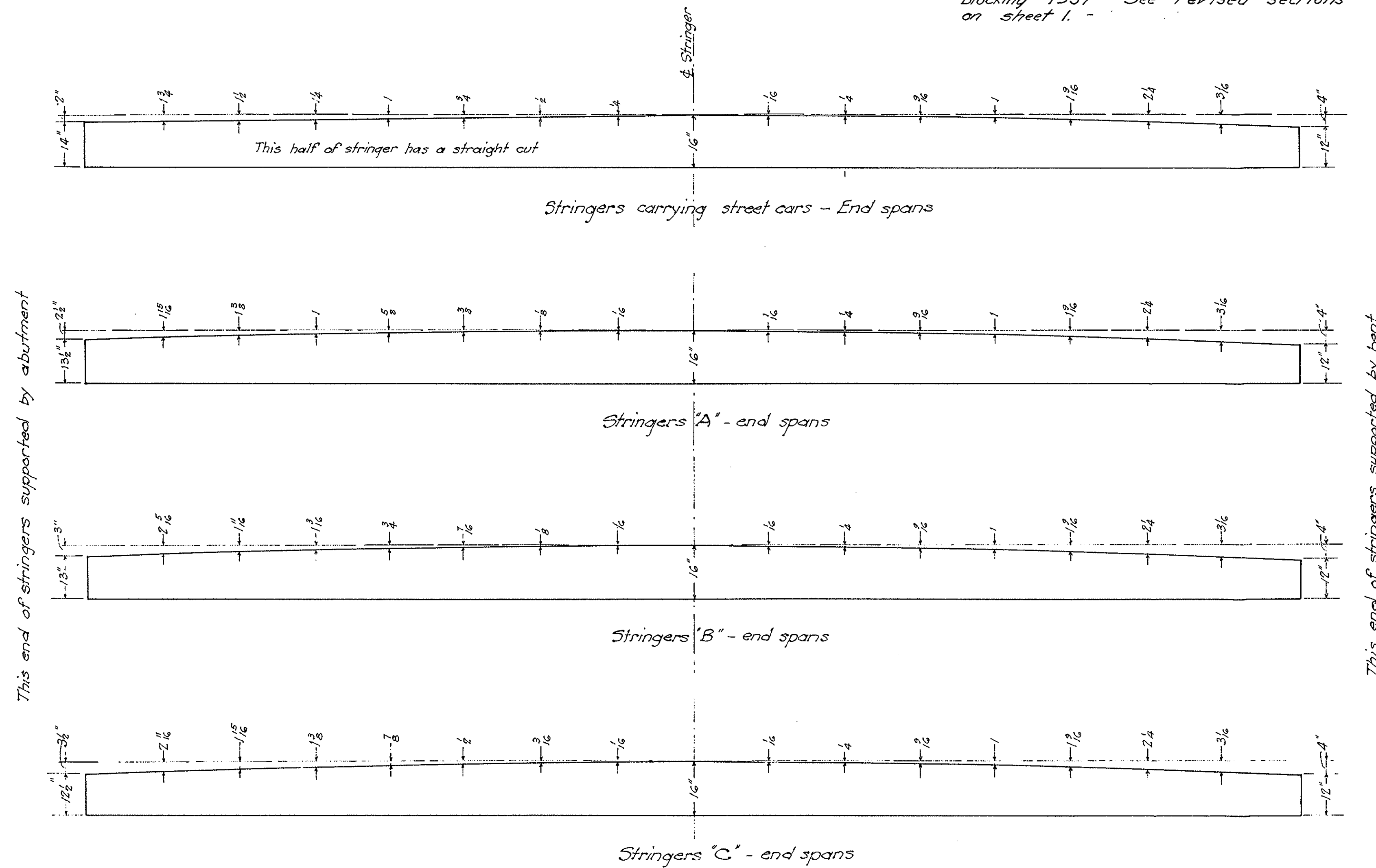
Issue F 1-23-28
 Section 11/20/28
 detail added
 Dimensions
 changed

Issue G 1-23-28
 Section 11/20/28
 detail added
 Dimensions
 changed



SECTION ON CL OF LOWELL STREET
Scale: 1/4"=1'-0"

Ties removed and stringers raised on blocking 1937 - See revised sections on sheet 1.



Note: Each half of stringer divided into 8 equal parts and cut as shown.

GENERAL NOTES
Old work shown by light lines.
New " " " heavy " "

Date: 13-3
Scale: 1/4"=1'-0"
Sheet: 1-35

PLAN SHOWING FRAMING OF STRINGERS IN END SPANS

Boston & Maine Railroad
Portland Div. (West) Manchester & Lawrence Branch
Valuation Section # 74.1
BRIDGE No 193
1/2 Mile North of North Lawrence at
LOWELL ST.

Scale: 1/4"=1'-0" A.F.E. No.
From Office of Chief Engineer Boston, Mass.

13.521E	Drawn by	Approved:
A 9-17-28	Traced - H.B.	Engineer of Structures
B 11-11-28	Checked	Assistant Chief Engineer
C 11-18-29	Checked	
D 3-27-39	Correct Off.	

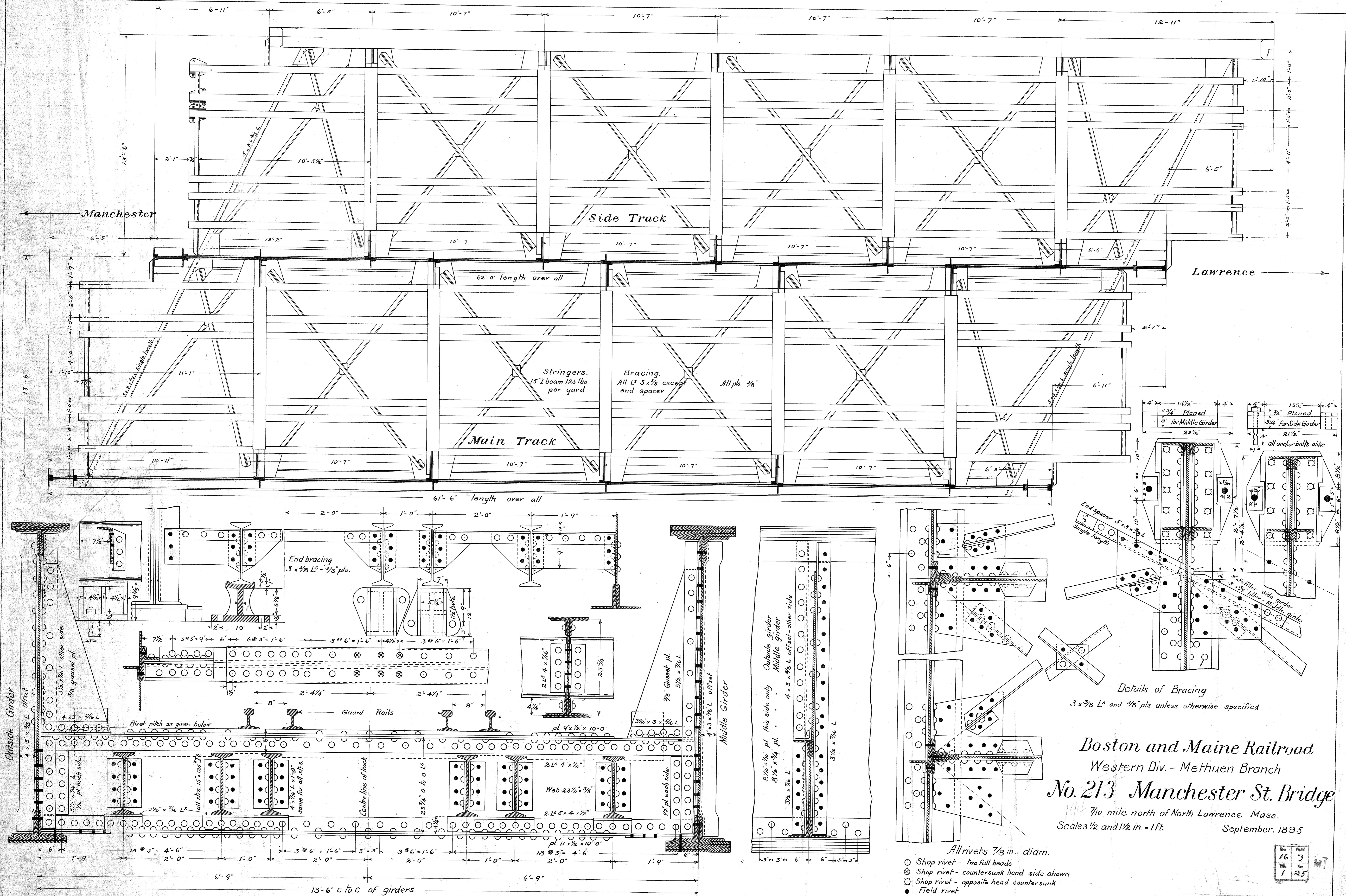
Earlier issues obsolete

Sheet #2 of 2 Sheets

BR. No. L-4-27

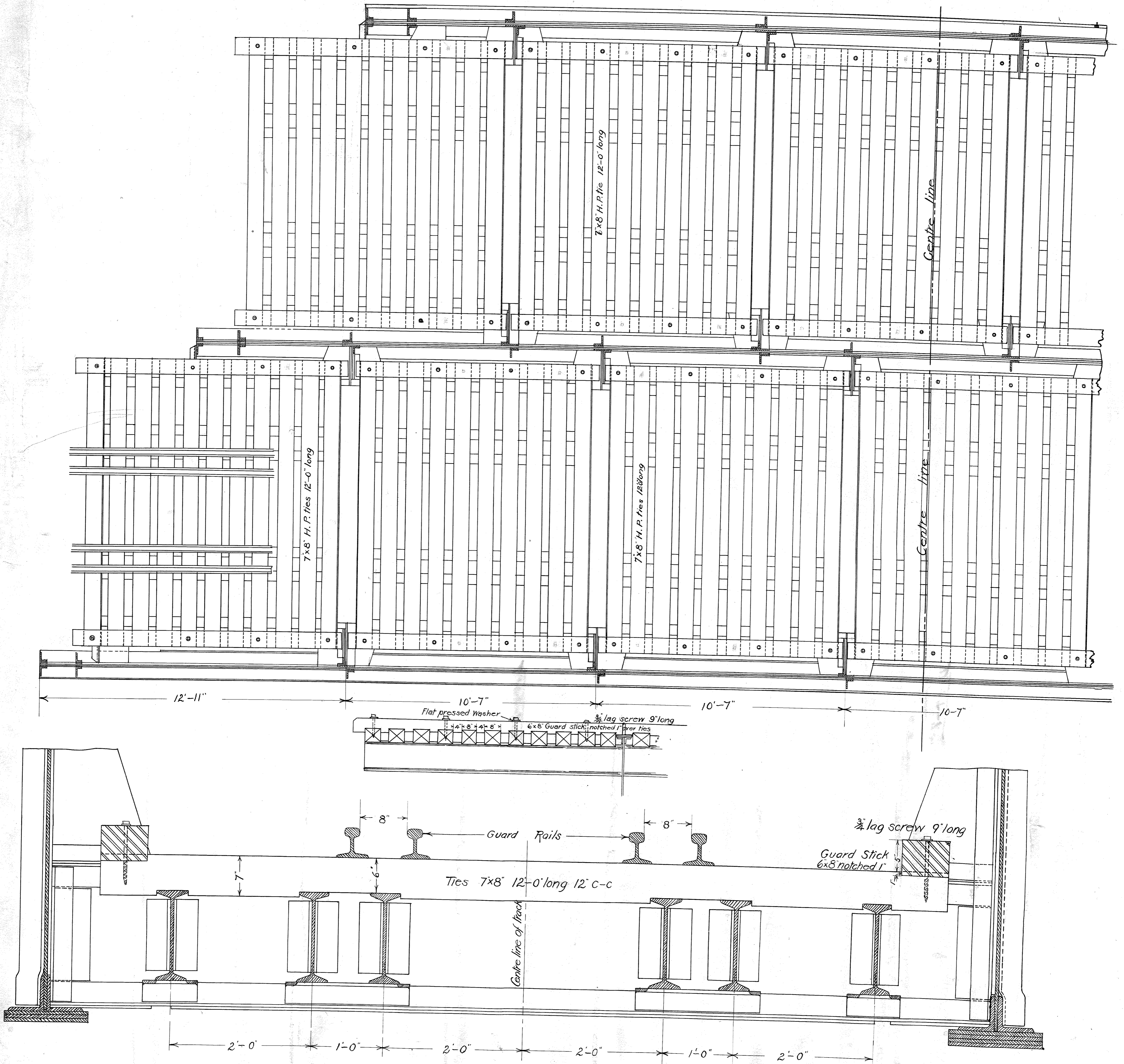
Issue B
Dimension of
Issue C
Underlea
changed
Issue D
1937 Che

DRAWING



Boston and Maine Railroad
 Western Div. - Methuen Branch
No. 213 Manchester St. Bridge
 7/10 mile north of North Lawrence, Mass.
 Scales 1/2" and 1 1/2" = 1 ft
 September, 1895

Scale	Sheet
16	3
100	1
1	25



Boston and Maine Railroad

Western Div. - Methuen Branch

No. 213 Manchester St. Bridge

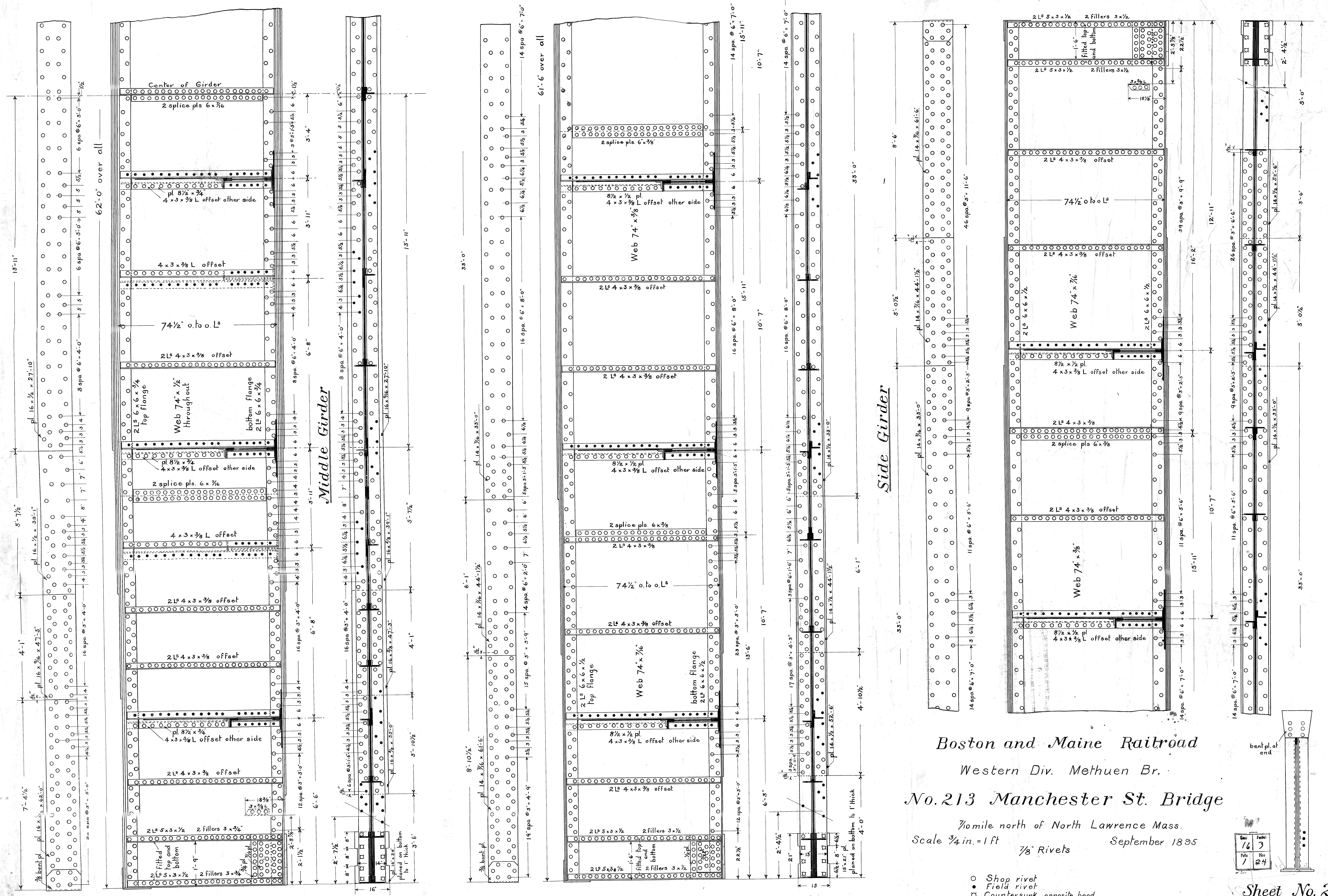
1/4 7/10 mile north of North Lawrence Mass.

Scales 1/2 and 1 1/2 in. = 1 ft.

September, 1895

Tie Plan

Sheet	16	Packet	3
File	1	Plan	22

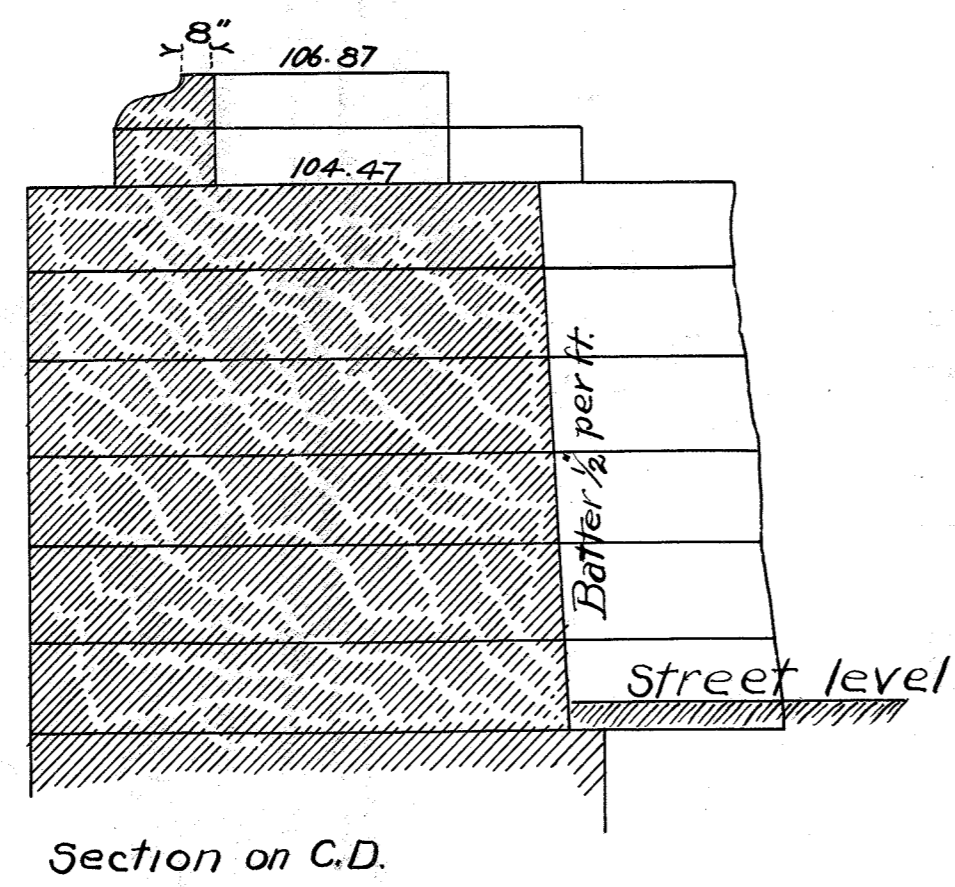
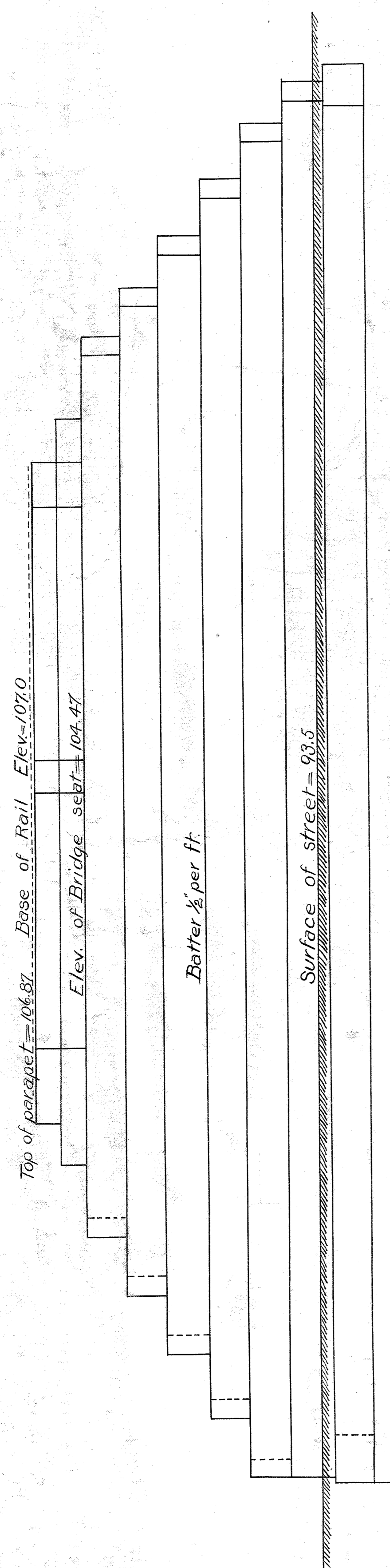


Boston and Maine Railroad
 Western Div. Methuen Br.
 No. 213 Manchester St. Bridge
 7/10 mile north of North Lawrence Mass.
 Scale 3/4 in. = 1 ft
 7/8 Rivets
 September 1895

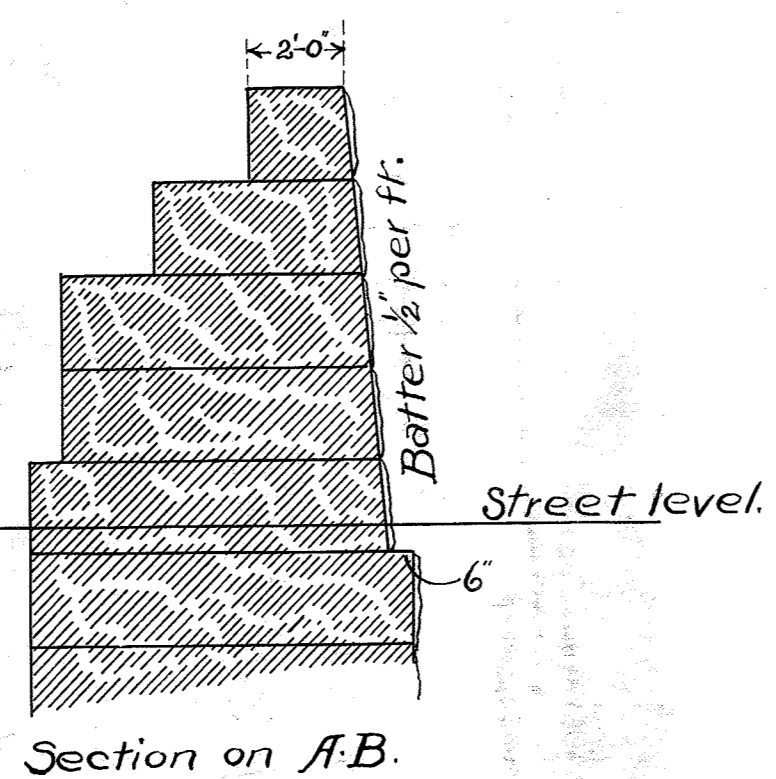
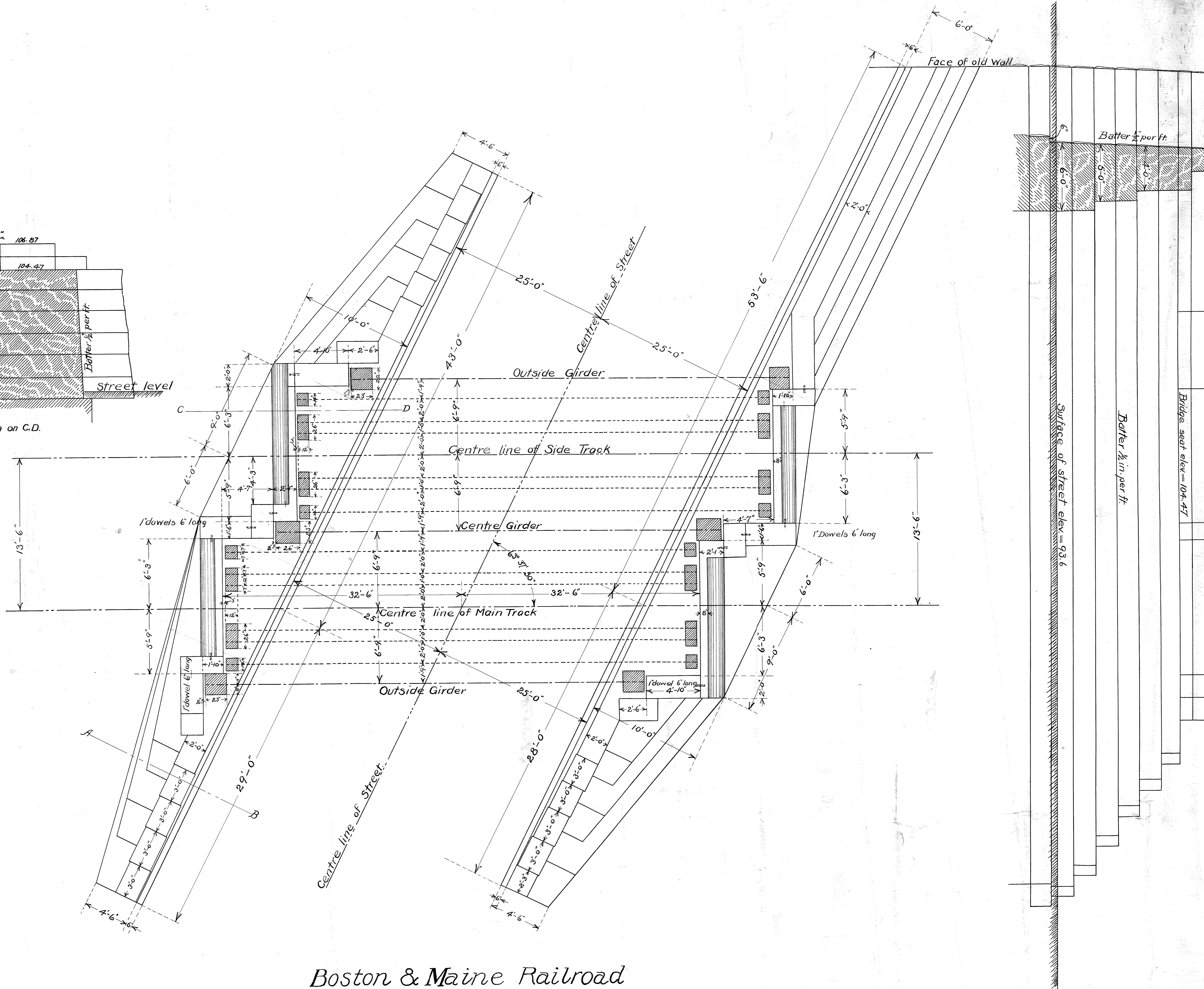
Scale	16	3
File	1	24

- Shop rivet
- Field rivet
- ◻ Countersunk opposite head

Sheet No. 2



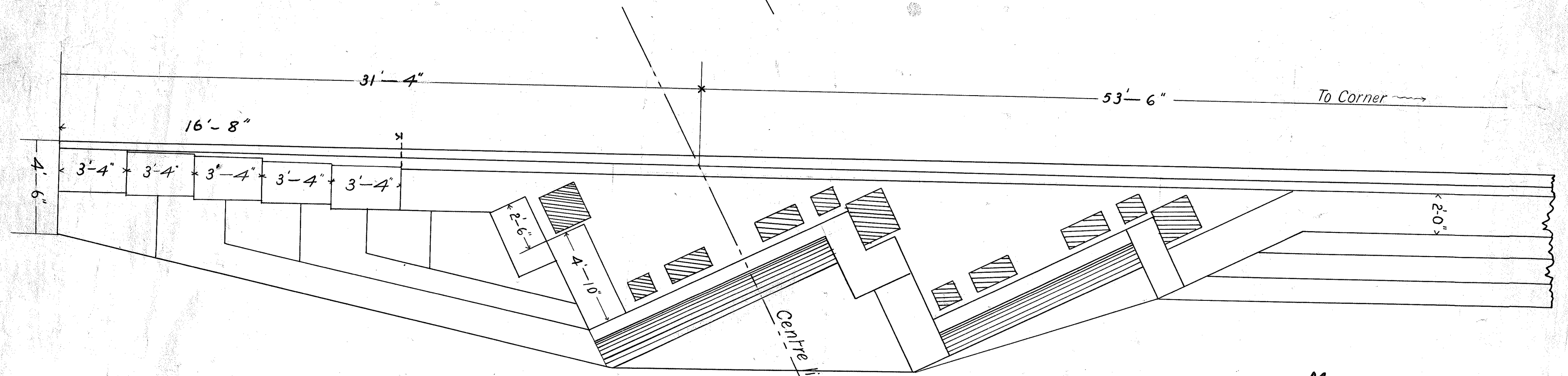
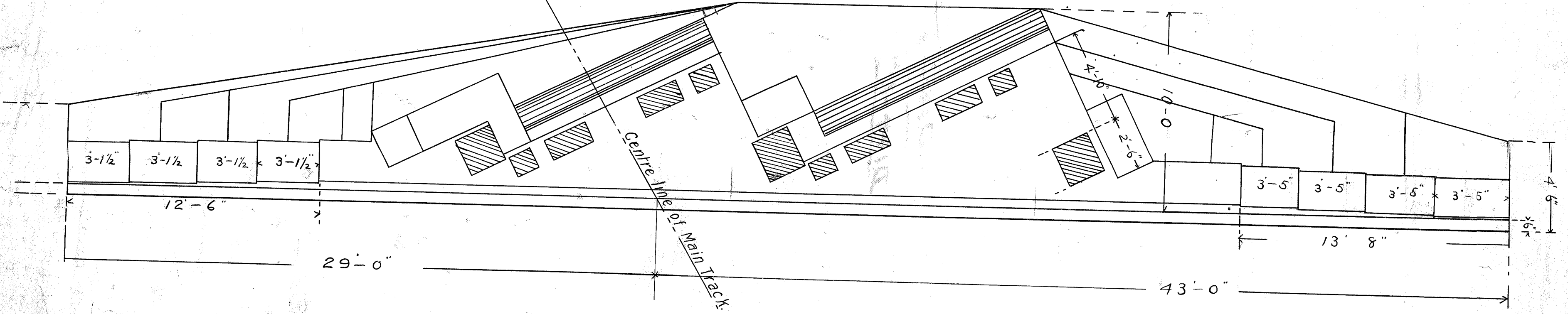
Manchester ←



Boston & Maine Railroad
 Western Div. - Methuen Branch
No. 213 Manchester St. Bridge.

3/4 mile North of North Lawrence Mass.
 Scale 1/4 in. = 1 ft. September 1895.

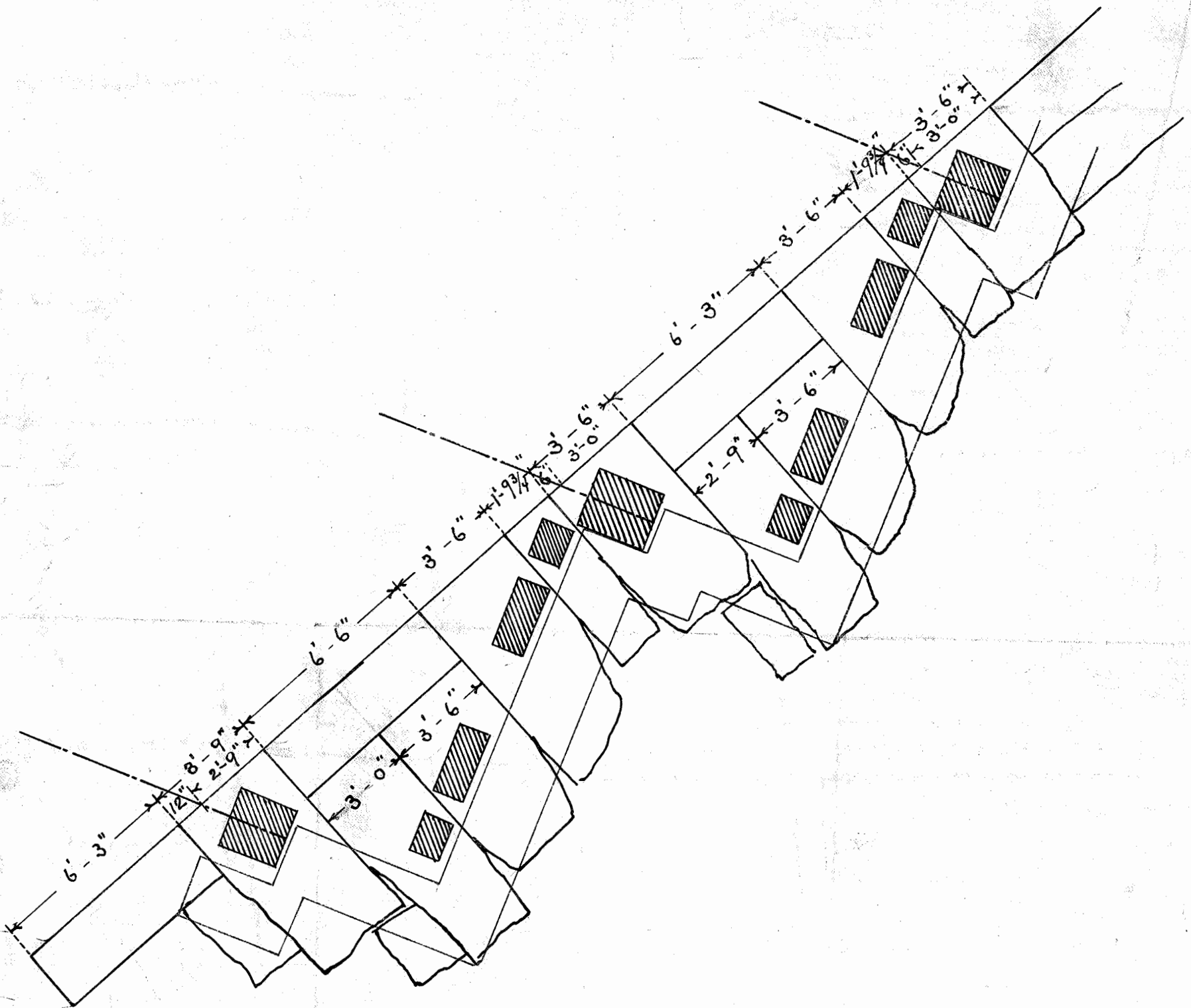
Note: - Hatched surfaces indicate bearings of iron work and must be full.
 No joint in bridge seat course under bearings
 Cut bearings 3" larger all around than shown.



South Abutment.

	M
16	3
1	21

Manchester St. Bridge,
 Lawrence.
 New Plan, showing changes
 in steps and backing on ends
 of abutments.
 February, 1896.



Manchester St. Bridge
Lawerence Mass.
Detail of Bridge Seat Course
Scale $\frac{1}{4}$ in. = 1 ft. Jan. '96
Gross dimensions, no allowance for joints.

1	16	Sheet	1
20	9	Plan	1

DOCUMENT A00806

RAILROAD SPECIAL PROVISIONS

THIS PAGE INTENTIONALLY LEFT BLANK



**MASSACHUSETTS
BAY
TRANSPORTATION
AUTHORITY**

RAILROAD OPERATIONS DIRECTORATE

The attached Specifications are required for any construction and/or related activities on, over, under, within or adjacent to railroad property owned or controlled by the Massachusetts Bay Transportation Authority. They are intended to provide general guidelines and safeguards. Attachment "A" of Construction Guidelines and Procedures contains a summary of MBTA Railroad Operations Specifications which may be required. It is the responsibility of the Contractor to obtain all the necessary specifications for each project.

AUGUST 2014



**MASSACHUSETTS BAY
TRANSPORTATION
AUTHORITY**

RAILROAD OPERATIONS DIRECTORATE



GUIDELINES AND PROCEDURES
FOR CONSTRUCTION ON
MBTA RAILROAD PROPERTY

AUGUST 2014

SECTION 1. SCOPE

- 1.01 These specifications provide general safeguards to railroad property owned or controlled by the Massachusetts Bay Transportation Authority and to railroad operations upon that property during the performance of construction and/or related activities on, over, under, within or adjacent to the railroad property. They are intended as guidelines and do not represent all legal requirements which are or may be associated with construction and/or related activities. The MBTA reserves the right to require additional information and clarification and to make unilateral changes to these specifications at any time, at its sole discretion.

SECTION 2. DEFINITIONS

MBTA

Massachusetts Bay Transportation Authority; Massachusetts Realty Group, Designated Representative of MBTA Real Estate

RAILROAD COMPANY

The particular reference for the purpose of these specifications is the railroad company which maintains and/or operates or has trackage rights on the subject MBTA Railroad Property, including, but not limited to:

- Massachusetts Bay Transportation Authority (MBTA)
- Keolis Commuter Services
- Providence and Worcester Railroad (PW)
- National Railroad Passenger Corporation ("Amtrak")
- CSX Transportation ("CSX")
- Pan Am Railways (PAR) and subsidiaries The Boston and Maine Corporation (BM), The Springfield Terminal Railway Company (ST), its affiliates, successors and assigns
- Bay Colony Railroad Corporation (BLCR)

MBTA RAILROAD PROPERTY

All railroad rights of way and adjacent owned and/or controlled by the MBTA.

OWNER

The individual, utility, government, or corporation having title to the structure to be constructed upon, over or adjacent to the railroad property owned or controlled by the MBTA.

UTILITY

Public or private communication, water, sewer, electric, gas and petroleum companies or other entity governed by the Massachusetts Department of Public Utilities.

GOVERNMENT

Federal, State, Town, City, County and other forms of government.

CORPORATION

Any firm duly incorporated under laws of a state government.

INDIVIDUAL

Any party not defined by "Owner, Utility, Government or Corporation".

CONTRACTOR

The individual, partnership, firm, corporation or any combination thereof, or joint venture, contracting with a Utility, Government, Firm, Company, Corporation or Individual for work to be done on, over, under, within or adjacent to MBTA Railroad Property.

OWNER OR ITS CONTRACTOR

As used in these specifications, does not affect the responsibilities of either party for work conducted on, over, under, within or adjacent to MBTA Railroad Property.

CONSTRUCTION DRAWINGS

Original drawings, submitted to the Engineer by the Contractor pursuant to the Work, including, but not limited to: stress sheets, working drawings, diagrams, illustrations, schedules, performance charts, brochures, erection plans, falsework plans, framework plans, cofferdam plans, bending diagrams for reinforcing steel, or other supplementary plans or similar data which are prepared by the Contractor or a Subcontractor, manufacturer, supplier or distributor, and which the Contractor is required to submit for review and approval by the MBTA. Working Drawings: Contractor prepared plans for temporary

structures and facilities. Working Drawings for elements of work which may affect safety of persons or property included but are not limited to Contractor's plans for temporary structures such as decking, temporary bulkheads, support of utilities, and for such other work as may be required for construction but which do not become an integral part of completed project.

SECTION 3. SUBMITTALS

3.01 INITIAL CONTACT

- A. The MBTA owns the majority of the railroad lines in eastern Massachusetts. Many of these railroad lines are operated for passenger service, using a Railroad Company as an operating and maintaining Contractor. Some of the railroad lines are used for freight-only service, operated and maintained by other Railroad Company(s). In most instances, both passenger and freight service are operated over the same railroad lines.
- B. All of the MBTA railroad lines are maintained by a designated Railroad Company(s), excepting rapid transit and light rail lines. The maintaining Railroad Company(s) has rights and responsibilities, in addition to the MBTA's property owner's rights.
- C. To obtain further information concerning License Agreements, Easements, Licenses for Entry and performance of construction related activities which affect MBTA Railroad Property, a written request may be forwarded to:

License Administrator
Massachusetts Realty Group
20 Park Plaza, Suite 1120
Boston, MA 02116

or you may access the website at www.mbtarealty.com

The License Administrator is also the contact person for information concerning rapid transit and light rail lines.

SECTION 4. PLANS AND SPECIFICATIONS

- 4.01 SCOPE: It is the intent of the MBTA to eliminate or minimize any risk involved with construction or related activities on, over, under, within or adjacent to MBTA Railroad Property. Therefore, MBTA approval and

frequently one or more Railroad Company(s) approval of construction plans and specifications for all phases of a proposed project affecting MBTA Railroad Property is required.

- 4.02 GENERAL: If requested by the License Administrator, the applicant must provide six (6) sets of plans and specifications to the License Administrator. These plans and specifications must meet the approval of the Railroad Company(s) and the MBTA prior to the start of construction. These plans are to be prepared in sizes as small as possible (no smaller than 11" x 17") and are to be folded to an 8-1/2 inch by 11 inch size (folded dimensions) with a 1-1/2 inch margin on the left side and a 1 inch margin on the top.
- A. After folding, the title block and other identification of the plans shall be visible at the lower right corner, without the necessity of unfolding. Each plan shall bear an individually identifying number and an original date, together with subsequent revision dates, clearly identified on the plan.
 - B. All plans are to be individually folded or rolled and where more than one plan is involved, they shall be assembled into complete sets before submission to the MBTA.
- 4.03 PLANS: The plans are to show all the work which may affect MBTA Railroad Property, and contain a location map and plan view of the project, with appropriate cross sections and sufficient details. The proposed construction or related activities must be (orated with respect to top of rail (vertical) and center line of track (horizontal). The plan must also include railroad stationing, property lines and subsurface soil conditions. The subsurface information is to be in the form of boring logs with the borings located on the plan view. The plans must be stamped by a Professional Engineer registered in the state of Massachusetts. (The purchase of railroad valuation plans may be arranged by contacting MBTA Engineering offices at (617) 222-6178).
- 4.04 SPECIFICATIONS: The specifications summarized on Attachment "A" attached hereto are the Standard Specifications of the MBTA Railroad Operations Department and apply to all types of construction work affecting MBTA Railroad Property.
- A. In addition to "Maintenance and Protection of Railroad Traffic" and "Insurance Specifications" which are required for all work on, over, under, within or adjacent to MBTA Railroad Property, certain other Specifications contained in Attachment "A" shall be incorporated into construction/engineering submittals when deemed necessary by the MBTA and/or Railroad Company(s). (The purchase

of additional specifications may be arranged by contacting MBTA offices at (617) 222-3448 or visiting Massachusetts Realty Group website at www.mbtarealty.com.

SECTION 5. SUBMISSION REVIEW

- 5.01 An initial submission of six (6) sets of plans and specifications for MBTA review must be forwarded to the License Administrator, along with a completed MBTA Application for Entry (Attachment "B"). The submission will be circulated for review and comment to MBTA departments which may be impacted by the proposed project. If approved by the MBTA, the Railroad Company(s) will review.
- 5.02 The applicant is advised that the MBTA's initial review process requires a minimum forty-five (45) day period, prior to the Railroad Company(s) involvement, and additional processing time may be required for specific documents (See Section 9).

SECTION 6. INSPECTIONS/PAYMENTS

- 6.01 The MBTA may inspect all projects affecting MBTA Railroad Property at least twice, at the applicant's sole expense. The actual number of MBTA inspections will depend on the size and complexity of the project.
- 6.02 The MBTA may utilize Railroad Company inspectors and flagmen for daily inspection and protection of rail traffic during the term of the construction period or related activities. The Owner or Contractor will be responsible for advance payment of all associated fees.
- 6.03 Advance payments to the MBTA for construction/engineering review of plans and specifications by MBTA staff must be submitted when initial contact is made with the License Administrator. Payments shall be in the form of check or money order, made payable to the Massachusetts Bay Transportation Authority.
- 6.04 Advance payments covering the services for Railroad Company(s) construction/engineering review of plans and specifications, or services of an inspector or flagman, will be paid directly to the Railroad Company(s). The MBTA will advise when such services are required, and the Railroad Company(s) will advise of the amount of the required advance payment.

SECTION 7. EXAMINATION OF PLANS OR PROPERTY

- 7.01 The Contractor/Applicant shall have no claim for any differences between MBTA valuation plans and the actual conditions encountered in the field.

SECTION 8. INSURANCE AND INDEMNIFICATION

- 8.01 Prior to entry upon MBTA Railroad Property, insurance will be provided to and approved by the MBTA and affected Railroad Company(s), as outlined in "Insurance Specifications."
- 8.02 Additionally, all MBTA Licenses and Letters of Authorization contain a clause for Indemnifying MBTA and the Railroad Company(s) from and against any and all liabilities, losses, damages, costs, expenses, causes of action, suits, claims, demands and/or judgments of any nature whatsoever that may be imposed upon or incurred by or asserted against the MBTA or the Railroad Company(s).

SECTION 9. LEGAL DOCUMENTS FOR TEMPORARY AND PERMANENT INSTALLATIONS

- 9.01 The nature of entry upon or installation within MBTA Railroad Property will determine the authorizing document to be issued. Listed below are brief descriptions of MBTA documents:
 - A. **License for Entry:** Authorizes short-term entry for purposes of survey, inspection, test borings, access, etc. One time administrative/engineering/legal review and access fees.
 - B. **License Agreement:** Authorizes installations, subject to termination clause, if Applicant chooses not to pursue an Easement. One time administrative/engineering/legal review fee as well as annual rental fee.
 - C. **Easement:** Authorizes permanent installations in form suitable for recording at Registry Deeds. All easements are non-exclusive and subject to relocation at the Owner's expense, for Mass transportation purposes:
 - 1. Easements must receive MBTA Board of Directors approval, which involves considerable time. Once approved by the Board of Directors and upon payment in full to the MBTA, a License for Construction is issued. Upon final inspection and acceptance of the installation by the MBTA the Easement document is issued.
 - 2. Permanent Subsurface Easement widths are limited to a maximum three-foot distance on either side of the occupation.

3.
 - a) A one-time administrative/engineering/legal review fee, in addition to value of easement, as established by independent appraisal conducted at the Applicant's expense.
 - b) If easement size is minimal, as determined by the MBTA, a fixed fee, encompassing administrative/engineering/legal review fee.
- D. **Letter of Authorization**: Authorizes installations and construction activities in association with Master License Agreements. One-time administrative/engineering/legal review as well as access and/or annual fees.

ATTACHMENT "A"

SUMMARY OF MBTA RAILROAD OPERATIONS SPECIFICATIONS

I. GUIDELINES AND PROCEDURES FOR CONSTRUCTION ON MBTA RAILROAD PROPERTY

This general specification outlines the immediate design requirements and methodology for progressing construction activities on MBTA Railroad Property.

II. MAINTENANCE AND PROTECTION OF RAILROAD TRAFFIC

This specification will be included in ALL work requirements on MBTA Railroad Property, and covers rules, requirements, and protective services or any construction-related activity on MBTA Railroad Property. Supplemental specifications are listed below.

III. INSURANCE SPECIFICATIONS

This specification details the required insurance coverages and limits of the MBTA and Railroad Company(s).

IV. PIPELINE OCCUPANCY SPECIFICATIONS

This specification details requirements for all pipeline borings/jacking's and open cuts on or adjacent to MBTA Railroad Property, as well as requirements for Drawing submittals.

V. SPECIFICATIONS FOR WIRE CONDUIT AND CABLE OCCUPATIONS

This specification details requirements for clearances and installations of parallel and overhead crossings on MBTA Railroad Property, as well as requirements for Drawing submittals.

VI. BRIDGE ERECTION DEMOLITION AND HOISTING OPERATIONS

This specification details plan preparation for demolition and/or hoisting and erection of structures on and over MBTA Railroad Property.

VII. TEMPORARY SHEETING AND SHORING

This specification details requirements for plan preparation and calculations necessary for sheeting and shoring for construction on or adjacent to MBTA Railroad Property.

VIII. BLASTING SPECIFICATIONS

This specification outlines submittals, details and requirements for blasting on or adjacent to MBTA Railroad Property.

IX. TEMPORARY PROTECTION SHIELDS FOR DEMOLITION AND CONSTRUCTION

This specification outlines criteria for plan preparation related to protection of MBTA Railroad Property when work takes place on overhead structures.

X. INDUSTRIAL SIDE TRACK SPECIFICATIONS

This specification outlines minimal requirements for materials and installation submission for private railroad side tracks up to MBTA property line and/or clearance point. Other provisions, site-specific, may be required, including signal protection maintenance and protection of railroad traffic.

XI. RIGHT OF WAY FENCING SPECIFICATIONS

This specification details the requirements for the materials, construction and installation of standard right of way fence.

XII. TEST BORING SPECIFICATIONS

This specification outlines procedures and requirements for the performance of test borings on MBTA Railroad Property.

XIII. FIBER OPTIC CABLE SPECIFICATIONS

This specification details requirements for design and installation of fiber optic cables on MBTA Railroad Property; and is modified by site-specific requirements, including the construction methodology, location and type of fiber optic cables and protection conduits.

XIV. RAILROAD OPERATIONS BOOK OF STANDARD PLANS, TRACK AND ROADWAY, MW-I SPECIFICATIONS FOR CONSTRUCTION AND MAINTENANCE OF TRACK

Certain construction activities may require obtaining this comprehensive package if rail construction details and requirements are related to the track operation.

XV. COMMUTER RAIL DESIGN STANDARDS

ATTACHMENT "B"

**MASSACHUSETTS BAY TRANSPORTATION AUTHORITY
APPLICATION FOR ENTRY UPON MBTA RAILROAD, TRANSIT,
OR OTHER PROPERTY**

Date_____

1. Name of Applicant: _____

2. Type of Entity (Partnership, Corporation, Proprietorship, Public Authority, etc.):

3. Mailing Address: _____

4. Contact info:_____

5. If incorporated, state of incorporation:_____

6. Proposed license term commencement date:_____

7. Agents for applicant for service of notice or process: _____

8. Administrative Fee: 1,000.00 paid with application

9. If plan reviews by The MBTA Design and Construction are deemed necessary the following fee shall apply:

Design and Construction Plan Review Fee: 1,600.00 Paid with Application Fee

10. Applicant shall submit Drawings in pdf form and one set of paper Drawings to License Administrator

11. If applicant is self-insured, please provide limits of self-insurance and attach copies of authorizing legislation or certification thereof: _____

12. If applicant is authorized by public authority to enter into such license agreement, please provide:

Motion, Resolution, or Ordinance No.: _____

Date of Adoption: _____

Adopted by: _____

13. Is the applicant seeking permission to perform environmental testing and/or assessment on Authority property?

a) Is the proposed testing and/or assessment required by the Massachusetts Contingency Plan ("MCP")?

b) What is the Release Tracking number and current status of the MCP work?

14. Name, title and email of applicant's officer authorized to sign agreement: _____

Project Description

1. Brief description of construction (including types of pipes and other attachments or ancillary facilities to be installed on MBTA Railroad Property): _____

2. Brief description of purpose of entry and/or installation: _____

Space Requirements
[To Be Provided]

Technical Information

- 1. Is this occupancy within the limits of a public road? _____
Attach copies of applicant's franchise to occupy such space.

- 2. If occupancy is under, over, through, or attached to undergrade or overhead bridge, who owns such bridge? _____

- 3. Type of occupancy (facility):
 - a) Exact Length of MBTA Railroad Property to be burdened by occupancy: _____

 - b) Width of excavation facility on MBTA Railroad Property:

 - c) Number of manholes: _____

A. Aerial or underground wire and cable:

- (1) Telephone and other communication cables:
 - Number of cables: _____
 - Number of pairs/cable: _____
 - Are these composite coaxial cables? _____

- (2) Power Cables:
 - Number of cables/size: _____
 - Number of volts per conductor: _____
 - Are these pipe-type cables consisting of one or more high voltage cables encased in steel pipe under inert oil pressure? _____

- (3) Fiber optic cables:
 - Number of cables: _____
 - Number of distribution cables: _____
 - Number of transmission cables: _____
 - Number of strands in each cable: _____

Number of repeater stations on MBTA Railroad Property: _____

Systems (check one):

Transmission _____

Distribution _____

Sensor _____

(4) Number of spare or unoccupied ducts to be installed: _____

B. Pipes and Sewers

(1) Circular line carrying no pressure:

Number of pipes: _____

Number of inches of inside nominal diameter per pipe: _____

(2) Circular lines under pressure and carrying non-flammable, non-explosive, or non-combustible supporting materials, except coal and slurry:

Number of pipes: _____

Number of inches of inside nominal diameter per pipe: _____

(3) Circular lines under pressure and carrying flammable, explosive, or combustible supporting material:

Number of pipes: _____

Number of inches of inside nominal diameter per pipe: _____

(4) Non-circular pipe: _____

(5) Will a pipe tunnel be constructed? _____

(6) Will pipe be supported by MBTA structures, bridges, etc.? _____

Explain: _____

(7) Will pipe be attached to MBTA structures, bridges, etc.? _____

Explain: _____

C. Ancillary Facilities

Number of wooden poles to be installed on MBTA Railroad Property:

Other wooden supporting structures: _____

Steel supporting structures: _____

Explain: _____

Number of braces, stub poles: _____

Number of guy wires anchored on MBTA Railroad Property: _____

Number of span guy wires crossing MBTA Railroad Property: _____

D. Attachments

(1) Attachment of aerial wires and cables to poles or other structures of MBTA used in wire line construction or support:

Number of wires attached to MBTA cross-arm: _____

Voltage of wire: _____

Number of wires attached to applicant's cross-arm or bracket: _____

Voltage of wire: _____

Number of cross-arms or brackets attached to MBTA poles: _____

(2) Attachment of aerial wires and cables to building or structures other than those used in wire line construction or support:

Number of wires or cables attached to MBTA's building or structures:

(3) Attachment of cable terminals to poles, buildings, or structures including highway bridges, railroad bridges over highways, or other bridges of MBTA:

Number of cable terminals, loading coils, transformers, or like devices attached:

Explain: _____

E. Guy wire crossings and overhanging cross-arms and power wires of pole lines outside MBTA right-of-way.

Number of guy wires crossing MBTA Railroad property but not anchored thereon: _____

Number of cross-arms overhanging MBTA Railroad Property from poles located outside thereof: _____

Number of cross-arms on any poles: _____

It is hereby understood and agreed that the undersigned applicant will bear any and all costs associated with MBTA's preliminary and final engineering review in connection with this application. Any charges in excess of the initial advance payment will be billed directly to the address indicated in Item #3 above.

Agent: _____

For: _____
Name of Applicant

By: _____
(Title)

(Date)

REVENUE ENFORCEMENT AND PROTECTION PROGRAM CERTIFICATION

Pursuant to M.G.L. Ch. 62C, Sec. 49A, I certify under penalties of perjury that I (my company), to my best knowledge and belief, have (has) filed all state tax returns and paid all state taxes required under law.

Social Security Number or
Federal Identification Number

Signature of Individual or Corporate Name

By: _____
Corporate Officer
(If applicable)

Date: _____

EMPLOYER'S CERTIFICATE OF COMPLIANCE WITH
MASSACHUSETTS EMPLOYMENT SECURITY LAW

Pursuant to G. L. C. 151A, Sec. 19A (b), I _____

on behalf of (Name of Employer) _____,

D.E.T. ID Number _____, certify under the penalties of perjury¹ that the
aforementioned employer has complied with all laws of the Commonwealth relating to contributions
and payments in lieu of contributions.

Signed under the penalties of perjury this _____ day of _____, 20__.

Name of Employer

Signature

Name (Printed)

Title (Printed)

¹ The employer may certify its compliance if it has entered into and is complying with a repayment agreement satisfactory to the Commissioner or there is a pending adjudicatory proceeding or court action contesting the amount due pursuant to G. L. C. 161A, Sec. 19A(c).

STATEMENT REGARDING BENEFICIAL INTEREST

In compliance with the provisions of Chapter 7, Sec. 40J of the General Laws, I hereby state, under the penalties of perjury, that the true names and addresses of all persons who have or will have a direct or indirect beneficial interest in the real property subject to this Application dated

_____, 20___,

between _____ as applicant/tenant, for premises in the building (on the site) know as _____, and located at _____

_____ are listed below.

Name and residence of all persons with beneficial interests:

- 1. _____
- 2. _____
- 3. _____
- 4. _____
- 5. _____
- 6. _____

Signed: _____

Title: _____

Date: _____

ATTACHMENT "C"

REFERENCED STANDARDS AND SPECIFICATIONS

- A. Wherever standards or specifications issued by a recognized industry association or regulatory body are referenced in these Specifications, the reference shall be interpreted as incorporating the referenced standard or specification in total into these Specifications as applicable. In the event of a difference between referenced standard or specifications and these Specifications, the latter shall govern.
- B. Technical Reference Abbreviations - References are made to recognized standards by use of the acronyms listed below. Addresses are included for convenience, and the accuracy of the addresses is not warranted:

AA	The Aluminum Association 900 19th Street NW Washington, DC 20006
AAR	The Association of American Railroads American Railroads Building 50 F Street NW Washington, DC 20001
AASHTO	American Association of State Highway and Transportation Officials 444 North Capitol Street NW Suite 249 Washington, DC 20001
ACGIH	American Conference of Governmental Industrial Hygienists 1330 Kemper Meadow Drive Cincinnati, OH 45240
ACI	American Concrete Institute P. O. Box 19150 Detroit, MI 48219
AFPA	American Forest and Paper Association 1111 19th Street, NW Suite 700 Washington, DC 20036

AIA	American Insurance Association 1130 Connecticut Avenue NW Washington, DC 20036
AISC	American Institute of Steel Construction Inc. 1 East Wacker Drive Suite 1300 Chicago, IL 60601
AISI	American Iron and Steel Institute 1101 17th Street NW Suite 1300 Washington, DC 20036-4700
AITC	American Institute of Timber Construction 7012 South Revere Parkway Suite 140 Englewood, CO 80112
ANSI	American National Standards Institute 11 West 42nd Street New York, NY 10036
APA	American Plywood Association P. O. Box 11700 Tacoma, WA 98411
APHA	American Public Health Association 1015 15th Street NW Washington, DC 20005
AREA	American Railway Engineering Association 50 F Street NW Washington, DC 20001
ASCE	American Society of Civil Engineers 345 East 47th Street New York, NY 10017
ASHRAE	American Society of Heating, Refrigerating and Air Conditioning Engineers 1791 Tullie Circle, NE Atlanta, GA 30329
ASME	American Society of Mechanical Engineers 345 East 47th Street New York, NY 10017

ASTM	American Society for Testing and Materials 1916 Race Street Philadelphia, PA 19103
AWPA	American Wood Preservers' Association P. O. Box 286 Woodstock, MD 21163-0286
AWS	American Welding Society 550 NW 42nd Avenue Miami, FL 33126
AWWA	American Water Works Association, Inc. 6666 W. Quincy Avenue Denver, CO 802350
CSI	Construction Specifications Institute 601 Madison Avenue Alexandria, VA 22314-1791
FHA	Federal Highway Administration 400 7th Street SW Washington, DC 20590
FRA	Federal Railroad Administration 403 7th Street SW Washington, DC 20590
ICBO	International Conference of Building Officials 5360 Workman Mill Road Whittler, CA 90601
IIA	Incinerator Institute of America 60 East 42nd Street New York, NY 10017



**MASSACHUSETTS BAY
TRANSPORTATION
AUTHORITY**

RAILROAD OPERATIONS DIRECTORATE

||

MAINTENANCE AND PROTECTION OF RAILROAD TRAFFIC

AUGUST 2014

SECTION 1. GENERAL

- 1.01 The Contractor should note that these specifications govern proposed work that involves construction on, over, under, within or adjacent to MBTA Railroad Property. Requirements must be strictly observed whenever the tracks, structures, or properties of the MBTA are involved or affected.
- 1.02 If the tracks or other facilities of the MBTA are endangered, the Contractor shall immediately perform such work as directed by the Railroad Company(s), and upon failure of the Contractor to carry out such orders immediately, the Railroad Company(s) may take whatever steps are necessary to restore safe conditions. The cost and expense to the Railroad Company(s) and/or MBTA of restoring safe conditions or of any damage to the MBTA's trains, tracks, or other facilities caused by the Contractors' or subcontractors' operations, shall be at the sole expense of the Contractor and will be collected as appropriate. This cost shall be paid for by the Contractor and may be deducted from any monies due and that may become due to the Contractor.
- 1.03 Before entering upon MBTA Railroad Property:
- A. The Owner or its Contractor shall be fully informed of all requirements of the MBTA pertaining to the specific project and shall conduct all their work accordingly. Any questions relating to the requirements of the MBTA should be directed to the Director of Engineering for MBTA Railroad Operations or their authorized representative.
 - B. The Owner or its Contractor shall execute an MBTA License for Entry, and shall provide the MBTA and Railroad Company(s) with the information required in the "Insurance Specifications".
 - C. The Owner or its Contractor shall take note that if an excavation is to be made within a 2 to 1 slope line commencing 5.5 feet from the centerline of track, they shall be required to submit the proposed method of soil stabilization for approval by the Director of Engineering for MBTA Railroad Operations.
 - D. The Owner or its Contractor shall furnish detailed plans for falsework, bracing, sheeting, or other supports adjacent to the tracks for approval by the Director of Engineering for MBTA Railroad Operations and the Railroad Company(s), and the work shall be performed in accordance with temporary "Sheeting and Shoring". All plans and calculations shall be stamped by a Registered Professional Engineer.
 - E. The Owner or its Contractor shall give written notice to the Director of Engineering for MBTA Railroad Operations and the applicable

Railroad Company(s) at least 21 days in advance of starting work or locating equipment at the site.

- F. The Owner or its Contractor shall make all necessary arrangements with the MBTA before entering upon MBTA Railroad Property.

1.04 After entering upon MBTA Railroad Property:

- A. The Owner or its Contractor shall have, in their possession on the job site, the contract plans and specifications which bear the stamp of approval of the Director of Engineering for MBTA Railroad Operations or Railroad Company(s). The Owner or its Contractor shall conduct all their work according to these plans and specifications.
- B. All work shall be performed and completed in a manner fully satisfactory to the MBTA Chief Engineering Officer or authorized representative(s). Railroad Company(s) inspection of the work shall be conducted at any time and the Owner or its Contractor shall cooperate fully with the MBTA and Railroad Company(s) representatives.
- C. All equipment used by the Owner or its Contractor on MBTA Railroad Property may be inspected by the Railroad Company(s) and shall not be used if considered unsatisfactory by the Railroad Company(s) representative. Equipment of the Owner or its Contractor to be used adjacent to tracks shall be in first class condition so as to positively prevent any failure that would cause delay in the operation of trains or damage to MBTA or railroad facilities. Equipment shall not be placed or put into operation adjacent to a track without first obtaining the permission of the Railroad Company(s).
- D. Operators of such equipment must be properly licensed and may be examined by the Railroad Company(s) representative to determine their fitness. If it is determined that they are unfit to work, then the Owner or its Contractor shall remove them from MBTA Railroad Property.
- E. If the Director of Engineering for MBTA Railroad Operations deems it necessary, the Owner or its Contractor shall furnish and erect in close proximity to the site of the work a suitable, furnished shelter with lights, heat, telephone, etc., for use by Railroad Company(s) personnel providing services to the Owner's or Contractor's work.
- F. The Owner or its Contractor's work shall be performed in such manner that the tracks, train operations and appurtenances of the MBTA and the Railroad Company(s) will be safeguarded.

- G. Open excavations shall be suitably planked and safeguarded when construction operations are not in progress.
- H. Blasting will be permitted under or adjacent to tracks only after proof that blasting is required and all methods have been approved by the Director of Engineering for MBTA Railroad Operations and the Railroad Company(s). All blasting operations must comply with the MBTA's "Blasting Specifications".
- I. The Owner or its Contractor shall be fully responsible for all damages arising from their failure to comply with the requirements of these specifications. Failure to comply may result in their removal from MBTA Railroad Property, at the MBTA's sole discretion.

SECTION 2. RULES, REGULATIONS, AND REQUIRMENTS.

- 2.01 Railroad traffic shall be maintained at all times with safety and continuity, and the Contractor shall conduct all operations on, over, under, within or adjacent to MBTA Railroad Property within the rules, regulations, and requirements of the Railroad Company(s) and/or MBTA. The Contractor shall be responsible for acquainting themselves with such requirements as the Railroad Company(s) and/or MBTA may demand.
- 2.02 The Contractor shall obtain verification of the time and schedule of track occupancy from the Railroad Company(s) before proceeding with any construction or demolition work on, over, under, within or adjacent to MBTA Railroad Property. The work shall not proceed until the plans and method of procedure have been approved by the Director of Engineering for MBTA Railroad Operations or their authorized representative.
- 2.03 All work to be done on, over, under, within or adjacent to MBTA Railroad Property shall be performed by the Contractor in a manner satisfactory to the MBTA and the Railroad Company(s), and shall be performed at such times and in such manner, as to not interfere with the movement of trains or operations upon the tracks of the MBTA. The Contractor shall use all necessary care and precaution in order to avoid accidents, delays or interference with the MBTA's trains or other property.
- 2.04 The Contractor shall give written notice to the Railroad Company(s) at least twenty- one (21) days prior to the commencement of any work, or any portion of the work, by the Contractor or their subcontractors on, over, under, within or adjacent to MBTA Railroad Property, in order that necessary arrangements may be made by the Railroad Company(s) to protect railroad operations.

- 2.05 If deemed necessary by the Railroad Company(s), it may assign an inspector and/or engineer who will be placed on the work site during the time the Contractor or any subcontractor is performing work on, over, under, within or adjacent to MBTA Railroad Property. The cost and expense will be paid directly by the contracting party with an advance deposit to the Railroad Company(s), unless otherwise approved.
- 2.06 Before proceeding with any construction or demolition work, on, over, under, within or adjacent to the MBTA's Railroad Property, a pre-construction meeting shall be held at which time the Contractor shall submit for approval of the MBTA and Railroad Company(s), Drawings, computations, and a detailed description of the method for accomplishing the construction work, including methods of protecting railroad operations. Such approval shall not serve in any way to relieve the Contractor of complete responsibility for the adequacy and safety of the referenced methods.
- 2.07 During any demolition procedure, the Contractor must provide an approved shield to prohibit all debris from falling onto MBTA Railroad Property. A protective fence must be erected at both ends of the project to prohibit trespassers from entering MBTA Railroad Property.
- 2.08 Cranes, shovels, or any other equipment shall be considered to be fouling the track when located in such position that failure of same with or without load brings the equipment within the fouling limit. The Contractor's employees and equipment will not be permitted to work near overhead wires or apparatus.
- 2.09 The Contractor shall conduct their work and handle their equipment and materials so that no part of any equipment should foul an operated track or wire line without the written permission of the Railroad Company(s). When it becomes necessary for the Contractor to foul any track, they must give the Railroad Company(s) written notice of their intentions twenty-one (21) days in advance, so that if approved, arrangements may be made for proper protection of the Railroad Company(s).
- 2.10 The Contractor's equipment shall not be placed or put into operation adjacent to tracks without first obtaining permission from the Railroad Company(s). Under no circumstances shall any equipment or materials be placed or stored within fifteen (15) feet from the centerline of the closest track.
- 2.11 Materials and equipment belonging to the Contractor shall not be stored on MBTA Railroad Property without first having obtained permission from the Railroad Company(s), and such permission will be on the condition that the MBTA and/or Railroad Company(s) will not be liable for damage to such materials and equipment from any cause. The Contractor shall keep the

tracks adjacent to the site clear of all refuse and debris that may accumulate from construction operations, and shall leave the MBTA Railroad Property in the condition existing before construction commencement. Equipment repair, refueling or extended storage is prohibited on MBTA Railroad Property.

- 2.12 The Contractor shall consult the Railroad Company(s) in order to determine the type of protection required to insure safety and continuity of railroad operations. The railroad field engineer may assign track foremen, flagmen, signalmen or other employees deemed necessary for protective services by the Railroad Company(s), to insure the safety of trains and MBTA Railroad Property. The cost of same shall be paid directly by the contracting party with an advance deposit to the Railroad Company(s), unless otherwise approved.
- 2.13 The provision of such protective services, and other precautionary measures, shall not relieve the Contractor from liability for the cost of any and all damages caused by their operations.
- 2.14 The Railroad Company(s) will require protection during all periods when the Contractor is working on, over, under, within or adjacent to MBTA Railroad Property or as may be deemed necessary. When protection is required, the Contractor shall make the request in writing to the Railroad Company(s) at least twenty-one (21) days before such protection is required.
- 2.15 The Contractor shall not bill the Railroad Company(s) or MBTA for any work which they are proposing to perform, unless the Railroad Company(s) or MBTA authorizes the said work in writing. This work must be to the benefit of the MBTA or Railroad Company(s).
- 2.16 The Contractor, subcontractor and respective employees who will come within the limits of the MBTA Railroad Property, must first attend the Railroad Company(s) Safety Orientation Class. They are required to comply with the Railroad Company(s) Safety Requirements throughout the entire construction period. All costs associated with compliance of the Railroad Company(s) Safety Requirements will be at the sole expense of the Contractor and subcontractors.
 - A. The Contractor for the project must appoint a qualified person who will be designated as a Safety Representative. They must be approved by the Railroad Company(s) Safety Representative. The Contractor's designee will be responsible to give Safety Orientation to the Contractor's/subcontractor's employees who will come onto the MBTA's Railroad Property for short periods of time after the initial Safety Orientation Class has been given by the Railroad Company(s). The Contractor's designee will keep the Railroad Company(s) Safety Representative informed of the temporary employees who received Safety Orientation. The Railroad Company(s)

Safety Orientation Class will be repeated when employee turnover or groups of Contractor's and subcontractor's employees are such that another Railroad Company(s) Safety Orientation Class is justified.

- B. All Contractors shall follow established safety procedures and remain 15 feet or more from the closest rail of the closest track. When it becomes necessary for Contractors to encroach on this 15 foot limitation, the proper fouling procedures will be arranged with the Railroad Company(s).
 - C. Contractors will establish the 15 foot foul line by installing stakes and taping off the area prior to beginning work.
- 2.17 Upon completion of the work, the Contractor shall remove from the MBTA Railroad Property, all machinery, equipment, surplus materials, falsework, rubbish, temporary buildings and other property of the Contractor, or any subcontractor, and shall leave MBTA Railroad Property in a condition satisfactory to the MBTA and Railroad Company(s). Failure to comply will result in Railroad Company(s) forces restoring MBTA Railroad Property at the Contractor's expense.
- 2.18 The Contractor will pay the Railroad Company(s) directly, for all protective services unless otherwise approved. The services are performed to insure safe operation of trains when construction work would, in the Railroad Company(s) opinion, be a hazard.

SECTION 3. DEFINITION OF HAZARD

- 3.01 Protection Services will be required whenever the Contractor is performing work on, over, under, within or adjacent to MBTA Railroad Property. This will include excavating, sheeting, shoring, erection, removal of forms, handling material, using equipment which by swinging or by failure could foul the track, and when any other type of work being performed, in the opinion of the Railroad Company(s), requires such service.
- 3.02 Railroad operations will be considered subject to hazard when explosives are used in the vicinity of MBTA Railroad Property during the driving or pulling of sheeting for footings adjacent to a track, when erecting structural steel across or adjacent to a track, when operations involve swinging booms or chutes that could in any way come closer than 5 feet to the center line of a track or wire line. None of these or similar operations, shall be carried on without Railroad Company(s) protective services personnel on site.
- 3.03 A signal line or communication line shall be considered fouled and subject to hazard when any object is brought closer than ten (10) feet to any wire or cable. An electrical supply line shall be considered fouled and subject to hazard when any object is brought closer than ten (10) feet to any

wire of the line.

- 3.04 As excavation approaches pipes, conduits, or other underground structures on or adjacent to MBTA Railroad Property, digging by machinery shall be discontinued and the excavation shall continue by means of hand tools. All existing pipes, poles, wires, fences, property line markers, and other structures, which the MBTA and/or Railroad Company(s) decides must be preserved in place, shall be carefully protected from damage by the Contractor or its Owner. Should such items be damaged, they shall be restored by the Railroad Company(s), at the Owner's or Contractor's sole expense to the original condition prior to construction commencement. If any excavation is taken beyond the work limit indicated on the approved Drawings or prescribed herein, the Owner or its Contractor shall backfill and compact to the satisfaction of the Railroad Company(s) at the Contractors expense.

SECTION 4. BACKFILL

4.01 Backfilling

- A. All backfill material adjacent to any Railroad Company(s) facility shall be approved by the Railroad Company(s). Backfill material shall be free from hard lumps and clods larger than 3 inches in diameter, and free from large rocks or stumps. Uniformly fine material shall be placed next to any pipe liable to dent or break.
- B. All backfill material shall be compacted at or near optimum moisture content, in layers not exceeding 6 inches in compacted thickness by pneumatic tampers, vibrator compactors, or other approved means to the base of the railroad subgrade. Material shall be compacted to not less than 95 percent of AASHTO T 99, Method C. The Contractor will be required to supply to the job site, ballast stone (AREA #4) to be installed by the Railroad Company(s).

4.02 Certification

The Owner or its Contractor shall provide testing, through the use of a testing lab or Professional Engineer, to insure that the in place density of the backfill meets or exceeds the requirements of Section 4.01(B). Written certification of the tests shall be given to the Railroad Company(s) immediately upon completion of the test.

4.03 Alternate

In the case of an open cut crossing of the MBTA Railroad Property, the Owner or its Contractor may backfill with concrete having a three-day compressive strength of 1000 psi to the base of the track subgrade. This

may be used in lieu of providing the certification of proper compaction when using gravel backfill. The Owner or its Contractor will be required to supply to the job site, ballast stone (AREA #4) to be installed by the Railroad Company(s).

SECTION 5. CLEARANCES

- 5.01 Staging falsework or forms shall at all times be maintained with a minimum vertical clearance of 226" above top of the high rail and a minimum horizontal clearance of 15' from the center line of track.

SECTION 6. PROTECTION SERVICES

- 6.01 The MBTA shall require railroad inspection and may require railroad flagging. Prior to the start of any work on MBTA Railroad Property, the Owner or its Contractor shall submit a deposit to the amount required by the Railroad Company(s). If Railroad Company(s) expenses are greater than the amount of deposit, the Owner or its Contractor shall reimburse the Railroad Company(s) for the balance when billed, and, if the Railroad Company(s) expenses are less than the amount of deposit, the Railroad Company(s) will refund the balance to the Owner or its Contractor. The Railroad Company(s) reserves the right to request additional deposits as project work progresses.
- 6.02 If the MBTA or Railroad Company(s) determines that flagmen are necessary, the number required shall be on duty at the site during the hours of hazard described under Section 3. No work shall be performed if flagmen are required but are not on duty.
- 6.03 It shall be the responsibility of the Owner or its Contractor to keep the MBTA and Railroad Company(s) informed at all times when the Owner or its Contractor shall be working on, over, under, within or adjacent to MBTA Railroad Property and creating the hazards described under Section 3. Failure of the Owner or its Contractor to give the MBTA and Railroad Company(s) suitable advance notice of hazardous operation shall result in the shutdown of the work by the Railroad Company(s), until such time as sufficient numbers of flagmen are on duty at the site. If this becomes a repeat occurrence, the Contractor will be removed from the project.
- 6.04 The Railroad Company(s) will make its best effort to provide protective services personnel. Should the situation arise where such personnel are not available, Contractor operations must cease. The Railroad Company(s) is not liable for any monetary claims incurred during the absence of protective services personnel.

SECTION 7. INSPECTION

- 7.01 If deemed necessary by the Director of Engineering for MBTA Railroad Operations, the MBTA will furnish and assign an engineer(s) for inspection and the Railroad Company(s) will furnish an appropriate inspector for general inspection purposes or for general protection of MBTA Railroad Property and operations during construction. All protection services will be at the expense of the Owner or its Contractor.

SECTION 8. EXTRA-CONTRACT SERVICES

- 8.01 Temporary and permanent changes of tracks and all railroad utilities made necessary by the work of the Contractor, will be made by the MBTA or Railroad Company(s) at the expense of the Owner or its Contractor.
- 8.02 All other changes made or services furnished by the Railroad Company(s), at the request of the Owner or its Contractor, will be at the Owner's or its Contractor's expense.



**MASSACHUSETTS BAY
TRANSPORTATION
AUTHORITY**

RAILROAD OPERATIONS DIRECTORATE



INSURANCE SPECIFICATIONS

The insurance outlined in these Specifications is required of the Owner or Contractor, and shall be provided by or in behalf of all subcontractors performing any portion of the work. The Owner or Contractor shall be responsible for any modifications, deviations or omissions of the required insurance as it applies to subcontractors.

All insurance policies, unless otherwise specified under Railroad Protective Liability Insurance, are to be written either on an occurrence basis or, if a claims-made form, applicable renewals must have a date retroactive to the construction start date and shall be maintained in force for one year following the acceptance of the work by the MBTA or its duly authorized representative.

With the exception of Railroad Protective Liability Insurance, all insurance policies must name the MBTA as an additional insured as its interest appears and waive any rights of subrogation against the MBTA.

Certificates of Insurance evidencing (1) either the claims-made or occurrence form coverage, (2) work description/location, (3) Owner or Contractor's corporate name, and (4) individual, company, government agency or municipality for which the work is being performed, are to be furnished to the MBTA prior to work commencement, and within fifteen (15) days of expiration of the insurance coverage, when applicable.

All policies must contain a minimum thirty (30) day written notice of cancellation clause, and provide that the Insurance Company shall notify the Owner, Contractor, MBTA and Railroad Company(s), via registered mail, of any cancellation, change or expiration of the policy.

Original Insurance Certificate(s) shall be received and approved by the MBTA before the Owner or Contractor will be allowed entry upon MBTA Railroad Property. Certificates, including any required endorsements, shall be furnished to the MBTA, c/o Risk Manager, Office of the Treasurer-Controller, Ten Park Plaza, Room 8450, Boston, MA 02116, and shall provide stated coverage and a provision that Notice of Accident (occurrence) and Notice of Claim shall be given to the Insurance Company as soon as practicable after notice to the insured(s).

Original Insurance Binders reflecting Railroad Protective Insurance shall be received and approved by the MBTA and the appropriate Railroad Company(s) prior to entry upon MBTA Railroad Property. Mailing addresses for transmittal of original Insurance Binders to the named insured Railroad Company(s) are contained on Page Four of these Specifications.

The Owner or Contractor shall indemnify, defend and save harmless the MBTA and the appropriate Railroad Company(s) from and against any and all liabilities, losses (including losses of revenue), claims, costs, damages and expenses (including reasonable attorney's fees and expenses) that may be asserted against or incurred by the MBTA and the Railroad Company(s) arising from or as a result of the Owner or Contractor's work, or its use of adjacent land. Said indemnification shall include claims, whether covered by insurance or not, including, but not limited to

Workers Compensation and similar insurance.

The Owner or Contractor shall maintain, during the life of the contract, from company (s) authorized to do business in the Commonwealth of Massachusetts and satisfactory to the MBTA:

A. COMMERCIAL GENERAL LIABILITY INSURANCE for personal injury, bodily injury and property damage in an amount not less than \$1,000,000 per occurrence and \$3,000,000 in the aggregate covering all work performed on over or adjacent to MBTA Railroad Property (the "work"), including:

1. All operations;
2. Contractual liability;
3. Coverage for the so-called "X, C, U" hazards, i.e., collapse of building, blasting, and damage to underground property;
4. Asbestos abatement, when applicable.

B. AUTOMOBILE LIABILITY INSURANCE including the use of all vehicles owned, non-owned, leased and hired, in an amount not less than \$1,000,000 combined single limit covering all the work.

C. WORKER'S COMPENSATION INSURANCE including Employees, Liability Insurance, as provided by Massachusetts General Laws, Chapter 152, as amended, covering all the work.

D. UMBRELLA LIABILITY COVERAGE in an amount not less than \$10,000,000 per occurrence covering all the work.

E. HAZARDOUS MATERIALS INSURANCE if the work involves hazardous materials, the following coverage is required:

1. **Pollution Liability insurance** for sudden and gradual occurrences in an amount not less than \$1,000,000 per occurrence and \$5,000,000 in the aggregate arising out of the work, including but not limited to all hazardous materials identified in the contract.
2. When applicable, the Owner or Contractor shall designate the disposal site and furnish a Certificate of Insurance from the Disposal Facility for Environmental Impairment Liability Insurance for (a) sudden and accidental occurrences in an amount not less than \$3,000,000 per occurrence and \$6,000,000 in the aggregate and (b) non-sudden occurrences in an amount not less than \$5,000,000 per occurrence and \$10,000,000 in the aggregate.

- 3. Certificates of insurance shall clearly state the hazardous materials exposure work being performed.

F. RAILROAD PROTECTIVE LIABILITY INSURANCE is specifically designed for insuring Railroads, and is purchased by the Owner or Contractor in the name of the MBTA and the Railroad Company(s). **The Railroad Company(s) is the named insured on the policy.** Railroad Protective Liability Insurance is required for any work performed within fifty (50) feet from center line of the nearest railroad track; it is not a substitute for any types of insurance outlined in these Specifications. Required limits are:

Bodily injury: not less than \$5,000,000 for all damages arising out of bodily injuries to or death of one person, and subject to that limit for each person, a total limit of \$6,000,000 for all damages arising out of bodily injury to or death of two or more persons in any one accident;

Property Damage: not less than \$10,000,000 or all damages arising out of injury to or destruction of MBTA property in any one accident, and subject to that limit per accident, a total of \$10,000,000 in the aggregate for all damages arising out of injury to or destruction of MBTA property.

Questions regarding insurance should be directed to MBTA's Risk Manager at (617) 222-3064.

Questions regarding train counts and train speeds should be directed to the appropriate Railroad Company(s) listed on Page Four.

PROOF OF INSURANCE

MAILING ADDRESSES:

<u>MBTA</u>	Risk Manager c/o Treasurer-Controller 10 Park Plaza Boston, MA 02116 cc: Massachusetts Realty Group
-------------	---

<u>National Railroad Passenger Corporation (Amtrak)</u>	Boston Division Office c/o Division Engineer 2 South Station 5 th Floor Boston, MA 02110
---	--

<u>CSX Transportation Inc.</u>	500 Water St. Jacksonville, FL 32202
--------------------------------	---

<u>Bay Colony Railroad Corporation</u>	General Manager 4 Freight House Road East Wareham, MA 02571
--	---

Boston and Maine Corporation
and Springfield Terminal Railway
Co.

Chief Engineer
402 Amherst Street
Suite 300
Nashua, NH 03063-1287

Providence and Worcester
Railroad Company

P. O. Box 1188
Worcester, MA 01601

Keolis Commuter Services

Chief Engineering Officer
470 Atlantic Ave.
Boston, MA 02110



**MASSACHUSETTS BAY
TRANSPORTATION
AUTHORITY**

RAILROAD OPERATIONS DIRECTORATE

IV

PIPELINE OCCUPANCY SPECIFICATIONS

INDEX

<u>SUBJECT</u>	<u>PAGE</u>
<u>SECTION 1. GENERAL REQUIREMENTS</u>	
1.01 Description of Work and Location	1
1.02 License to Enter Railroad Company(s) Property	1
1.03 Work on Railroad Property	1
1.04 Coordination	3
1.05 Layout of Work	3
1.06 Indemnification	3
1.07 Scientific or Historic Artifacts	3
1.08 Record Documents	4
<u>SECTION 2. SUBMITTALS</u>	
2.01 Application for Occupancy	4
2.02 Submission of Construction Drawings and Specifications	4
<u>SECTION 3. TEMPORARY FACILITIES AND CONTROLS</u>	
3.01 Requirements of Regulatory Agencies	7
3.02 Installation and Coordination - General	7
3.03 Sanitary Facilities	8
3.04 Light and Power	8
3.05 Temporary Water	8
3.06 Temporary Traffic Controls	8

<u>SUBJECT</u>	<u>PAGE</u>
3.07 Temporary Work and Storage Areas	8
3.08 Pollution Abatement Controls	9
3.09 Protection of Persons and Properties	10
3.10 Vermin Control	11
3.11 Rubbish and Debris Removal	11
SECTION 4. <u>PIPELINE OCCUPANCY GENERAL CRITERIA</u>	
4.01 Method of Installation	12
4.02 General Requirements	13
4.03 Inspection and Testing	14
4.04 Cathodic Protection	14
4.05 Soil Investigations	15
4.06 Ground Stabilization	16
4.07 Support of Tracks	16
4.08 Geotechnical Monitoring	17
4.09 Pipelines On Bridges	18
4.10 Bonding and Grounding of Pipelines In Electrified Territory	18
4.11 Abandoned Pipelines or Facilities	19
4.12 Drainage	19
SECTION 5. <u>CARRIER PIPE</u>	
5.01 Design Criteria - General	20
5.02 General - Products	20

5.03	Oil and Gas Pipes	21
5.04	Cast Iron Pipe	21
5.05	Vitrified Clay Pipe	21
5.06	Corrugated Metal Pipe	21
5.07	Asbestos Cement Pipe	21
5.08	Other	22
5.09	Shut-Off Valve	22
5.10	Signs	22
5.11	Installation - Execution	22

SECTION 6. CASING PIPE

6.01	Design Criteria - General	23
6.02	Protection at Ends of Casing	24
6.03	Vents	24
6.04	Steel Pipe - Products	25
6.05	Cast Iron Pipe	25
6.06	Corrugated Metal Pipe and Corrugated Structural Plate Pipe	25
6.07	Reinforced Concrete Pipe	25
6.08	Tunnel Liner Plates	25
6.09	Depth of Installation - Execution	26
6.10	Method of Installation	26
6.11	Construction	27

<u>PLATES</u>	<u>PAGE</u>
Plate I Pipe Crossing	33
Plate II Pipe Crossing	34
Plate III Longitudinal Occupancy	35
Plate IV Pipe Crossing Data Sheet	35
Plate V Table of Minimum Wall Thickness	37

SECTION 1. GENERAL REQUIREMENTS

1.01 DESCRIPTION OF WORK AND LOCATION

These specifications apply to the design and construction of pipelines carrying flammable and non-flammable substances and to casings over 4-inches in diameter containing wires and cables, under, across or along MBTA Railroad Property, facilities and tracks.

1.02 LICENSE TO ENTER RAILROAD PROPERTY

- A. Entry upon MBTA Railroad Property for the purpose of conducting surveys, field inspections, obtaining soil information, or any other purpose associated with the design and engineering of the proposed occupancy, will be authorized by an MBTA License for Entry (See "Guidelines and Procedures for Construction on MBTA Railroad Property").
- B. Issuance of the License does not constitute authority to proceed with the actual construction.

1.03 WORK ON RAILROAD PROPERTY

- A. The safety and continuity of train operations shall be the first priority. The Applicant shall arrange the work so that the trains will be protected and safeguarded at all times. Whenever the work may affect the safety and movement of trains, the method, sequence and time schedule of performing such work shall be submitted to the Director of Engineering for MBTA Railroad Operations or their authorized representative for approval.
- B. The Applicant waives all claims against the Railroad Company(s) and/or the MBTA for delays or any interference occasioned by railroad traffic or railroad maintenance.
- C. All Applicant-designed temporary construction on MBTA Railroad Property shall be designed in accordance with the appropriate railroad criteria and all construction performed on, over, under, within or adjacent to MBTA Railroad Property will be subject to the inspection and approval of the Railroad Company(s) and/or MBTA.
- D. A minimum of fourteen (14) days advance written notice shall be given to the Railroad Company(s) prior to construction related activities.
- E. The Railroad Company(s) will furnish such qualified flagmen, signalmen or protection men as may be required to insure complete

protection of train operations and railroad facilities. The need for this type of service will be determined by the Railroad Company(s) on the basis of railroad regulations and the Applicant's approved construction schedule. No work shall proceed without proper protection on the site.

- F. All expenses incurred in connection with protection of railroad facilities by Railroad Company(s) employees will be borne by the Applicant. Billings for such service or expense, including labor, materials and equipment will be made directly to the Applicant for payment.
- G. During construction, railroad traffic shall be maintained at all times without interruption, except when approved in advance, in writing, by the Director of Engineering for MBTA Railroad Operations or their authorized representative.
- H. All construction operations shall be conducted so as not to interfere with, interrupt, or endanger the operation of trains, nor damage, destroy, or endanger the integrity of railroad facilities. All work on or near MBTA Railroad Property shall be conducted in accordance with the Railroad safety rules and regulations. The Applicant shall secure and comply with the Railroad safety rules and shall give written acknowledgment to the Railroad Company(s) that they have been received, read, and understood by the Applicant and their employees. Construction operations will be subject to Railroad Company(s) inspection at any and all times.
- I. All cranes, lifts, or other equipment that will be operated in the vicinity of the MBTA's electrification and power transmission facilities shall be electrically grounded as directed by the Railroad Company(s).
- J. At all times when the work is progressing, a field supervisor for the work with no less than twelve (12) months experience in the operation of the equipment being used shall be present. Certification of the above must be submitted to the Railroad Company(s).
- K. Whenever equipment or personnel are working closer than fifteen (15) feet to the closest rail of an adjacent track, that track shall be considered as being obstructed. As best possible, all construction operations shall be conducted no less than this distance. Construction operations closer than fifteen (15) feet to the closest rail of a track shall be conducted only with the permission of, and as directed by, a qualified Railroad Company(s) employee present at the work site.
- L. Crossing of tracks at grade by equipment and personnel is prohibited except by prior arrangement with, and as directed by, the Director of

Engineering for MBTA Railroad Operations or their authorized representative.

- M. All tunneling, jacking and boring operations within railroad influence lines will be done on a 24 hour per day basis to minimize Railroad exposure to construction hazards.

1.04 COORDINATION

The Applicant shall coordinate the work with their Contractors, subcontractors, utility companies, governmental units, and any affected Railroad Company(s) with regard to site access, establishment and use of temporary facilities, work schedules, and other elements of the specified work which require interfacing with others.

1.05 LAYOUT OF WORK

The Applicant shall lay out their work true to lines and grades indicated on the Drawings and shall be responsible for all measurements in connection therewith. The Applicant will be held responsible for the execution of the work to such lines and grades indicated on the approved construction Drawings or such other lines and grades as may be directed or established by the Director of Engineering for MBTA Railroad Operations or their authorized representative.

1.06 INDEMNIFICATION AND INSURANCE

See requirements in "Guidelines and Procedures for Construction on MBTA Railroad Property" and "Insurance Specifications."

1.07 SCIENTIFIC OR HISTORIC ARTIFACTS

The Applicant shall immediately notify the Director of Engineering for MBTA Railroad Operations of the discovery of scientific or historical artifacts and shall protect same until identified and removed by the appropriate Authorities exercising jurisdiction.

1.08 RECORD DOCUMENTS

- A. The Applicant shall furnish the Railroad Company(s) and the MBTA with one reproducible "As Built" copy of each approved Construction Drawing, marked to indicate all changes and deviations from same.
- B. All project record documents shall be received and accepted by the MBTA and the Railroad Company(s) prior to final inspection.

SECTION 2. SUBMITTALS

2.01 APPLICATION FOR OCCUPANCY

The Applicant must agree, upon approval of the construction details by the Director of Engineering for MBTA Railroad Operations, to execute the MBTA Pipeline Occupancy Agreement and pay any required fees and/or rentals outlined therein. Refer to "Guidelines and Procedures for Construction on MBTA Railroad Property" for application policy.

2.02 SUBMISSION OF CONSTRUCTION DRAWINGS AND SPECIFICATIONS

- A. Six (6) sets of Drawings and specifications for proposed pipeline occupations shall be submitted to the AGM for Real Estate and Asset Development and meet the approval of the Railroad Company(s) and the MBTA prior to the start of construction. These plans are to be prepared in sizes as small as possible and are to be folded to an 8-1/2 inch by 11-inch size (folded dimensions) with a 1-1/2 inch margin on the left side and a 1-inch margin on the top.
1. After folding, the title block and other identification of the Drawings shall be visible at the lower right corner, without the necessity of unfolding. Each Drawing shall bear an individually identifying number and an original date, together with subsequent revision dates, clearly identified on the Drawing.
 2. All Drawings are to be individually folded or rolled and where more than one Drawing is involved, they shall be assembled into complete sets before submission to the MBTA.
- B. Drawings shall be to scale and show the following (see attached Plates).
1. Plan view of proposed pipeline in relation to all railroad facilities.
 2. Location of pipe (in feet) from nearest railroad milepost, centerline of a railroad bridge (giving bridge number), or centerline of an existing or former passenger station, or other fixed point. In all cases, the name of the City or Town and County in which the proposed facilities are located must be shown.
 3. Profile of ground on centerline of pipe from field survey showing relationship of pipe and casing to ground level, tracks and other facilities. For longitudinal occupations, the profile of adjacent track(s) must be shown.

4. All MBTA property lines. If pipeline is in a public highway, the limits of the right-of-way for the highway shall be clearly indicated with dimensions from centerline.
 5. The angle of crossings in relation to centerline of tracks.
 6. Location of valves or control stations of the pipeline.
 7. "Pipe Crossing Data Sheet" completed and out on Plan.
- C. The Drawing must be specific (both on MBTA Railroad Property and under tracks that are not on MBTA Railroad Property) as to:
1. Method of installations.
 2. Size and material of casing pipe.
 3. Size and material of carrier pipe.

These items shall not have an alternative.

- D. Once an application is approved by the Director of Engineering for MBTA Railroad Operations or their authorized representative, proposed variances from the approved plans, specifications, method of construction, etc., will be resubmitted for approval.
- E. Location and dimensions of jacking, boring, or tunneling pits shall be shown with details of their sheeting and shoring. If the bottom of the pit excavation nearest the adjacent track intersects a line from a point 5.5 feet horizontally from center line of adjacent track at the plane of the base of fall drawn on a slope of 2 horizontal to 1 vertical, submit design and details of the pit construction to the MBTA for approval complete with computations prepared by a Registered Professional Engineer. In any event, the face of the pit shall be no less than 25 feet from adjacent track, unless otherwise approved by the Director of Engineering for MBTA Railroad Operations or their authorized representative. Pits shall be fenced, lighted, and otherwise protected as directed by the Railroad Company(s).
- F. All Drawings and computations, including those submitted by Contractors, must bear the seal of a Registered Professional Engineer.
- G. Computations for all structures involving the support or protection of railroad track, embankment and facilities must be prepared by and bear the seal of a Registered Professional Engineer and shall be submitted within the construction Drawings.
- H. When computer calculations are included with design calculations, the following documentation shall be furnished:

1. A synopsis of the computer program(s) stating briefly required input, method of solution, approximations used, second order analysis incorporated, specifications or codes used, cases considered, output generated, extent of previous usage of certification of program(s) and program(s) author.
 2. Identification by number, indexing and cross-referencing of all calculation sheets, including supplemental "long-hand" calculation sheets.
 3. Fully identified, dimensioned, and annotated diagram of each member or structure being considered.
 4. Clear identification and printing of all input and output values, including intermediate values if such values are necessary for orderly review.
 5. Identification of the processing unit, input/output devices, storage requirements, etc., if such supplemental information is significant and necessary for evaluation of the submittal.
- I. Specifications shall conform to Construction Specifications Institute (CSI) 16 Division, 3-part Section Format.
- J. If other than American Railway Engineering Association (AREA), American Society for Testing and Materials (ASTM), or American National Standards Institute (ANSI) specifications are referred to for design, materials or workmanship on the Construction Drawings and specifications for the work, then copies of the applicable sections of such other specifications referred to shall accompany the Construction Drawings and specifications for the work.

SECTION 3. TEMPORARY FACILITIES AND CONTROLS

3.01 REQUIREMENTS OF REGULATORY AGENCIES

Applicant shall:

- A. Obtain and pay all costs for required permits for installation and maintenance of temporary facilities and controls.
- B. Comply with all applicable Federal, State and local codes, regulations and ordinances.
- C. Comply with regulations and requirements of all utility or service companies from which temporary utilities or services are obtained, and pay all costs incurred therewith.

3.02 INSTALLATION AND COORDINATION - GENERAL

Applicant shall:

- A. Install all temporary facilities and controls in a neat and orderly manner.
- B. Make all temporary facilities structurally and functionally sound throughout.
- C. Construct temporary facilities and controls to give continuous service and to provide safe working conditions.
 - 1. Enforce conformance with applicable standards
 - 2. Enforce safe practices.
- D. Modify, extend or relocate temporary facilities and controls as work progress requires.
- E. Locate temporary facilities and controls to avoid interference with, or hazards to:
 - 1. Work or movement of railroad personnel or traffic.
 - 2. Vehicular traffic.
 - 3. General Public.
 - 4. Work of other contracts.
 - 5. Railroad Passengers.
- F. Obtain easements as may be required across non-MBTA Railroad Property.
- G. Provide materials for temporary facilities and controls for the purpose intended and shall not violate requirements of applicable codes and shall not create unsafe conditions.

3.03 SANITARY FACILITIES

Prior to the start of work, the Applicant shall furnish necessary toilet conveniences, secluded from public observation. They shall be kept in a clean and sanitary condition and comply with the requirements and regulations of the area in which the work is performed.

3.04 LIGHT AND POWER

Applicant shall make their own arrangements for obtaining temporary light and power as required for the work, and shall maintain such temporary facilities in a proper and safe condition, including compliance with applicable codes.

3.05 TEMPORARY WATER

Applicant shall make their own arrangements for obtaining all temporary water service as required for the work.

3.06 TEMPORARY TRAFFIC CONTROLS

Applicant shall cooperate with the directives of the MBTA and/or Railroad Company(s) regarding vehicular traffic control and provide any temporary controls or devices required to eliminate or minimize congestion or obstruction of vehicular traffic caused by the work, including use of designated routes of ingress and egress from the work area.

3.07 TEMPORARY WORK AND STORAGE AREAS

- A. The areas designated by the MBTA as the temporary parking, work and storage area(s) will be provided to the Applicant in accordance with the terms of the MBTA License Agreement.
- B. All designated temporary parking, work and storage areas used by the Applicant shall be restored to their original condition prior to completion of the work, subject to inspection and approval of the MBTA and the Railroad Company(s).

3.08 POLLUTION ABATEMENT CONTROLS

Applicant shall:

- A. Conduct operations in a manner to minimize pollution of the environment surrounding the area of work by every means possible. Specific controls shall be provided as follows:
 - 1. Vehicles: All vehicles and material transport trucks leaving the site and entering paved public streets shall be cleaned of mud and dirt clinging to the body and wheels of the vehicle. Trucks arriving at or leaving the site with materials shall be loaded in a manner which will prevent dropping of materials or debris on the streets. Spills of materials in public areas shall be removed immediately at no cost to the MBTA or Railroad Company(s).

2. Waste Materials: No waste or erosion materials shall be allowed to enter natural or man-made water or sewage removal systems. Erosion materials from excavations, borrow areas or stockpiled fill shall be contained within the work area. The Applicant shall develop methods for control of waste and erosion which shall include such means as filtration, settlement and manual removal to satisfy the above requirements. Do not dispose of machinery lubricants, fuels, coolants and solvents on the site. If hazardous waste is encountered, the Applicant shall dispose of it in accordance with all federal, state and local codes. Verification of proper disposal must be provided, in writing, to the MBTA and the Railroad Company(s).
 3. Burning: No burning of waste shall be allowed without prior written permission. In cases where permission is granted, burning shall be conducted in accordance with the regulations of the appropriate jurisdictional agency.
 4. Dust Control: The Applicant shall at all times control the generation of dust by their operations. Control of dust is mandatory and shall be accomplished by water sprinkling or by other methods approved by the MBTA or Railroad Company(s).
 5. Noise Control: The Applicant shall take every action possible to minimize the noise caused by their operation. When required by agencies having jurisdiction, noise producing work shall be performed during less sensitive hours of the day or week as directed by the MBTA or Railroad Company(s) or as required by local ordinance.
 6. Environmental: All local and state environmental laws will be strictly adhered to. All applications, permits, licenses, approvals, etc., will be the sole responsibility of the Applicant.
- B. Submit a program for pollution control with applicable licenses and permits for all piping carrying non-potable liquids, gases or other pollutants.

3.09 PROTECTION OF PERSONS AND PROPERTY

A. Safety Requirements

1. The Applicant must adhere to the most stringent provisions of the applicable statutes and regulations of the political subdivision in which the work is being performed. The Applicant must also observe the Department of Labor-

Occupational Safety, Health Administration provision, pertaining to the safe performance of the work, and further, the methods of performing the work must not involve undue danger to the personnel employed thereon, Railroad Company(s) employees, the public, or to public and private property. Should charges of violation of any of the above be issued to the Applicant in the course of the work, a copy of each charge shall immediately be forwarded to the Railroad Company(s). The Applicant shall pay all fines and penalties levied against him.

2. The Applicant shall erect and maintain, as required by existing conditions and progress of the work, all reasonable safeguards for safety and protection. This includes posting danger signs and other warnings against hazards, promulgating safety regulations and notifying owners and users of adjacent utilities.

B. Safety of Persons and Property - The Applicant shall take all reasonable precautions for the safety of, and shall provide all reasonable protection to prevent damage, injury or loss to:

1. All employees on the work site and all other persons who may be affected.
2. All materials and equipment, whether in storage on or off the site, under the care, custody or control of the Contractor or any of their subcontractors.
3. Other property at the site or adjacent thereto, including walks, pavements, roadways, structures, and utilities not designated for removal, relocation or replacement in the course of construction. Any damage to such items shall be restored to original condition by the Applicant at no cost to the MBTA or Railroad Company(s).

C. First Aid

The Applicant shall maintain adequate first aid supplies at the site as prescribed by Federal, State or Local codes and regulations.

D. Use of Explosives

Non blasting methods are preferred. See "Blasting Specifications."

E. Site Security

The Applicant shall:

1. Maintain a secure work site protecting the MBTA and the Railroad Company(s) interests and property from claims arising from trespass, theft and vandalism.
2. Permit access to the work site only to employees, Contractors and those persons having business related to the work.
3. Provide security measures as required to protect Contractor or subcontractor's tools, equipment and property from damage, theft or vandalism.
4. Assume all costs for any MBTA and/or local police details required by the work.

3.10 VERMIN CONTROL

- A. Do not permit food scraps, lunch bags, food wrappers or other items which would attract rats or other vermin to be left lying around the site. Deposit such items in closed, rat-proof metal containers for disposal on a regular basis.
- B. The Applicant must provide vermin control as required by the MBTA or Railroad Company(s).

3.11 RUBBISH AND DEBRIS REMOVAL

- A. Rubbish and debris resulting from the work must be neatly piled in a single location and legally disposed of at least once a week. If rubbish or debris interferes with railroad activities, or creates a fire or safety hazard, it must be removed on a more frequent basis.
- B. Volatile waste such as mineral spirits, oil, or paint thinner shall not be disposed of in storm or sanitary drains, streams or waterways or any location upon the site.

SECTION 4. PIPELINE OCCUPANCY GENERAL CRITERIA

GENERAL:

4.01 METHOD OF INSTALLATION:

- A In a public way:
 1. No work shall be done without a Railroad Company(s) Inspector present.
 2. Open cuts will not be allowed in or immediately adjacent to an at

grade crossing. Sleeves will be installed by the jerking method, unless otherwise approved by the Director of Engineering for MBTA Railroad Operations.

3. Jerking is the preferred method of installation in or immediately adjacent to and at grade crossing. The sleeve may be installed by the open cut method with the Applicant paying for the complete rebuilding of the crossing, pending approval of the Director of Engineering for MBTA Railroad Operations. Approval will be given only under very unusual circumstances.
4. Jacking is the preferred method of installation in or immediately adjacent to and at grade crossing scheduled for rebuilding. The sleeve may be installed by the open cut method within seven (7) calendar days of the scheduled date of the crossing reconstruction. In the case of any open cut, strict adherence shall be made to the backfill specifications which provide the MBTA with written certification from a testing lab or Professional Engineer, that the backfill density requirements of the MBTA specifications have been met or exceeded.

B. Not within a Public Way:

The preferred method of crossing the railroad is by jacking of a pipe sleeve under the railroad. Only upon written request, will an alternate of open cut be given consideration. The engineering decision shall be based upon, but not limited to, the following: (1) track usage, (2) depth of cut, (3) soil conditions, (4) physical restraints. In the event an open cut is allowed, the following items shall be adhered to, and (5) any other circumstances which may necessitate an open cut.

1. The installation is to be a continuous operation and performed according to an MBTA approved schedule.
2. No work shall be done without a Railroad Company(s) Inspector present.
3. MBTA backfill specifications by the Owner or its Contractor.
4. The Owner or its Contractor may be required to provide a non-refundable lump sum payment for "after the fact maintenance." The determination of this amount is based on the individual situation. No work will be allowed until this payment is received. This payment is not to be confused with payments for Drawings and specification review, flagging, inspection, etc. (also required from the Owner or its Contractor before they enter upon MBTA property.)

4.02 GENERAL REQUIREMENTS

- A. Pipelines under or across MBTA tracks on rights-of-way shall be encased in a larger pipe or conduit called the casing pipe as indicated in Plate II.
- B. Casing pipe will be required for all pipelines carrying oil, gas, petroleum products, or other flammable, highly volatile substances which, from their nature or pressure, might cause damage if escaping on or near MBTA Railroad Property.
- C. For non-pressure sewer or drainage crossings where the installation can be made without interference to railroad operations, the casing pipe may be omitted when the pipe strength is capable of withstanding railroad loading. This type of installation must be approved by the Director of Engineering for MBTA Railroad Operations.
- D. The casing pipe shall be laid across the entire width of the right-of-way. Casing pipe shall extend beyond the right-of-way when the right-of-way line on either side of the tracks is less than the minimum length of casing specified in Section 6, Para. 6.01(E).
- E. Pipelines laid longitudinally on railroad right-of-way shall be located in accordance with Plate III. If located within 25 feet of the closest rail of any track or closer than 45 feet to nearest point of any bridge, building or other structure, the carrier pipe shall be encased.
- F. Where practicable, pipelines shall be located to cross the tracks at approximate right angles, but preferably at not less than 45 degrees.
- G. Pipelines shall not be placed within a culvert, under railroad bridges, or closer than 45 feet to any portion of a railroad bridge, building, or other structure, except in special cases, and then by special design, as approved by the Director of Engineering for MBTA Railroad Operations.
- H. Pipelines carrying liquefied petroleum gas shall, where practicable, cross the railroad where tracks are carried on embankment.
- I. Any replacement or modification of an existing carrier pipe and/or casing shall be considered a new installation, subject to the requirements of these Specifications.
- J. Where laws or orders of public authority prescribe a higher degree of protection than specified herein, the higher degree so prescribed shall be deemed a part of these Specifications.

- K. Pipelines and casings shall be suitably insulated from underground conduits carrying electric wires on MBTA Railroad Property.

4.03 INSPECTION AND TESTING

For pipelines carrying flammable or hazardous materials, ANSI Codes B 31.8 and B 31.4, current at time of constructing the pipeline, shall govern the inspection and testing of the facility on MBTA Railroad Property, except that proof-testing of strength of carrier pipe shall be in accordance with the requirements of ANSI Code B 31.4, as applicable, for all pipelines carrying all liquefied petroleum gas, natural or manufactured gas, and other flammable substances.

4.04 CATHODIC PROTECTION

- A. Cathodic protection shall be applied to all pipelines and casings carrying flammable substances.
- B. Where casing and/or carrier pipe is cathodically protected by other than anodes, the Director of Engineering for MBTA Railroad Operations shall be notified and suitable testing shall be made. This testing shall be witnessed by the Railroad Company(s) to insure that other railroad structures and facilities are adequately protected from the cathodic current in accordance with the recommendations of Reports of Correlating Committee on Cathodic Protection, current issue by the National Association of Corrosion Engineers.

4.05 SOIL INVESTIGATIONS

- A. Soil borings (or other soil investigations approved by the Railroad Company(s)) will be performed to determine the nature of the underlying material for all pipe crossings under tracks. See Test Boring Specifications.
- B. Borings shall be made on each side of the tracks, on the centerline of the pipe crossing, and as close to the tracks as practicable.
- C. Soil borings shall be in accordance with the current issue of the American Railway Engineering Association Specifications, Chapter 1, Part 1, "Specifications for Test Borings". Soils shall be investigated by the split-spoon and/or thin-walled tube method and rock shall be investigated by the Boring method specified therein.
- D. Soil boring logs shall clearly indicate all of the following:
 - 1. Boring number as shown on boring location Drawing.

2. Elevation of ground at boring, using same datum as the pipeline Construction Drawings.
 3. Description or soil classification of soils and rock encountered.
 4. Elevations or depth from surface for each change in strata.
 5. Identification of where samples were taken and percentage of recovery.
 6. Location of ground water at time of sampling and, if available, subsequent readings.
 7. Natural dry density in lbs./sq.ft. for all strata.
 8. Unconfined compressive strength in tons/sq.ft., for all strata.
 9. Water content (percent). Liquid limit (percent) and plastic limit (percent).
 10. Standard penetration in blows/ft.
- E. The location of the carrier pipe and casing shall be superimposed on the boring logs before submission to the Director of Engineering for MBTA Railroad Operations.
- F. Soil investigation by auger, wash, or rotary drilling method is not acceptable.
- G. Soil boring logs shall be accompanied by a Drawing drawn to scale showing location of borings in relation to the tracks and the proposed pipe location, the elevation of around surface at each boring, and the elevation of the base of rail of the tracks.

4.06 GROUND STABILIZATION

Soil stabilization shall take place prior to the start of jacking. Stabilization shall be achieved by dewatering, grouting or a combination of both to maintain the stability of the face of the heading.

- A. The Owner or its Contractor shall lower and maintain the ground water level a minimum of two (2) feet below the invert at all times during construction by well points, vacuum well points, or deep wells to prevent inflow of water and/or soil into the heading. Ground water observation wells shall be installed in the area to be dewatered to demonstrate that the dewatering requirements are being complied with.
- B. The grouting Contractor shall be a specialist in the field with a minimum

of five (5) continuous years of successfully grouting soils. All granular soils (silty sands, sand or sand and gravel) shall be stabilized by injection of a cement or chemical grout from the ground surface or from the pipe heading. The stabilization shall extend as far as necessary outside the periphery of the casing pipe in order to maintain a stable face at the heading.

- C. Railroad Company(s) forces will survey the crossing prior to, during and after construction. If it is necessary to align or surface the tracks as a result of construction, the Railroad Company(s) will perform the work at the expense of the Owner or the Owner's Contractor.

4.07 SUPPORT OF TRACKS

- A. When jacking, boring, or tunneling, temporary track support structures shall be installed. The track support structures shall be provided by the Applicant and installed by the Railroad Company(s) at the Applicant's expense. The Contractors proposed type of temporary track support structures shall be subject to the approval of the Railroad Company(s)
- B. All work involving rail, signals, ties and other track material will be performed by the Railroad Company(s) at the Applicant's expense.
- C. The Applicant shall deliver the track support structures to a site approved by the Railroad Company(s). Provisions for unloading shall be provided by the Applicant at no expense to the Railroad Company(s) and the Applicant shall provide the necessary labor to handle the material for pre-installation inventory.

4.08 GEOTECHNICAL MONITORING

THE FOLLOWING SPECIFICATIONS ARE REQUIRED FOR ALL PIPE JACKING OPERATIONS.

- A. Jacking shall be performed on a continuous basis, 24 hours per day, and 7 days per week.
- B. The monitoring points shall be set up one week before the jacking operation begins. The MBTA and Railroad Company(s) shall be notified. Elevation readings shall begin two days prior to the start of jacking and continue for a minimum of two weeks after the completion of the jacking operation. Initial readings immediately after any surfacing operations shall serve as new baseline figures. All future elevation readings shall be compared to the adjusted baseline. If the

track deviates to a condition not acceptable to the MBTA or Railroad Company(s), corrections shall be made at the proponent's expense.

- C. Elevation readings shall be taken from the top rail of each track.
- D. Elevation readings shall be taken every four hours or two times per shift, i.e., six times per day. The readings shall be faxed to the MBTA and Railroad Company(s) on a daily basis and all information is to be presented in legible print. Additional readings may be required by the MBTA or Railroad Company(s).
- E. Stations shall be spaced at 15-1/2 foot intervals. The number of stations required shall be determined by the depth of the pipe. There shall be a minimum of two stations on either side of the centerline jacking. Additional stations may be required at the discretion of the MBTA or Railroad Company(s),
- F. Elevation readings must show the date, time, weather conditions and temperature. Each reading must also provide the following information: track number, compass direction, station number, base elevation (with date), static elevation, change in elevation (recorded in hundredths and in inches), dynamic reading and total deflection in inches. See sample sheet attached.
- G. Station "0" shall be located at the centerline of the pipe jacking with Stations 1 and being to the right and Stations -1 and -2 being to the left when standing in the gauge of the near track and looking at the receiving pit. In multiple track areas the stations as determined herein are to be carried across each track perpendicular to the near track.
- H. Elevation readings taken from the top of the rail for static measurement and the dynamic readings shall be combined and the sum compared to the adjusted baseline. This reading will demonstrate the difference in elevation caused by the jacking operation.
- I. The MBTA requires that the truck be maintained at all times within established criteria for the specific track classification. At the completion of the project the requirement for tamping and realigning the tracks, caused by the settlement from the construction activity, remains with the Contractor for the duration as specified by the MBTA in their initial review of the work plans. This tamping and track realignment will be performed by the MBTA or Railroad Company(s) at the sole expense of the Contractor.

4.09 PIPELINES ON BRIDGES

- A. Pipelines carrying flammable or non-flammable substances which by their nature might cause damage if escaping on or near railroad facilities or personnel shall not be installed on bridges over railroad tracks or bridges carting railroad tracks.
- B. The Director of Engineering for MBTA Railroad Operations may approve such an installation when it is demonstrated that no practicable alternative is available.
- C. When allowed by the Director of Engineering for MBTA Railroad Operations, pipelines on bridges shall be located in a way to minimize the possibility of damage from vehicles, railroad equipment, vandalism and other external causes. Pipelines on bridges may be installed in a utility bay that is constructed between the girders of the bridge. The utility bay shall be protected from the environment by a removable shield bolted to the girders. This will allow utility companies to comply with the Code of Federal Regulations for Periodic Inspection.
- D. In the event of pipe relocation due to the reconstruction of a bridge, the installation of the new pipe must comply with the requirements in these Specifications.

4.10 BONDING AND GROUNDING OF PIPELINES IN ELECTRIFIED TERRITORY

- A. Carrier pipe shall be enclosed in a metal casing that is isolated from carrier pipe by approved insulators having a dielectric value of not less than 25 kV that provide an air gap between carrier pipe and casing of not less than 2 inches.
- B. Carrier pipe supporting hangers, mountings or cradles shall provide an insulation value of not less than 25 kV and an air gap of not less than 2 inches between casing and any portion of mounting assembly.
- C. Any grounding or isolation methods used must have a minimum dielectric of 25,000 volts.

4.11 ABANDONED PIPELINES OR FACILITIES

- A. For all pipeline occupations on the railroad right-of-way, the owner of the pipeline shall notify the MBTA, in writing, of the intention to abandon the pipeline. Upon abandonment the carrier pipe shall be removed and the casing shall be filled with cement grout, compacted sand or other material approved by the Director of Engineering for

MBTA Railroad Operations. If it is impractical to remove the carrier pipe, then the carrier must be filled along with the annular space between the casing and carrier.

- B. Facilities other than pipelines shall be removed or altered at abandonment to the satisfaction of the Director of Engineering for MBTA Railroad Operations.

4.12 DRAINAGE

- A. Occupancies shall be designed, and constructed, so that adequate and uninterrupted drainage of railroad right-of-way is maintained. If it becomes necessary to block a ditch, pipe or other drainage facility, the applicant shall install temporary pipes, ditches or other drainage facilities as required to maintain adequate drainage, as approved by the MBTA or Railroad Company(s). Upon completion of the work, the temporary drainage facilities shall be removed and the permanent facilities restored.
- B. Water may not be pumped or disposed of onto railroad rights-of-way unless discharged into an existing drainage facility, providing discharge does not cause erosion or leave sediment.
- C. When water runoff is disposed of onto MBTA Railroad Property, it must be demonstrated to the Railroad Company(s) that the existing drainage facility can accommodate the increased runoff. Drainage calculations stamped by a Registered Professional Engineer must accompany all requests to use railroad culverts or drainage ditches.
- D. If in the estimation of the Director of Engineering for MBTA Railroad Operations or their authorized representative, the railroad culvert or drainage ditch has to be cleaned in order to allow the increased flow to safely pass through the culvert, it must be cleaned at the expense of the applicant.

SECTION 5. CARRIER PIPE

GENERAL:

5.01 DESIGN CRITERIA

- A. If the maximum allowable stress in the carrier pipe on either side of the occupancy of MBTA Railroad Property is less than specified herein, the carrier pipe on MBTA Railroad Property shall be designed at the same stress as the adjacent carrier pipe.

- B. Requirements for carrier pipe under railroad tracks shall apply for a minimum distance equal to that of the casing pipe.
- C. Carrier pipes within a casing shall be designed for railroad live loads as if they were not encased.
- D. All pipes, ditches and other structures carrying surface drainage on MBTA Railroad Property and/or crossing under railroad tracks shall be designed to carry the run-off from a one hundred (100) year storm. Computations indicating this design and suitable topographic plans, prepared by a Registered Professional Engineer, shall be submitted to the Director of Engineering for MBTA Railroad Operations, or their authorized representative, for approval. If the drainage is to discharge into an existing drainage channel on railroad right-of-way and/or under railroad tracks, the computations should include the hydraulic analysis of any existing structures. Submitted with the computations should be formal approval of the proposed design by the appropriate governmental agency.

PRODUCTS:

5.02 GENERAL

- A. All pipes shall be designed for the external and internal loads to which they will be subjected. The dead load of earth shall be considered 120 pounds per cubic foot. Railroad live loading shall be Cooper's E-80 with 50% added for impact. On railroad right-of-way or where railroad loading will be experienced, the following shall be the minimum requirements for carrier pipes:
 - 1. Reinforced concrete pipe - ASTM Spec. C-76, Class V, Wall C.
 - 2. Ductile Iron Pipe - For Culverts and Gravity Sewers - ASTM Spec, A-142 Extra Heavy.

5.03 OIL AND GAS PIPES

- A. Pipelines carrying oil, liquefied petroleum gas, natural or manufactured gas and other flammable products shall conform to the requirements of the current ANSI B 31.4, with Addenda, "Liquefied Petroleum Transportation Piping Systems," ANSI B 31.8, "Gas Transmission and Distribution Piping Systems," and other applicable ANSI codes, except that the minimum allowable stresses for the design of steel pipe shall not exceed the following percentages of the specified minimum yield strength (multiplied by the longitudinal joint factor) of the pipe as defined in the ANSI Codes:

1. Steel pipe within a casing under, across and longitudinally on MBTA Railroad Property. (The following percentages apply to hoop stress):
 - a. Seventy-two percent for installation on oil pipelines.
 - b. Fifty percent for pipelines carrying liquefied petroleum gas and other flammable Liquids with low flash point.
 - c. Sixty percent for installations on gas pipelines.
 2. Steel pipe without a casing laid longitudinally on MBTA Railroad Property. (The following percentages apply to hoop stress):
 - a. Sixty percent for installations on oil pipelines.
 - b. Forty percent for pipelines carrying liquefied petroleum gas and other flammable Liquids with low flash point.
 - c. Forty percent for installations on gas pipelines.
- B. Design computations showing compliance with the requirements of Paragraph 5.03(A) above, and prepared by a Registered Professional Engineer, shall accompany the application for occupancy.
- 5.04 CAST IRON PIPE: For water and other materials under pressure shall conform to the current ANSI specifications A-21 Series 21/45 Iron strength with plain end, compression type or mechanical joints. The strength to sustain external railroad and other loadings shall be computed in accordance with the current ANSI A-21.1 "Thickness Design of Cast Iron Pipe."
- 5.05 VITRIFIED CLAY PIPE: ASTM Spec C-700, Extra Strength.
- 5.06 CORRUGATED METAL PIPE: AREA Spec Chapter I, Part 4
- 5.07 ASBESTOS CEMENT PIPE (Non-pressure): ASTM Spec. C-428, C1. 5000 Min. Pressure: AWWA Spec. C400, C1. 150 Min.
- 5.08 OTHER: Other miscellaneous piping not specified above shall be submitted to approval by the Director of Engineering for MBTA Railroad Operations.
- 5.09 SHUT-OFF VALVE
- A. Provide accessible emergency shut-off valves at each side of the railroad within distances and at locations as directed by the Chief Engineering Officer.

- B. Where pipelines are provided with automatic control stations and within distances approved by the Director of Engineering for MBTA Railroad Operations, no additional valves will be required.

5.10 SIGNS

- A. Prominently identify all pipelines at rights-of-way by durable, weatherproof signs located over the centerline of the pipe. Mark pipelines at under crossings on both sides of track. Signs shall display the following:
 - 1. Name and address of pipeline Owner.
 - 2. Contents of Pipe.
 - 3. Pressure in Pipe.
 - 4. Depth below grade at point of sign.
 - 5. Emergency telephone in event of pipe rupture.
 - 6. Railroad File Number.
- B. For pipelines running longitudinally on MBTA Railroad Property, place signs over the pipe (or offset and appropriately mark) at all changes in direction the pipeline. Locate signs so that when standing at one sign, the next adjacent marker in either direction is visible. In no event shall pipeline identification signs be placed more than 500 feet apart, unless otherwise directed by the Director of Engineering for MBTA Railroad Operations.
- C. Submit details of signs (materials, size, methods of support, etc.) to the Director of Engineering for MBTA Railroad Operations for approval.

EXECUTION:

5.11 INSTALLATION:

- A. Install carrier pipes in accordance with approved Construction Drawings, requirements of this specification, and all applicable codes and ordinances.
- B. Install carrier pipes with sufficient slack so they are not in tension.

SECTION 6. CASING PIPE

GENERAL:

6.01 DESIGN CRITERIA

- A. Casing pipe and joints shall be of metal and of leak-proof construction.
- B. Casing pipe shall be designed for the earth and/or other pressures present, and for railroad live load. The dead load of earth shall be considered 120 pounds per cubic foot. Railroad Live load shall be Cooper E-80 with 50g added for impact.
- C. The inside diameter of the casing pipe shall be such as to allow the carrier pipe to be removed subsequently without disturbing the casing or the roadbed. For carrier pipe less than six (6) inches in diameter, the inside diameter of the casing pipe shall be at least two (2) inches greater than the largest outside diameter of the carrier pipe joints or couplings. For carrier pipe six (6) inches and over in diameter, the inside diameter of the carrier pipe shall be at least four (4) inches greater than the largest outside diameter of the carrier pipe joints or couplings.
- D. For flexible casing pipe, a minimum vertical deflection of 3 percent of its diameter, plus 1/2 inch, shall be provided so that no loads from the roadbed, track, traffic or casing pipe itself are transmitted to the carrier pipe. When insulators are used on the carrier pipe, the inside diameter of the flexible casing pipe shall be at least two (2) inches greater than the outside diameter of the carrier pipe for pipe less than eight (8) inches in diameter; at least 3-1/4 inches greater for pipe 8 to 16 inches in diameter, and at least 4-1/2 inches greater for pipe 18 inches and over in diameter. In no event shall the casing pipe diameter be greater than is necessary to permit the insertion of the carrier pipe.
- E. Casing pipe under railroad tracks and across MBTA Railroad Property shall extend the greater of the following distances, measured at right angles to centerline of track:
 - 1. Across the entire width of MBTA Railroad Property.
 - 2. Two (2) feet beyond ditch line.
 - 3. Three (3) feet beyond toe of slope.
 - 4. A minimum distance of 25 feet each side from centerline of outside track when casing is sealed at both ends.
 - 5. A minimum distance of 45 feet from centerline of outside track when casing is open at both ends.

- F. If additional tracks are constructed in the future, the casing shall be extended at the expense of the Applicant.
- G. Table of Live Loads

LIVE LOADS, INCLUDING IMPACT, FOR VARIOUS HEIGHTS OF COVER
FOR COOPER E- 80

COVER (FT)	LOAD (PSF)	COVER (FT)	LOAD (PSF)	COVER (FT)	LOAD (PSF)
2	3800	10	1100	20	300
5	2400	12	800	30	100
8	1600	15	600		

6.02 PROTECTION AT ENDS OF CASING

- A. Casings for carriers of flammable substances shall be sealed to the outside of the carrier pipe. Details of seals shall be shown on the Drawings.
- B. Casings for carriers of non-flammable substances shall have both ends of the casing blocked in such a way as to prevent the entrance of foreign material, but allowing leakage to pass in the event of a carrier break.
- C. Where ends of casing are at or above ground surface and above high water level, they may be left open, provided drainage is afforded in such a manner that leakage will be conducted away from railroad tracks and structures.

6.03 VENTS

- A. Sealed casings for flammable substances shall be properly vented. Vent pipes shall be of sufficient diameter, but in no case less than two (2) inches in diameter, and shall be attached near each end of the casing and project through the ground surface at right-of-way lines or not less than 45 feet (measured at right angles from centerline of nearest track).
- B. Vent pipes shall extend at least four (4) feet above the ground surface. Top of vent pipe shall have a down-turned elbow, properly screened, or a relief valve. Vents in locations subject to high water shall be extended above the maximum elevation of high water and shall be supported and protected in a manner approved by the Director of Engineering for MBTA Railroad Operations.
- C. Vent pipes shall be at least four (4) feet from the closest aerial electric

wires.

- D. When the pipeline is in a public highway, street-type vents shall be installed.

PRODUCTS:

6.04 STEEL PIPE

The minimum yield strength for steel pipe shall be 35,000psi. Smooth wall pipes with a nominal diameter greater than 70 inches require special approval by the Director of Engineering for MBTA Railroad Operations. See Plate V, "Table of Minimal Wall Thickness for Steel Casing Pipe."

6.05 CAST IRON PIPE

May be used for a casing, provided the method of installation is by open trench. Cast iron pipe shall conform to ASTM Specification A-142, Extra Heavy. The pipe shall be of the mechanical joint type or plain end type with compression type couplings.

6.06 CORRUGATED METAL PIPE AND CORRUGATED STRUCTURAL PLATE PIPE

May be used for casing only when emplaced by the open-cut method. Jacking or boring through railroad embankment is not permitted. Pipe shall be bituminous coated and shall conform to AREA Specifications Chapter 1, Part 4.

6.07 REINFORCED CONCRETE PIPE

Shall conform to ASTM Specification C 76, Class V, Wall C. It shall be used only in the open cut and jacking methods of installation. If concrete pipe is to be jacked into place, grout holes tapped for at least 1-1/2 inch pipe spaced at approximately 8 feet around the circumference and approximately 4 feet longitudinally shall be cast into the pipe at manufacture. Immediately upon completion of jacking operations, the installation shall be pressure grouted.

6.08 TUNNEL LINER PLATES

Shall be four flange and otherwise conform to American Railway Engineering Association Specifications Chapter 1, Part 4. In no event shall the liner plate thickness be less than 0.1046 inches. Tunnel liner plates are to be used only to maintain a tunneled opening until the carrier pipe is installed. After installation the annular space between the carrier and liner must be filled

with 1:6 cement grout or lined with 6 inches of concrete, reinforced with 6x6-6/6 wire mesh for tunnels up to 108 inches in diameter. Required thickness of lining for larger tunnels shall be determined by span and structural analysis. Manufacturer's Shop Detail Drawings and manufacturer's computations showing the ability of the tunnel liner plates to resist the jacking stresses shall be submitted to the Director of Engineering for MBTA Railroad Operations for approval.

EXECUTION:

6.09 DEPTH OF INSTALLATION:

- A. Casing pipe under railroad tracks and across MBTA Railroad Property shall be at least 6-1/2 feet from top of rail to top of casing at its closest point. Under secondary or industrial tracks this distance shall be at least 5-1/2 feet. On other portions of MBTA Railroad Property where casing is not directly beneath any track, the depth from ground surface or from bottom of ditches to top of casing shall be at least four (4) feet, unless otherwise specified herein.
- B. Pipelines laid longitudinally on MBTA Railroad Property 50 feet or less from centerline of track shall be buried not less than five (5) feet from ground surface to top of pipe. This applies to all pipelines carrying oil, gas, petroleum products, or other flammable or highly volatile substances under pressure, and all non-flammable substances which by their nature or presence in the judgment of the Director of Engineering for MBTA Railroad Operations may be hazardous to life or property. For pipelines carrying water, sewage and non-flammable substances, the distance from surface of ground to top of pipe shall not be less than four (4) feet.
- C. Pipelines located within the line of track live load influence (as shown on Plates II and III) are subject to railroad loading and require a casing or are to be of special design approved by the Director of Engineering for MBTA Railroad Operations. All longitudinal occupation locations must be approved by the Chief Engineering Officer.
- D. The minimum cover shall be at least three (3) feet when pipeline is laid more than 50 feet from center line of track.
- E. Pipelines installed under or adjacent to any overhead structure must be a minimum of 29 feet from the bottom of the structure to the top of the casing. Such installations must comply with the above requirements.

6.10 METHOD OF INSTALLATION

- A. The Owner or its Contractor shall submit to the Director of Engineering for MBTA Railroad Operations, data and information demonstrating that the Contractor or their subcontractors have had successful previous experience in jacking, or using the proposed method of installation, in similar situations.
- B. Before any work is begun within the limits of jacking, the Owner or its Contractor shall have assembled all tools, materials, and equipment which will be required. When the Owner or its Contractor has started the jacking operation, they shall proceed in a continuous operation without stopping. This will minimize the tendency of the material to freeze around the pipe.
- C. A jacking shield shall be used and jacked ahead of the casing pipe. The excavation within the jacking pipe should not advance beyond the head of the pipe shield. If the stability at the face needs to be maintained from raveling or running soil, suitable temporary bulkheads, struts, and bracing shall be required. After completion of the sleeve installation the annular space around it shall be completely grouted with cement grout under pressure.
- D. Casing pipe ends shall be beveled with a single V-groove toe field welding. Pipe joints shall be butt welded and shall be a full penetration on the outside circumference of the pipe. The single V-groove butt weld shall conform to the latest A.W.S. Welding Code. All joints of the casing pipe shall be butt welded, by a certified welder, prior to being subject to the jacking operation.

Alternate method: The casing pipe may be jacked without being butt welded through the use of a continuous 1/2"x12" interior collar plate. The collar plate shall be welded completely upon completion of the jacking operation. All welding shall conform to the latest A.W.S. Welding Code, and shall be performed by a certified welder.

6.11 CONSTRUCTION:

- A. The casing pipe shall be constructed so as to prevent leakage of any substance from the casing throughout its length, except where the ends are left open, or through vent pipes when the ends are sealed. The casing shall be installed so as to prevent the formation of a waterway under the railroad, shall have an even bearing throughout its length, and shall slope to one end (except for longitudinal occupancy).
- B. Casing pipes shall be installed by the following methods:

1. Jacking

- a. This method shall be in accordance with the most current edition of the American Railway Engineering Association Specifications, "Jacking Culvert Pipe Through Fills." This operation shall be conducted without hand mining ahead of the pipe and without the use of any type of boring, auguring, or drilling equipment.
- b. Bracing and backstops shall be designed and jacks of sufficient rating used so that the jacking will be continuous.

2. Drilling

This method employs the use of an oil field type rock roller bit or a plate bit made up of individual roger cutter units which are welded to the pipe casing being installed and which are turned as it is advanced. The pipe is turned for its entire length from the drilling machine to the ground being drilled. A high density slurry is injected through a small supply line to the head which acts as a cutter lubricant. This slurry is injected at the rear of the cutter units to prevent any jetting action ahead of the pipe. The drilling machine runs on a set of steel rails and is advanced (thus advancing the pipe) by a set of hydraulic jacks. The method is the same whether earth or rock is being drilled. Any other drilling methods shall be submitted to the Director of Engineering for MBTA Railroad Operations for approval.

3. Tunneling

- a. Tunneling operations shall be conducted as approved by the Railroad Company(s). Care shall be exercised in trimming the surface of the excavated section in order that the steel liner plates fit snugly against the undisturbed material. Excavation shall not be advanced ahead of the previously installed liner plates any more than is necessary for the installation of the succeeding liner plate. The vertical face of the excavation shall be supported as necessary to prevent sloughing. At any interruption of the tunneling operation, the heading shall be completely bulkheaded. Tunneling shall be conducted continuously, on a 24 hour basis until the tunnel liners extend at least one foot beyond the railroad line of influence.
- b. When tunneling, tight breasting must be maintained around the entire face. On any shutdowns (under or beyond railroad influence line, see Plate II), the entire

face shall be fully breasted and packed with hay.

- c. The tail void shall be filled with pea stone (or other approved material) simultaneously with each advancement of the shield.
- d. An ample supply of hay and/or sandbags must be kept at the site to fill any voids caused by the removal of large stones or other obstructions extending outside the shield.
- e. A uniform mixture of 1:6 cement grout shall be placed under pressure behind the liner plates, in addition to the previously placed pea stone. Grout holes, tapped for at least 1-1/2 inch pipe and spaced 3 feet around the tunnel liner, shall be placed in every other ring. Grouting shall start at the lowest dole and proceed upwards. A threaded plug shall be installed in each grout hole as the grouting is completed at that hole.
- f. Grouting shall be kept as close to the heading as possible, using grout stops behind the liner plates. If necessary, grouting shall proceed as directed by the Railroad Company(s), but in no event shall more than six lineal feet of tunnel be progressed beyond the grouting.

4. Tunneling Shields

- a. All pipes 70 inches and larger in diameter shall be emplaced with the use of a tunneling shield, unless otherwise approved by the Director of Engineering for MBTA Railroad Operations. Pipes of smaller diameter may also require a shield when, at the sole discretion of the Director of Engineering for MBTA Railroad Operations, soil, or other conditions indicate its need.
- b. The shield shall be of steel construction, designed to support railroad track loading as specified in Paragraph 6.01 B herein, in addition to other loadings it must sustain. The advancing face shall be provided with a hood, extending no less than 20 inches beyond the face and extending around no less than the upper 240 degrees of the total circumference. Installations made with liner plates shall be provided with a full 360 degree shield. It shall be of sufficient length to permit the installation of at least one complete ring of liner plates within the shield before it is advanced for the installation of the next ring of liner plates, It shall conform to and not exceed the outside dimensions of the pipe being emplaced by more than one inch at any point in the periphery.

- c. The shield must be adequately braced and provided with necessary appurtenances for completely bulkheading the face with horizontal breastboards, and arrange so that the excavation can be benched as may be necessary. Excavation shall not be advanced beyond the edge of the hood, unless otherwise approved by the Railroad Company(s).
 - d. Manufacturer's Shop Detail Drawings and computations showing the ability of the tunnel liner plates to resist the jacking stresses shall be submitted to the Director of Engineering for MBTA Railroad Operations for approval.
 - e. For jacking reinforced concrete pipe, the shield shall be fabricated as a special section of reinforced concrete pipe with the steel cutting edge, hood, breasting attachments, etc., cast into the pipe. The wall thickness and reinforcing shall be designed for the jacking stresses.
 - f. Grout holes tapped for no less than 1-1/2 inch pipe, spaced at approximately 3 foot centers around the circumference of the shield (or the aforementioned special reinforced concrete section) and no more than 4 foot centers longitudinally shall be provided.
 - g. Detail Drawings sufficient to determine the adequacy of the shield, accompanied with design calculations prepared by a Registered Professional Engineer, shall be submitted to the Director of Engineering for MBTA Railroad Operations for approval and no work shall proceed until such approval is obtained.
5. Boring
- a. This method consists of pushing the pipe into the fill with a boring auger rotating within the pipe to remove the spoil. When augers, or similar devices, are used for pipe emplacement, the front of the pipe shall be provided with mechanical arrangements or devices that will positively prevent the auger and cutting head from leading the pipe so that there will be no unsupported excavation ahead of the pipe. The auger and cutting head arrangement shall be removable from within the pipe in the event an obstruction is encountered. The over-cut by the cutting head shall not exceed the outside diameter of the pipe by more than one-half inch. The face of the cutting head shall be arranged to provide reasonable obstruction to the free flow of soft or poor material.
 - b. Drawings and descriptions of the auger stop arrangement to be used shall be submitted to the Director of Engineering for MBTA Railroad Operations for approval,

and no work shall proceed until such approval is obtained and the arrangement is inspected in the field by the Railroad Company(s).

- c. The use of water or other Liquids to facilitate casing emplacement and/or spoil removal is prohibited.
 - d. Any method which employs simultaneous boring and jacking or drilling and jacking for pipes over 8 inches in diameter which does not have the above approved arrangement WILL NOT BE PERMITTED. For pipes 8 inches and less in diameter, augering or boring without this arrangement may be considered for use only as approved by the Director of Engineering for MBTA Railroad Operations.
- C. If an obstruction is encountered during the installation which stops the forward action of the pipe, and it becomes evident that it is impossible to advance the pipe, operations shall cease and the pipe shall be abandoned in place and filled completely with grout, in accordance with Section 4, Paragraph 4.10.
- D. Bored or jacked installations shall have a bored hole essentially the same as the outside diameter of the pipe plus the thickness of the protective coating. If voids should develop or if the bored hole diameter is greater than the outside diameter of the pipe (plus coating) by more than 1 inch, grouting or other methods approved by the Railroad Company(s) shall be employed to fill such voids.
- E. Pressure grouting or freezing of the soils before or during jacking, boring, or tunneling may be required at the direction of the Railroad Company(s) to stabilize the soils, control water, prevent loss of material and prevent settlement or displacement of the embankment and/or tracks. Grout shall be cement, chemical or other special injection material selected to accomplish the necessary stabilization.
- F. The materials to be used and the method of injection shall be prepared by a Registered Professional Engineer (Geotechnical), or by an experienced and qualified company specializing in this work and submitted for approval to the Railroad Company(s) before the start of work. Proof of experience and competency shall accompany the submission.
- G. When water is expected to be encountered, pumps of sufficient capacity shall be provided and maintained at the site, and continually attended on a 24-hour basis, until in the sole judgment of the Railroad Company(s), their operation can be safely halted.

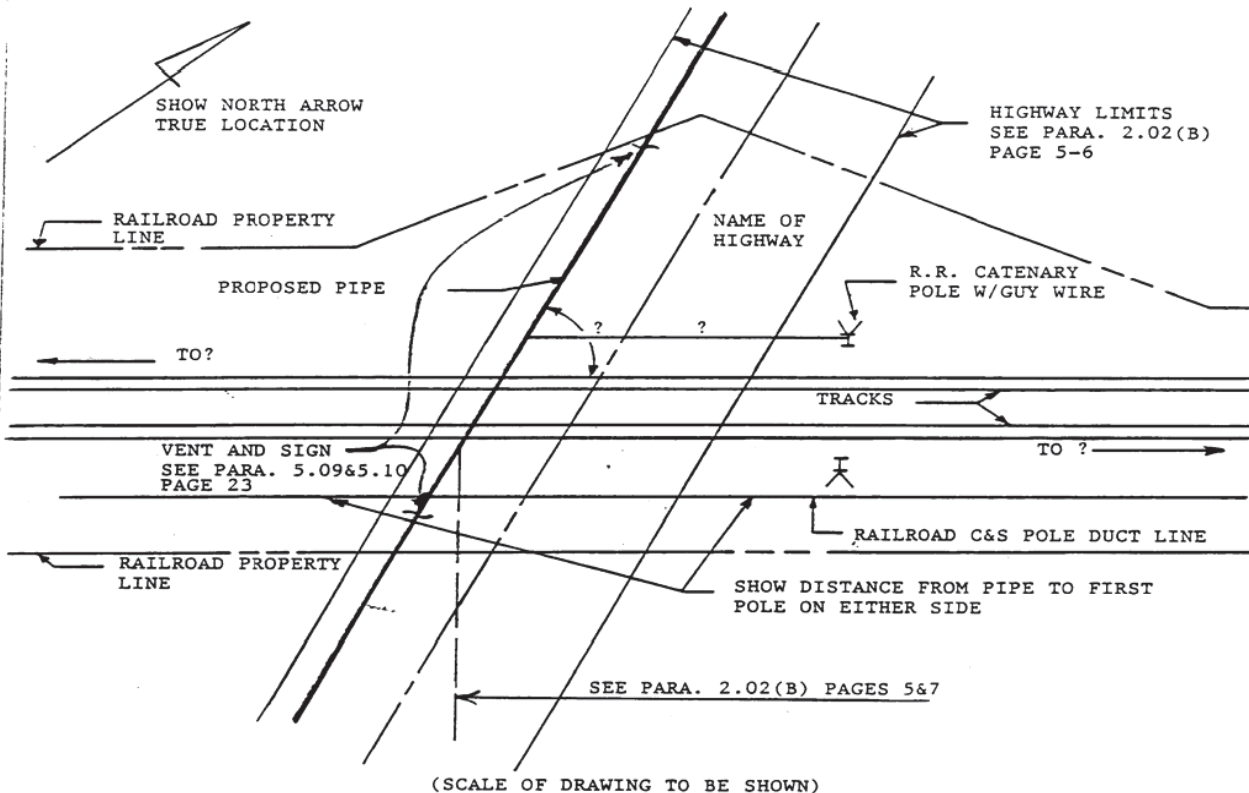
When dewatering, close observation shall be maintained to detect any settlement or displacement of railroad embankment, tracks, and facilities.

- H. Proposed methods of dewatering must be submitted to the Railroad Company(s) for approval prior to implementation. The discharge from the dewatering operations in the vicinity of the railroad shall be carefully monitored. If in the opinion of the Railroad Company(s), there is an excessive loss of fine soil particles at any time during the dewatering process, the dewatering shall be halted immediately. The dewatering operation cannot resume until the unsatisfactory condition is remedied to the satisfaction of the Railroad Company(s).

PLATE I

PIPE CROSSING

INFORMATION TO BE SHOWN ON PLAN SECTION OF DRAWING



NOTE:

IF MANHOLES ARE PLACED ON MBTA RAILROAD PROPERTY, DETAILS OF SAME, WITH CLEARANCES TO THE CENTERLINE OF THE NEAREST TRACK ARE TO BE SHOWN ON THE DRAWINGS.

IF THE PROPOSED PIPE IS TO SERVE A NEW DEVELOPMENT, A MAP SHOWING THE AREA IN RELATION TO ESTABLISHED AREAS AND ROADS IS TO BE SENT WITH THE REQUEST.

THE PROPOSED PIPE IS NOT WHOLLY WITHIN HIGHWAY LIMITS, THE SAME INFORMATION IS REQUIRED AS SHOWN ON THIS PLATE.

PLATE II

PIPE CROSSING

INFORMATION TO BE SHOWN ON PROFILE SECTION OF DRAWING

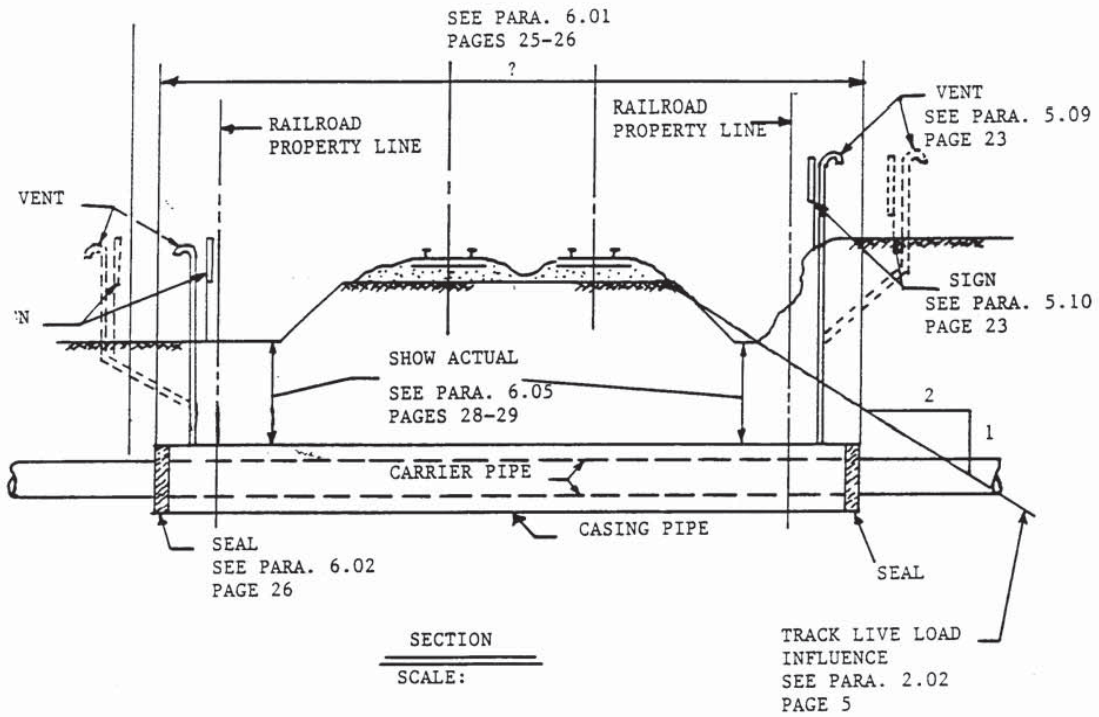
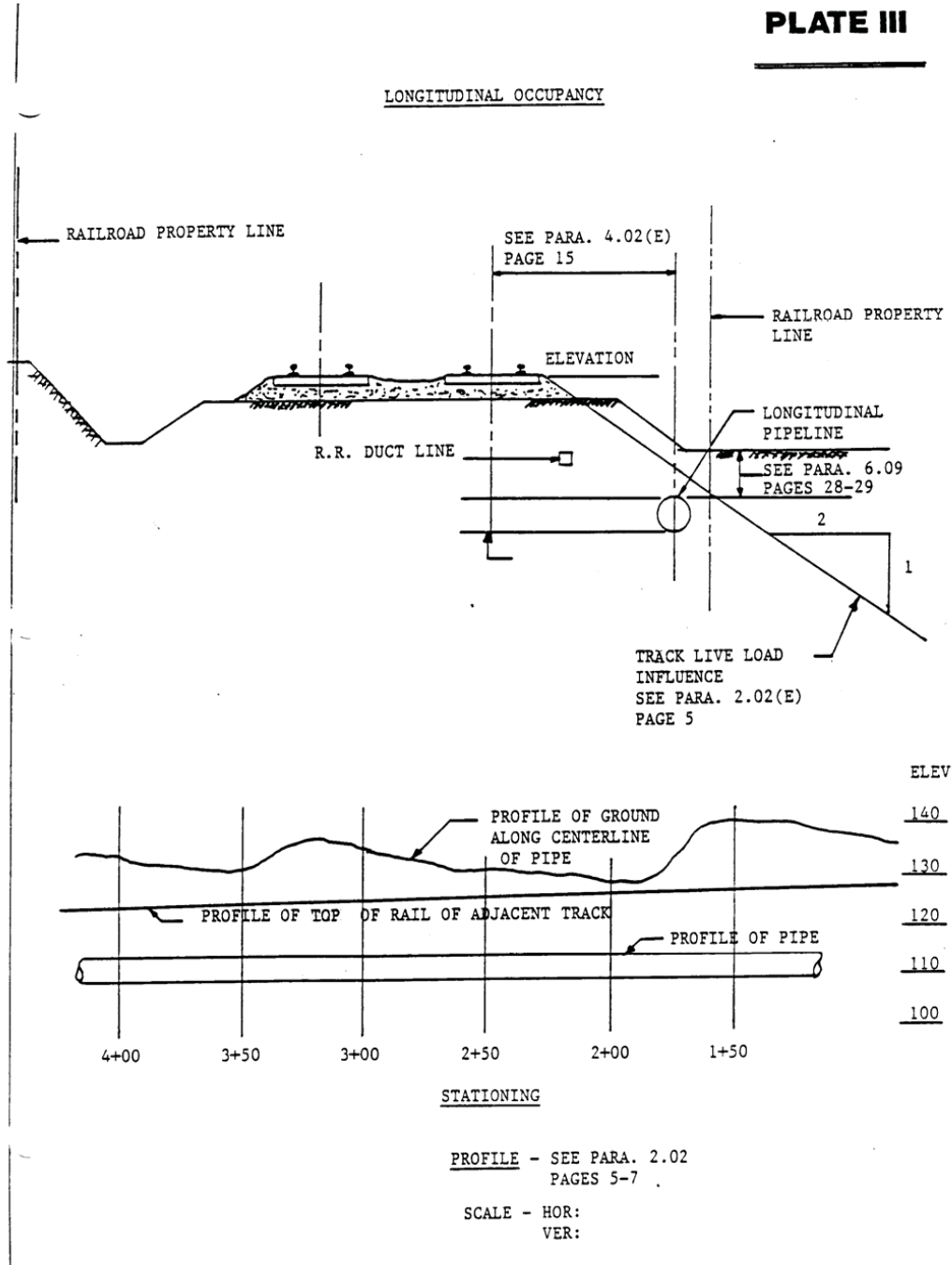


PLATE III

LONGITUDINAL OCCUPANCY



PIPE CROSSING DATA SHEET

PLATE IV

In addition to plan and profile of crossing, Drawings submitted for the Railroad Company(s) approval shall contain the following information:

	<u>Pipe Data</u>	
	<u>Carrier Pipe</u>	<u>Casing Pipe</u>
Contents To Be Handled	_____	_____
Normal Operating Pressure	_____	_____
Normal Size of Pipe	_____	_____
O.S. Diameter	_____	_____
I.S. Diameter Wall	_____	_____
Thickness Weight	_____	_____
Per Foot Material	_____	_____
Process of Manufacture	_____	_____
Specification	_____	_____
Grade or Class	_____	_____
Test Pressure	_____	_____
Type of Joint	_____	_____
Type of Coating	_____	_____
Details of Cathodic Protection	_____	_____
Details of Seal or Protection at Ends of Casing:	_____	_____
Method of Installation	_____	_____
Character of Subsurface: Material At the Crossing Location	_____	_____
Approximate Ground Water Level	_____	_____
Source of Information on Sub- surface conditions (Test Pits, Borings or Other)	_____	_____

NOTE: Any soil investigation made on MBTA Railroad Property, or adjacent to tracks shall be carried on under the supervision of the Railroad Company(s).

PLATE V

TABLE OF MINIMUM WALL THICKNESS FOR STEEL CASING PIPE
(FOR INFORMATION ONLY)

PROTECTED WALL THICKNESS

PIPE SIZE (INCHES)	WALL THICKNESS (PROTECTED)
10	0.375
12	0.375
14	0.375
16	0.375
18	0.375
20	0.375
22	0.375
24	0.375
26	0.375
28	0.406
30	0.469
32	0.501
34	0.532
36	0.532
38	0.569
40	0.569
42	0.569
44	0.594
46	0.688
48	0.688
50	0.688
52	0.813
54	0.813
56	0.876
58	0.876
60	0.876
62	0.876
64	0.876
66	0.876
68	0.876
70	0.906

NOTE: - FOR UNPROTECTED PIPE 26" AND UNDER ADD 0.032" TO PROTECTED WALL THICKNESS. FOR UNPROTECTED PIPE 28" AND OVER, ADD 0.063" TO PROTECTED WALL THICKNESS.



**MASSACHUSETTS BAY
TRANSPORTATION
AUTHORITY**

RAILROAD OPERATIONS DIRECTORATE

V

SPECIFICATIONS FOR WIRE CONDUIT AND CABLE
OCCUPATIONS

SECTION 1. SCOPE

- 1.01 These specifications apply to the design of electric transmission wires and cables (power and communication) which are to be located over, under, across or upon property, facilities, and tracks owned by the MBTA.

SECTION 2. LICENSE TO ENTER MBTA RAILROAD PROPERTY

- 2.01 Individuals, corporations, or municipalities desiring wire or cable occupations must agree, upon approval of the construction details by the Director of Engineering for MBTA Railroad Operations, to execute an appropriate occupational agreement and pay any required fees and/or rentals outlined therein.

- 2.02 Application for an occupancy shall be submitted in writing to:

AGM for Real Estate and Asset Development
MBTA, 10 Park Plaza
Boston, Massachusetts 02116

See "Guidelines and Procedures for Construction on MBTA Railroad Property."

- 2.03 All applications shall be accompanied with six (6) copies of all Construction Drawings, specifications and computations concerning the proposed occupancy.

SECTION 3. APPROVAL OF DRAWINGS

- 3.01 Entry upon MBTA Railroad Property for the purpose of conducting surveys, field inspections, obtaining soil information, or any other purpose associated with the design and engineering of the proposed occupancy will be permitted only with a proper entry permit prepared by the MBTA Real Estate Department. The issuance of such a permit does not constitute authority to proceed with the actual construction. Construction cannot begin until the proper insurance certificate is received and a formal agreement is executed by the MBTA and permission is received by the Railroad Company(s).

- 3.02 Drawings shall be drawn to scale and show the following: (See attached plates I -VI)

- A. Plan view of crossing or occupation in relation to all Railroad Company(s) facilities. (See Plate 1)
- B. Location of wire or cane (in feet) from nearest railroad mile post, center line of a railroad bridge (giving bridge number), or center line of a passenger station. In all cases, the name of the County and City or

Town in which the proposed facilities are located must be shown.

- C. Profile of ground on center line of pole or tower line, showing clearances between top of rail and bottom of sag, as well as clearances from bottom wire or cable to top wire or cable of the MBTA's transmission, signal and communication lines and catenary. If none of these facilities are in existence at the point of crossing, the plan should so indicate. Actual under-clearances are to be shown. (See Plate V for the required clearances).
- D. Show all known property lines. If wires, cables or conduits are within public highway limits, such limits should be clearly indicated with dimensions from center line.
- E. The Drawing must be specific as to:
 - 1. Base diameter, height, class and bury of poles. Poles shall be set no closer than 13' 6" from face of pole to center line of nearest track. When necessary, however, each location will be analyzed by the MBTA to consider speed, traffic, access, etc.
 - 2. Number, size and material of power wires, as well as number of pairs in communication cables.
 - 3. Nominal voltage of line, type of current and frequency.
 - 4. Number, location, size and material of anchors and all guying for poles and arms.

NOTE: Double cross-arms are required on poles adjacent to track. Any tower designs must be accompanied by engineering computations and data.

SECTION 4. CONSTRUCTION REQUIREMENTS

- 4.01 Power and communication lines shall be constructed in accordance with "Safety Rules for the Installation and Maintenance of Electric Supply and Communication Lines, National Electrical Safety Code Handbook, Part 2" (current issue), with the following exceptions:
 - A. Item 3 (c), page 2.
 - B. Casing pipes to contain power or communication wires or cables having an outside diameter of over four (4) inches shall be constructed in accordance with the current issue of MBTA Railroad Operations "Pipeline Occupancy Specifications".

SECTION 5. LONGITUDINAL OCCUPATIONS

- 5.01 Wires and cables running longitudinally along railroad right-of-way shall be

constructed as close to MBTA property lines as possible in accordance with Plate III. For electrical power lines and cables with voltages of 34,500 or over and communication canes containing over 180 pairs, the following information must be submitted in addition to the detail of the pole top configuration as called for on Plate IV of these specifications:

- A. Voltage of circuit(s) or number of pairs. B. Phase of electrical circuit(s).
 - B. Number of electrical circuits.
 - C. Size (AWG or CM) and material of wires and cables.
- 5.02 Any facilities overhanging MBTA Railroad Property must have approval of the MBTA and appropriate rental charges will be applied.

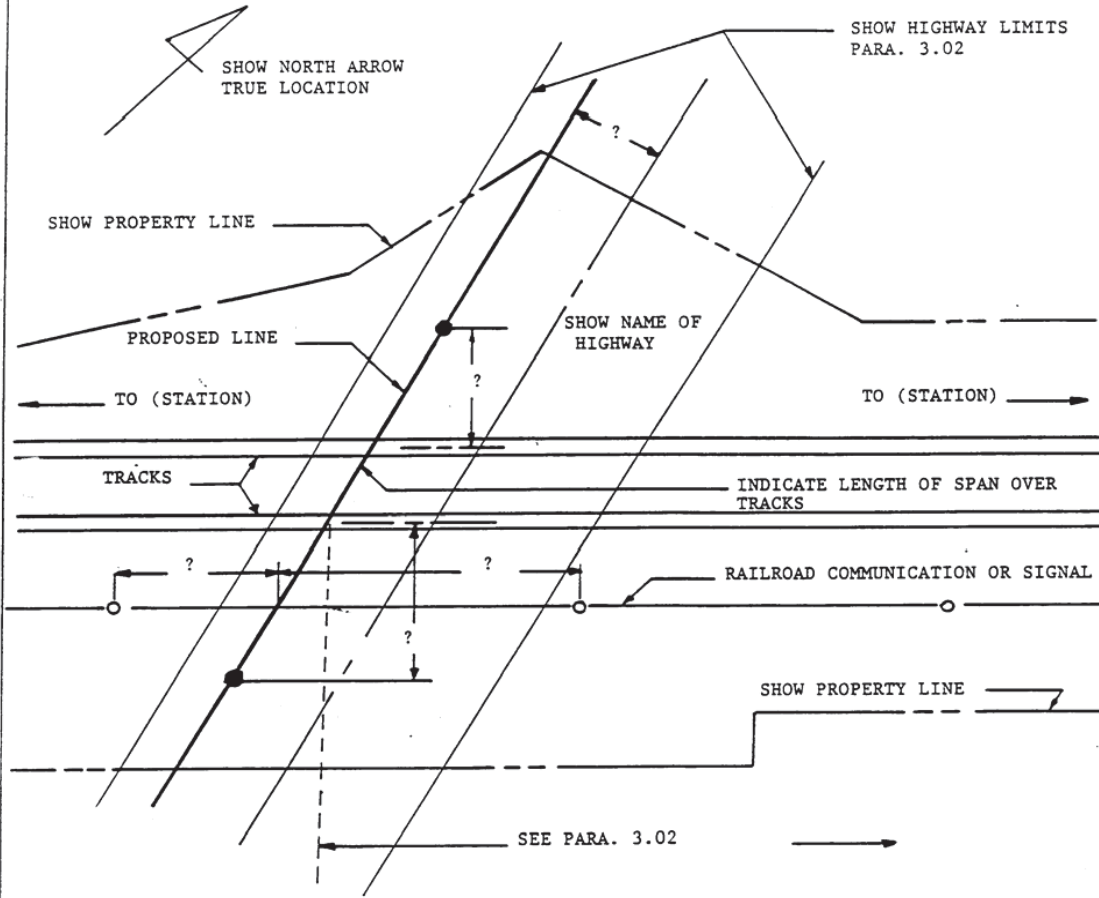
SECTION 6. INDUCTIVE INTERFERENCE

- 6.01 On agreements covering longitudinal occupations, provisions shall be included that hold the Applicant responsible to provide appropriate remedies, at their own expense, to correct any inductive interference with MBTA facilities.

PLATE I

PLAN VIEW

INFORMATION TO BE SHOWN ON PLAN SECTION OF DRAWINGS
WHEN FACILITY IS A CROSSING



SCALE OF DRAWING TO BE SHOWN

NOTE:

IF THE PROPOSED LINE IS TO SERVE A NEW DEVELOPMENT, A MAP SHOWING THE AREA IN RELATION TO ESTABLISHED AREAS AND ROADS IS TO BE SENT WITH THE REQUEST.

IF THE PROPOSED LINE IS NOT WHOLLY (OR PARTIALLY) WITHIN HIGHWAY LIMITS, THE SAME INFORMATION IS REQUIRED AS SHOWN ON THIS PLATE.

PLATE II

PIPE CROSSING

INFORMATION TO BE SHOWN ON PROFILE SECTION OF DRAWING

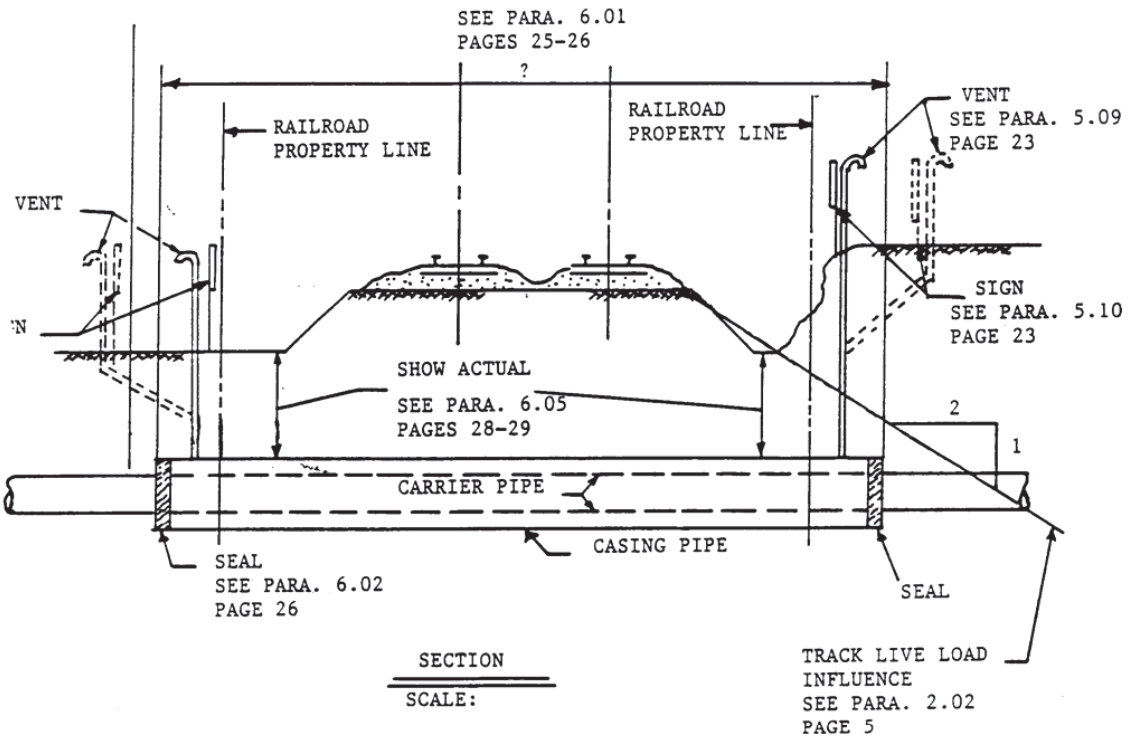
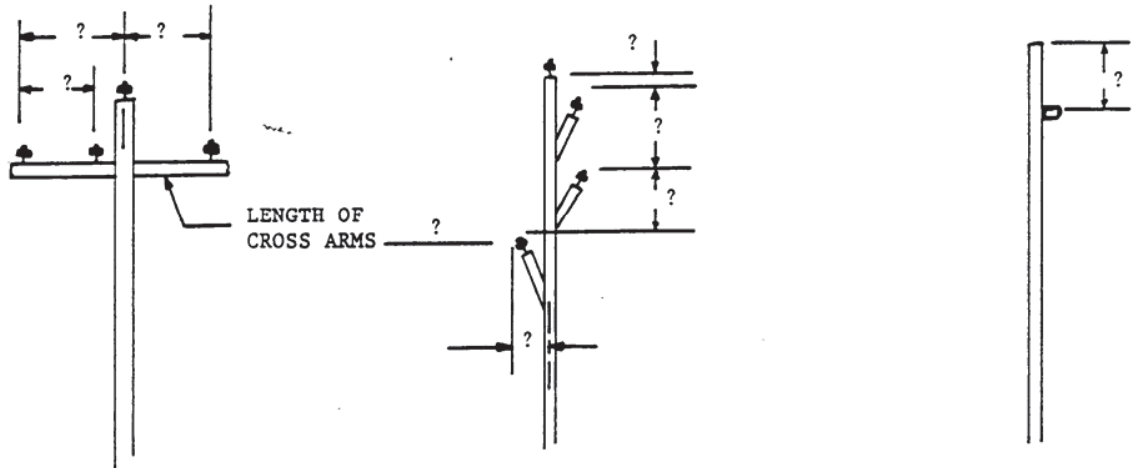
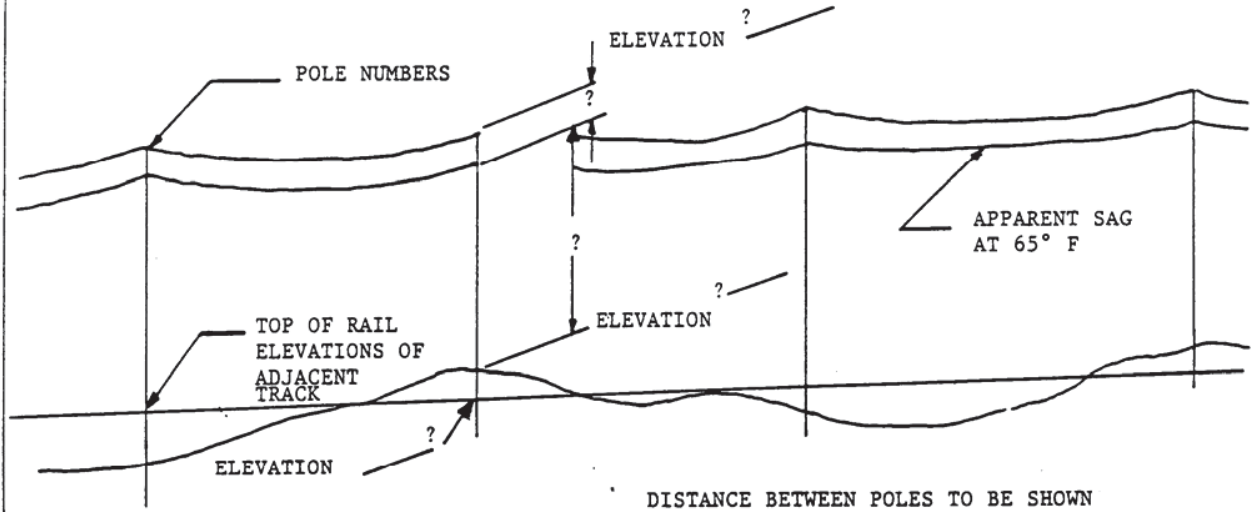


PLATE III

PROFILE VIEW

INFORMATION TO BE SHOWN ON PROFILE SECTION OF DRAWINGS
IN CASES OF LONGITUDINAL OCCUPATIONS



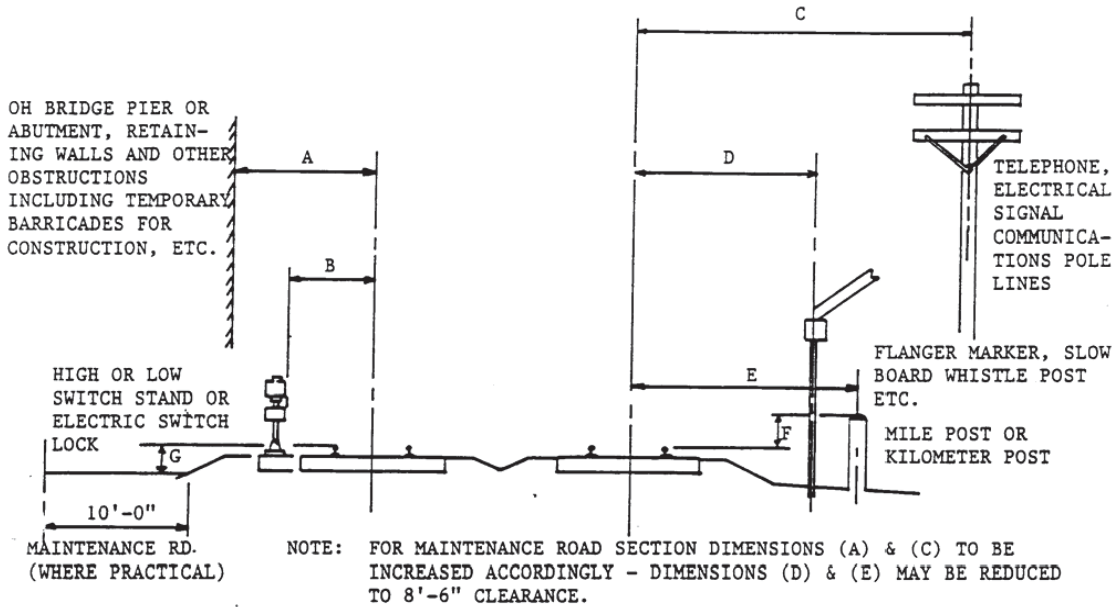
POLE TOP CONFIGURATION TO BE SHOWN SIMILAR TO SAMPLES ABOVE

NOTE: IF POWER LINE CROSSES ANY TRACK, THEN INFORMATION SHOWN ON PLATE II IS ALSO REQUIRED.

PLATE IV

STANDARD SIDE CLEARANCES - TANGENT TRACK

(FOR OBSTRUCTIONS OTHER THAN PASSENGER STATIONS)



DIMENSION	DESCRIPTION	
A	GENERAL MINIMUM SIDE CLEARANCE	8'-6"
	OVERHEAD BRIDGE PIERS & ABUTMENT, RETAINING WALLS & OTHER EXISTING STRUCTURES	8'-6"
B	LOW SWITCH STANDS (3'-0" MAX HEIGHT)	6'-6"
	HIGH SWITCH STANDS (OVER 3'-0" HEIGHT)	9'-0"
	ELECTRIC SWITCH LOCKS	6'-6"
C	POLE LINES - TELEPHONE, ELECTRIC, SIGNAL COMMUNICATIONS (MIN)	13'-6"
D	CENTERLINE WHISTLE POSTS, FLANGER MARKERS, SLOW OR SPEED BOARDS AND OTHER WAYSIDE SIGNS	12'-0"
	AUTOMATIC HIGHWAY CROSSING PROTECTION (MIN)	8'-6"
	AUTOMATIC HIGHWAY CROSSING PROTECTION (DESIRED)	15'-0"
E	MILE POSTS - HORIZONTAL	13'-6"
F	MILE POSTS - VERTICAL	7'-0"
G	DEPRESSION OF MAINTENANCE ROAD	

PLATE V

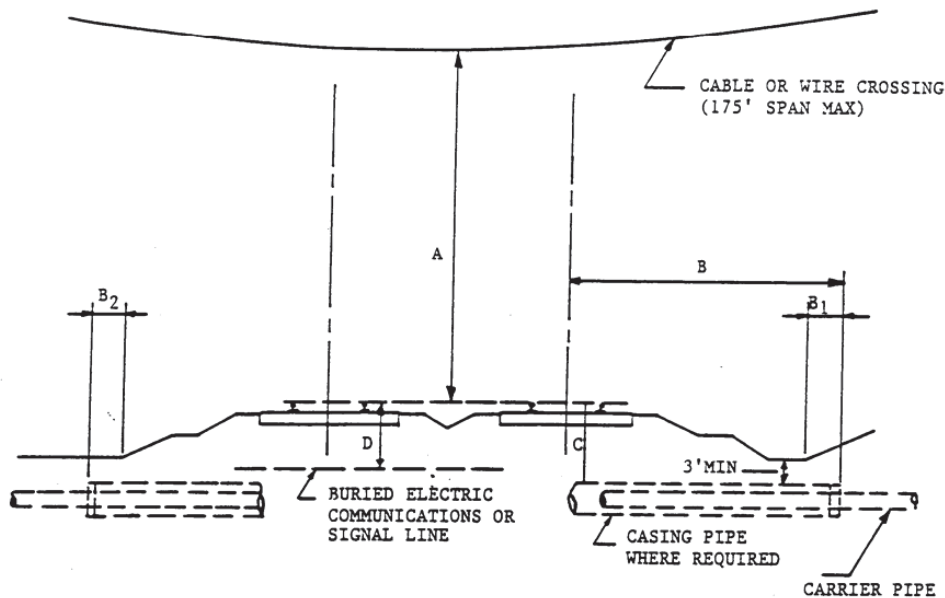
<u>VOLTAGE</u>	<u>OVERHEAD CLEARANCE</u> (Top of Rail to <u>Bottom of Sag</u>)	
0- 750	27'0"	} At 120°F Ambient Temperature
750- 15,000	28'0"	
15,000 - 50,000	30'0"	
69,000	30'8"	
115,000	32'2"	
138,000	33'0"	
345,000	39'10"	
500,000	45'0"	
745,000	53'2"	
765,000	53'10"	
Other than power lines	27'0"	

(Calculation is 30'0" + 0.4" per 1,000 volts over 50,000 volts)

.....

CLEARANCES FOR OVERHEAD AND BURIED UTILITY CROSSINGS

PLATE VI



DIMENSION	DESCRIPTION		
A	POWER LINES 0 TO 750V	27'-0"	} At 120°F Ambient Temperature
	POWER LINES 750V TO 15,000V	28'-0"	
	POWER LINES 15 TO 50KV	30'-0"	
	OTHER THAN POWER LINES	27'-0"	
B	SEALED ENDED CASINGS	25'-0"	
	OPEN ENDED CASINGS	45'-0"	
B ₁	END CASING BEYOND DITCH	2'-0"	
B ₂	END CASING BEYOND SLOPE	3'-0"	
C	CASING PIPE	4'-6"	
	CARRIER PIPE WITHOUT CASING	6'-6"	
D	BURIED ELECTRIC LINES	6'-6"	
	RAILROAD SIGNAL LINES (220V)	2'-6"	
	COMMUNICATIONS LINES	3'-6"	



**MASSACHUSETTS BAY
TRANSPORTATION
AUTHORITY**

RAILROAD OPERATIONS DIRECTORATE

VI

**BRIDGE ERECTION, DEMOLITION AND HOISTING
OPERATIONS**

Submittals for bridge erection, demolition, or other hoisting operations shall be prepared and stamped by a Registered Professional Engineer and must include the following:

1. Plan view showing locations of crane or cranes, operating radii, with delivery or disposal locations shown.
2. Crane rating sheets showing cranes to be adequate for 150% of the lift. Crane and boom nomenclature is to be indicated.
3. Drawings and computations showing weight of picks.
4. Location plan showing obstructions, indicating that the proposed swing is possible.
5. Data sheet listing type and size of slings or other connecting equipment. Include copies of catalog cuts or information sheets of specialized equipment. The method of attachment must be detailed on the erection plan. All lifting components must be adequate for 150% of the lift.
6. A complete procedure indicating the order of lifts and any repositioning or re-hitching of the crane or cranes.
7. Drawings detailing temporary support of any components or intermediate stages.
8. A time schedule (by hour and day) of the various stages, as well as a schedule for the entire lifting procedure.



**MASSACHUSETTS BAY
TRANSPORTATION
AUTHORITY**

RAILROAD OPERATIONS DIRECTORATE

VII

TEMPORARY SHEETING AND SHORING

The following items are to be included in the design and construction procedures for all permanent and temporary facilities on, over, under, within or adjacent to MBTA Railroad Property:

1. Footings for all piers, columns, walls or other facilities shall be located and designed so that any temporary sheeting and shoring for support of adjacent track or tracks during construction will not be closer than toe of ballast slope. (See dimensions in the MBTA's Book of Standard Plans, #1000 and #1002 for tangent and curved track). Sheeting shall be required when excavation is inside of a line which extends horizontally from 5.5 feet off center line of adjacent track, then on a 2 (horizontal) to 1 (vertical) slope. This is known as the zone of influence.
2. Where physical condition of design impose insurmountable restrictions requiring the placing of sheeting closer than specified above, the matter must be submitted to the Director of Engineering for MBTA Railroad Operations for approval of any modifications.
3. When support of track or tracks is necessary during construction of above mentioned facilities, interlocking steel sheeting adequately braced and designed to carry E-80 live load plus 50% impact is required. Soldier piles and lagging will be permitted for supporting adjacent track or tracks only when required penetration of steel sheet piling cannot be obtained or when in the opinion of the Director of Engineering for MBTA Railroad Operations, or their authorized representative, steel sheet piling would be impracticable to place.
4. Exploratory trenches, three (3) feet deep and fifteen (15) inches wide in the form of an "H" with outside dimensions matching the outside of sheeting dimensions are to be hand dug, prior to placing and driving steel sheeting, in areas where railroad underground installations are known to exist. These trenches are for exploratory purposes only and are to be backfilled and compacted immediately. This work must be done in the presence of a railroad inspector.
5. Absolute use of track is required while driving sheeting adjacent to any track. Procedure for arranging the use of track shall be through the Railroad Company(s) representative on the project.
6. Cavities adjacent to sheet piling, created by driving of sheet piling, shall be filled with sand and any disturbed ballast must be restored and tamped immediately as required by the Railroad Company(s).
7. Sheet piling shall be cut off at top of tie during construction. After construction and backfilling has been completed, the piling within twelve (12) feet from centerline of track shall be cut off 24" below bottom of tie or 24" below finished grade, whichever is greater. Sheeting, used as a form on a permanent

structure, shall be cut as directed by the Railroad Company(s).

8. The excavation adjacent to the track shall be covered and protected by handrails and barricades, warning lights shall be provided by the Contractor as directed by the Railroad Company(s).
9. Graded backfill material shall be compacted at near optimum moisture content, in layers not exceeding 6 inches in compacted thickness, by pneumatic tampers, vibrator compactors, or other approved means to the base of the railroad subgrade. Material in the vicinity of sheet pile shall be compacted to not less than 95 percent of AASHTO T 99, Method C. The Contractor shall be required to supply, to the job site, ballast stone as prescribed herein to be installed by the Railroad Company(s).
10. The Contractor is to advise the Railroad Company(s) of the time schedule of each operation and obtain approval of the Railroad Company(s) for all work to be performed adjacent to MBTA tracks so that it may be properly supervised by railroad personnel.
11. All Drawings for temporary sheeting and shoring shall be prepared and stamped by a Registered Professional Engineer and shall be accompanied by complete design computations when submitted for approval.
12. Particular care shall be taken to avoid erosion or filling of the Railroad Company(s) drainage facilities. Erosion and sediment control in the vicinity of the railroad shall be as approved by the Director of Engineering for MBTA Railroad Operations. Correction of disrupted Railroad Company(s) drainage facilities shall be at the Contractor's sole expense.

MBTA REQUIREMENTS FOR GEOTECHNICAL MONITORING

THE FOLLOWING SPECIFICATIONS ARE REQUIRED FOR ALL PILE DRIVING/EXCAVATING OPERATIONS:

1. Pile driving shall be on a continuous basis for each pile driven. Once a pile is started, it shall be driven or cut off at an elevation not to exceed the plane across the top of the rails of any track within 8'-6" plus 2" for each degree of curvature from centerline of track to the closest edge of the edge or excavation.
2. The monitoring points shall be set up one week before the pile driving or excavation operations begin. The MBTA and the Railroad Company(s) shall be notified. Elevation readings to establish the initial baseline reading shall begin two days prior to the start of driving. Readings shall be for a minimum of two weeks after the completion of the driving or backfilling of the excavation, whichever is longer. Initial readings immediately after any surfacing operations shall serve as new baseline figures. All future elevation readings shall be compared to the adjusted baseline. If the track deviates to a condition that is unacceptable to the MBTA or Railroad Company(s), corrections shall be made at the Contractor's expense.
3. Elevation readings shall be taken from the top of each rail of each track within the "zone of influence" the excavation. See Section 1, Page 1 of this specification.
4. Elevation readings will be taken once per eight hour shift. The readings shall be faxed to the MBTA Railroad Company(s) on a daily basis and all information is to be presented in legible print. During excavation within the sheet pile protected area, the top of rail elevations shall be checked every hour. Additional readings may be required by the MBTA or Railroad Company(s).
5. Stations shall be spaced at 15-1/2 foot intervals. The number of distractions required will be determined by the length of the excavation parallel to the tracks. There will be four additional stations on each end of the pile driving/excavation operation along the track. Extra stations may be required by the MBTA or Railroad Company.
6. Elevation readings must show the date, time, weather conditions and temperature. Each reading must also provide the following information: track number, compass direction, station number, base elevation (with date), static elevation, change in elevation (recorded in hundredths and in inches), dynamic reading and total deflection in inches. See sample sheet attached.
7. Station "0" will be located at the centerline of the project with Stations 1, 2, 3, etc., being to the right and Stations -1, -2, -3, etc., being to the left when

standing on the near track and looking at the work. In multiple track areas the stations as determined herein are to be carried across each track located within any part of the zone of influence. See Plate I.

8. At each monitoring station a dynamic load measurement shall be taken. The dynamic load measurement device shall consist of a wooden stake placed firmly in the ballast and in initially in contact with the bottom of the rail. The loaded measurement is the resultant gap between the bottom of the rail and the top of the stake caused by the deflection of the rail under the load of a passing train. Based on field observations of the excavation, and at the option of the MBTA or railroad company(s), this requirement may be reduced.
9. Elevation readings taken from the top of rail for static measurement and the dynamic reading shall be combined and the sum compared to the adjusted baseline. This reading will demonstrate the difference in elevation caused by the excavation.
10. The MBTA requires that the track be maintained at all times within established criteria for the specific track classification. At the completion of the project the requirement for tamping and realigning the tracks, caused by the settlement from the construction activity, remains with the Contractor for the duration as specified by the MBTA in their initial review of the Construction Drawings. This tamping and track realignment will be performed by the MBTA or railroad company(s) at the sole expense of the Contractor.



**MASSACHUSETTS BAY
TRANSPORTATION
AUTHORITY**

RAILROAD OPERATIONS DIRECTORATE

VIII

BLASTING SPECIFICATIONS

Blasting on, over, under, within or adjacent to MBTA Railroad Property will be permitted only in special cases where it is demonstrated to the Director of Engineering for MBTA Railroad Operations that there is no practicable alternative to perform the work.

In such cases when blasting is permitted, the Contractor must submit a detailed blasting program to the MBTA and Railroad Company(s) for approval prior to the commencement of any work. The blasting program must contain the following information:

- a. Site plan with location of nearest MBTA structure.
- b. Plan of each blast showing hole spacing and delay pattern.
- c. Diameter and depth of each hole.
- c. Amount of explosives per hole.
- d. Total pounds of explosives per day.
- e. Total amount of explosives per blast.
- f. Type of non-electric delays to be used.
- h. Amount of stemming in each hole.
- g. Type of explosive to be used.
- h. Soil and rock profile in blast zone.
- i. Scaled distance to the nearest MBTA facility.
- j. Type and location of seismograph to be used.
- m. Size of blasting mats to be used.
- k. Safety precautions to be followed.

The following general requirements are to be adhered to:

- a. Obtain the services of a qualified vibration and blasting consultant to monitor the blasting.
- b. Use a non-electric detonation system whenever possible. If electric caps are used, a check must be made for stray currents, induced current and radio frequency energy to insure that this hazardous extraneous electricity is at an acceptable safe level.
- c. Provide an open face for maximum relief of burden.
- d. Limit the maximum peak particle velocity to 1 inch per second. Depending on existing conditions, this may be modified to 2 inches per second.
- e. Maintain an initial scale distance of 60 ft. per 1-1/2 lbs. After initial blasting, scale distance may be modified to a minimum of 50 ft. per 1-1/2 lbs., if conditions permit.

Scale distance -- Distance from blast to structure (in feet)

Weight of explosives per delay (in pounds)

The Contractor shall provide for a pre-blast and post blast survey, including photographs. An inspection of all nearby MBTA facilities shall be made to determine any changes that may occur due to blasting operations.

The Contractor shall coordinate all blasting with the MBTA and Railroad Company(s) in advance to determine when the charges may be set. The Contractor is advised that the MBTA and Railroad Company(s) use two way radios for train control. The radios operate in the 160 MHz area. These radios cannot be turned off at any time.



**MASSACHUSETTS BAY
TRANSPORTATION
AUTHORITY**

RAILROAD OPERATIONS DIRECTORATE

IX

**TEMPORARY PROTECTION SHIELDS FOR DEMOLITION AND
CONSTRUCTION**

The Railroad Company(s) will determine when and where protection shields are required. The designated construction of temporary protection shields must adhere to the following specifications:

1. The construction of temporary protection shields shall be designed to prevent any dust, debris, concrete, formwork, paint, or tools from falling on MBTA Railroad Property below.
2. The temporary protection shields shall be erected prior to the start of work. The Railroad Company(s) will determine whether or not sufficient protection has been provided to perform the work over any particular area.
3. The temporary protection shields shall remain in place until all work over the railroad has been completed and shall be removed only when ordered by the Railroad Company(s).
4. To minimize the inconvenience to the users of any properties below and adjacent to the project, the Contractor shall be required to complete the actual erection and removal of the temporary shields within time limits acceptable to the Railroad Company(s).
5. The erected temporary protection shields shall not infringe on any existing minimum vertical clearance.
6. The Contractor shall be required to obtain the approval of the Railroad Company(s) before commencing any work beneath the shield. In certain areas, depending on the nature of the work, the Railroad Company(s) may require a specific method of protection.
7. The horizontal shield shall be designed to carry a live load of 100 pounds per square foot and a single concentrated load of 2,000 pounds located to produce maximum stress. The vertical shield shall be designed to carry a wide load of 30 pounds per square foot.
8. Prior to the start of construction, the Contractor shall be required to submit the details of the temporary protection shield to the Railroad Company(s), who will review and approve the details only as to the methods of erection and as to whether or not the proposed installation will provide the level of protection required at the various locations. It is the Contractor's responsibility to design these protections so that they are in conformance with all existing laws, regulations and specifications that govern this type of work. Shield plans must include a material list and shall be designed by a Registered Professional Engineer. The Drawings and calculations must bear their seal when they are submitted to the Railroad Company(s).
9. If during the actual construction, the Railroad Company(s) deems that the shield is not providing the desired level of protection or that the Contractor has failed to properly maintain the shield, all work at the

affected location shall cease until corrective measures acceptable to the Railroad Company(s) are instituted.

10. All temporary shields shall be constructed using new material.



**MASSACHUSETTS BAY
TRANSPORTATION
AUTHORITY**

RAILROAD OPERATIONS DIRECTORATE

X

INDUSTRIAL SIDE TRACK SPECIFICATIONS

SECTION 1. GENERAL

- 1.01 All railroad track construction shall be performed under competent supervision of personnel experienced in railroad construction and shall conform to the standards of the MBTA. The MBTA and Railroad Company(s) will inspect and approve all side tracks prior to being put in service. This specification shall be used for side tracks directly on or within 15 feet of the MBTA property line. Any construction outside of the MBTA property line shall be in compliance with the standards of the serving freight railroad.

SECTION 2. MATERIALS

2.01 MATERIAL

Rails, ties, switches, frogs, etc. shall conform to the standards of the MBTA for various types of turnouts and track installations thereby insuring replacement availability.

2.02 RAIL

The rails shall be 100# ASCE Section or of a heavier rail section in common use, new or relay. Relay rails shall not have more than 1/4" top wear measured vertically along center line of rail and not more than 3/8" side wear measured horizontally 3/4" below the normal top of rail. Rails shall be free from kinks, excessive rust and excessive head flow. Rails having line or surface bends that cannot be spiked will be rejected. Rail shall be free of internal defects. Rail used on the limits of MBTA Railroad Property shall be equal in weight and in section to the attached main line.

2.03 CROSS TIES

Cross ties shall conform to MBTA specifications, minimum size shall be 7" x 8" x 8'6" and shall be treated with creosote in accordance with MBTA specifications. Relay ties may be approved after inspection by the MBTA and Railroad Company(s) prior to installation.

2.04 SWITCH TIMBER

Switch timber shall be new hardwood and conform to MBTA specifications 7" x 9" and of lengths required by MBTA standard turnout bill of materials. All timber shall be creosote treated as specified for cross ties. Relay timber as above.

Tie plates shall be new or relay at least 7-1/2" x 10-3/4", 1/2" thick,

double shoulder and should be canted. Tie plates must conform to MBTA specifications. Damaged plates or plates showing more than 25% reduction in section due to corrosion or wear will be rejected.

2.06 JOINT BARS

Joint bars shall be new or relay, 100% toeless, 24" long or equal and conform to MBTA specifications. Relay bars must be free from appreciable wear. Joint bars shall have a minimum of four holes and the holes are to fit the punching's of the rail. Holes to have a clearance of 1/16". Joint bars that cannot be drawn up to give a tight fit will be rejected. No fewer than 4 bolts per joint will be allowed.

2.07 BOLTS, NUTS AND WASHERS

Bolts and nuts shall be new and of a size to fit the rail punching's. They shall conform to AREA specifications for low carbon steel track bolts and nuts. Washers shall be new spring type of appropriate size and shall conform to MBTA specifications.

2.08 TRACK SPIKES

Track spikes shall be 6" long, 5/8" square with an oval head and conform to MBTA specifications for soft steel track spikes. Tangent track shall have at least 2 rail holding spikes per tie plate and all curves over 3" shall have 3 spikes per tie plate.

2.09 BALLAST

Ballast shall conform to MBTA Material Specification 9248.

2.10 BUMPING POSTS

Bumping posts shall be Hayes type, Durable "D" or equal, unless otherwise specified, and will conform to MBTA Material Specification 9206.

2.11 DERAIL

Type and quality of derail shall be specified for each individual side track requirement. Derail shall be connected into the railroad signal system, which will be performed by the Railroad Company(s) at the Owner's expense. Two pairs of insulated joints shall be installed by the Contractor at a location to be determined by the MBTA. Side tracks with a descending grade toward the main track shall require a split switch type derail.

SECTION 3. INSTALLATION

- 3.01 The track shall be properly installed with a standard gauge of 4'8-1/2" except on sharp curves. In cases of sharp curves, gauge will be specified by the MBTA or the Railroad Company(s).
- 3.02 Ballast shall be installed on top of subgrade for a depth of at least 6" below the bottom of tie and brought up to the top of the tie at the center and slope off to 1" below top of tie at the ends. It shall then extend 1' beyond the end of the tie at that height, at which point it shall slope off at a rate of 2:1 to the sub- ballast.
- 3.03 Cross ties shall be placed not more than 24" on center on tangent track and 19 ½ " on center on curved track. When relay rails are used the unworn side shall be placed on the gauge side. Tie plates shall be installed on each cross tie. The center of the joint shall be installed so as to be suspended by two ties.
- 3.04 It shall be the responsibility of the builder of that portion of track designated as "property line to end" to connect to that portion of track designated as "clearance to property line" and provide the necessary joints or compromise joints with bolts as the weights of rail would dictate.

SECTION 4. BONDING

- 4.01 Where track bonding is necessary, it will be performed by the Railroad Company(s) in accordance with MBTA standards.

SECTION 5. APPROVAL

- 5.01 Plans for track installation must be approved by the MBTA and Railroad Company(s) before the design of the facility to receive rail service is finalized.

SECTION 6. CURVATURE OF TRACK

- 6.01 The recommended curvature shall be 8⁰ or less. The maximum allowable degree of curve is not to exceed 12⁰ 30', unless approved by the Director of Engineering for MBTA Railroad Operations.

SECTION 7. GRADE OF TRACK

- 7.01 The maximum allowable grade for all tracks shall not exceed 1.5% descending towards mainline or 3% descending from mainline using 100 foot vertical curves.

SECTION 8. ELEVATION

8.01 Super elevation shall not exceed 1 inch.

SECTION 9. SUBGRADE

9.01 Subgrade shall be prepared to a grade 18" - 20" below the proposed top of rail and shall be of a material that is compacted to 95% and provides for adequate drainage.

SECTION 10. ACCEPTANCE

10.01 Before track is placed into service to receive cars, it shall be inspected and approved by a qualified track inspector from the MBTA, the Railroad Company, and the freight carrier.

10.02 No exceptions to these specifications are authorized without the written approval of the Director of Engineering for MBTA Railroad Operations.



**MASSACHUSETTS BAY
TRANSPORTATION
AUTHORITY**

RAILROAD OPERATIONS DIRECTORATE

XI

RIGHT OF WAY FENCING SPECIFICATIONS

SECTION 1. GENERAL

1.01 DESCRIPTION

This section specifies the furnishing and installing of new Type I galvanized steel or Type II aluminum coated steel chain link fence. Right of way fence shall be 6', 8' or 10' as required by site specific conditions.

1.02 SUBMITTALS

Shop Drawings

1. Include cross sectional dimension of posts, braces, rails, fittings, accessories and gate frames, design of gates, and details of gate hardware.
2. Include a layout drawing showing the spacing of posts and location of all gates, abrupt changes in grade, and all corner, gate, anchor, end and pull posts.

SECTION 2. PRODUCTS

2.01 MATERIALS

A. General

1. Steel pipe dimensions and weights: ASTM A-53, Schedule 40 (except the hydrostatic testing requirement is waived). Dimensions specified are outside diameter (O.D.).
2. Provide post with accepted semi-steel or pressed steel tops, so designed as to fit securely over post and carry top rail or spring tension wire; the base of post top fitting shall fit over the outside of post and shall exclude moisture from post. All fittings and accessories shall be hot dipped galvanized in accordance with ASTM A-53.

B. Line Post: For all post heights, unless otherwise noted, Schedule 40, 2.375" O.D. pipe weighing 3.65 lbs./ft. ASTM A-53 with a 2 oz. hot dipped galvanized coating shall be used.

C. Gate post: Furnish post to support single gate leaf, or one leaf of a double gate installation, for the following gate widths:

<u>Leaf Width</u>	<u>Gate Post</u>	<u>Sch. 40</u>
up to 6'	2.875" O.D.	5.79 lb./ft.
6' to 12'	4.000" O.D.	9.11 lb./ft.
12' to 18'	6.625" O.D.	18.97 lb./ft.
18' to 32'	8.625" O.D.	28.55 lb./ft.

D. End, Corner and Intermediate Posts

For all post heights, unless otherwise noted, Schedule 40, 2.875" O.D. pipe weighing 5.79 lbs./ft. ASTM A-53 with a 2 oz. hot dipped galvanized coating shall be used.

E. Top rail and Spring Tension Wire

1. Top Rail

- a. Schedule 40, 1.66" O.D, pipe weighing 2.27 lbs./ft. ASTM A-53 with a 2 oz. hot dipped galvanized coating.
- b. Couplings and expansion sleeves: Outside sleeve type, minimum six inches long.

2. Spring tension wire: shall be marcelled (spiraled or crimped) #7 gauge (.177 inches) plus or minus 0.005 inches in diameter. ASTM A-824. 1.2 oz. zinc per sq. ft.

F. Braces and Tension Rods

1. Compression braces: Same type and size as top rail.
2. Tension rods: 3/8" round rods with drop forged turnbuckles or other approved type of adjustment.

G. Fence Fabric

1. Type I galvanized steel ASTM A-392 Class 2 coating 2 oz.
 - a. Typical-2" diamond mesh 6 gauge (192") 2 oz.
 - b. Hot dipped galvanizing after weaving.
2. Type II aluminum coated steel ASTM A-491 size 2. 3/8" mesh.
3. Selvages: All types
 - a. Fabric shall be knuckled at both selvages.
 - b. Fabric over 60 inches high: knuckled at one selvage and twisted and barbed at the other.

H. Fabric Bands, Brace Bands and Stretcher Bars

1. Fabric Bands: 12 gauge pressed steel 7/8 inch wide.
2. Brace Bands: 11 gauge pressed steel 1 inch wide.
3. Stretcher Bars: 3/16" x 3/4" galvanized steel.

- I. Tie wire and miscellaneous Items
 - 1. Tie Wire: Galvanized steel 6 gauge (.192") for post and rails.
 - 2. Hog rings: Galvanized steel 6 gauge (.192") for spring tension wire.
 - 3. Rail and Truss Cups: Galvanized semi-steel or pressed steel.

- J. Barbed Wire and Extension Arms
 - 1. Barbed Wire; ASTM A121, 12-1/2 gauge, 4-point round barbs, Class 3 coating.
 - 2. Extension Arms: Projecting at an angle of approximately 45 degrees, fitted with clips or other means of attaching three strands of barbed wire, the top outside wire approximately 12 inches from the fence line and the other wires spaced uniformly between the top outside wire and the fence fabric.

- K. Gates
 - 1. General: Furnish gates complete with necessary hinges, latches, and drop bar locking devices; corners shall be welded or fastened and reinforced with suitable fittings.
 - 2. All gates fabricated from 1.90" O.D. Schedule 40 pipe weighing 2.72 lbs./ft. with a 2 oz. hot dipped galvanized coating.

- L. Concrete: Class 2500 psi concrete consisting of aggregate passing the No. 8 sieve.

SECTION 3. EXECUTION

3.01 INSTALLATION

- A. Place terminal post at each end, corner, gate post, pull post (minimum 500'), or any change in grade or direction greater than 30 degrees.

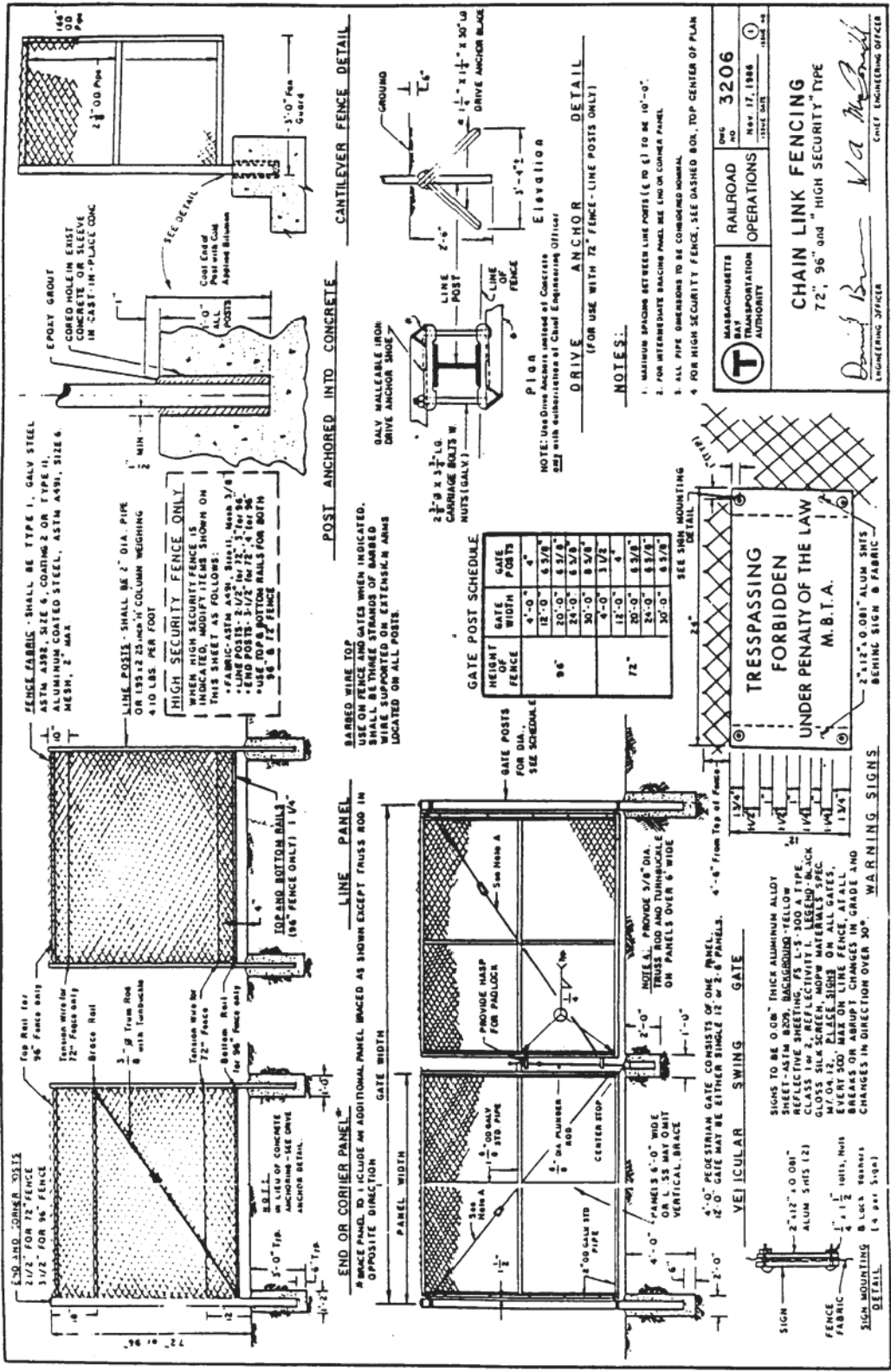
- B. Line posts shall be spaced on a maximum of 10 foot centers. In determining the post spacing, measure parallel to slope of finished grade. All posts to be set plumb and in line. Post spacing on radius as follows:

200'- 500' radius 8' O.C.
100' - 200' radius 6' O.C.
less than 100' radius 5' O.C.

- C. When fencing is installed on the top of concrete structures, use galvanized sleeve and grout posts or install with suitable galvanized flange casing and galvanized anchor bolts. Set all other posts permanently in concrete.
- D. Excavate post hole footings at least 12" in diameter for line post and 16" for terminal and gate posts up to 4" O.D. Larger gate posts require 18" diameter footings. All footings excavated to a depth of 42" with a minimum post embedment of 36". Crown top of concrete to shed water and allow curing for not less than 72 hours before proceeding with further work on the post.
- E. Brace end, corner pull, and gate posts to the nearest line post with diagonal or horizontal brace rails used as compression chambers, and with truss rods with turnbuckles used as tension members. Brace line posts horizontally and truss in both directions as required, at approved intervals.
- F. Install fabric on post side which best secures MBTA's Railroad Property. Pull fabric taut and tie to all line posts, rails, braces and spring tension wire spacing all ties at 12" intervals. Use hook shaped steel ties confined to the diameter of the pipe to which it is attached, clasping pipe and fabric firmly with both ends twisted at least 2 turns.
- G. Barbed wire and tension wire must be taut and properly secured with brace bands at each terminal and gate post.
- H. Electric Ground: Where a power line carrying more than 600 volts passes over fence, install ground rod at the nearest point directly below each point of crossing. Ground all substation fences and gates and perform other electrical grounding as indicated.

3.02 TOUCH-UP AND REPAIR WORK

Remove and replace fencing which is improperly located or is not true to line, grade and plumb within tolerances as indicated.



MASSACHUSETTS BAY TRANSPORTATION AUTHORITY

RAILROAD OPERATIONS

DWG NO. **3206**

REV. 17, 1986

CHAIN LINK FENCING

72", 96" and "HIGH SECURITY" TYPE

David B. ...
ENGINEERING OFFICER



**MASSACHUSETTS BAY
TRANSPORTATION AUTHORITY**

RAILROAD OPERATIONS DIRECTORATE

XII

TEST BORINGS SPECIFICATIONS

SECTION 1. GENERAL

All borings on MBTA Railroad Property are to be performed according to the following requirements:

- 1.01 Work on MBTA Railroad Property must be performed with a Railroad Company(s) inspector and/or flagman present.
- 1.02 Where access can only be gained by crossing the tracks, a temporary crossing must be used. This crossing shall adhere to the following:
 - A. The location and material must be approved in advance by the Chief Engineering Officer or Railroad Company(s).
 - B. The crossing will be constructed by Railroad Company(s) forces at the Contractor's expense.
 - C. The crossing must be protected at all times when not in use. Access shall be prohibited through the use of right-of-way gates which will be constructed by Railroad Company(s) forces at the Contractor's expense.
 - D. No crossing of the track shall be made without a railroad flagman and/or inspector present.
 - E. The crossing of tracks shall be kept to a minimum.
- 1.03 Boring locations, including positioning of the boring rig, shall be kept at least 8'-6" from the center line of track.
- 1.04 All borings must be cased to insure adequate return (of mud and water) and to avoid undermining of the track.
- 1.05 All holes shall be backfilled with cement grout to fill the voids and protect against an artesian condition.
- 1.06 The location of all utilities owned or private, shall be located and suitably marked by the Railroad Company(s) and/or the private owner at the Contractor's expense to avoid damage to the utility and/or track structure.
- 1.07 Prior to entry upon the MBTA Railroad Property, all necessary contracts, insurance policies and financial obligations shall be provided in a form acceptable to the Railroad Company(s).
- 1.08 Work within the operating right-of-way that has potential to foul the tracks, shall be restricted to periods of non-peak passenger operations.

- 1.09 While performing the work, full cooperation with the inspector and flagman is essential. The work will be terminated immediately if the safety of all traffic and personnel is jeopardized in any way.

SECTION 2. TESTING

- 2.01 Soil borings shall be in accordance with the current issue of the American Railway Engineering Association Specifications, Chapter 1, Part 1, "Specifications for Test Borings". Soils shall be investigated by the split-spoon and/or thin-walled tube method and rock shall be investigated by the Coring method specified therein.
- 2.02 Soil boring logs shall clearly indicate all of the following:
1. Boring number as shown on boring location plan.
 2. Elevation of ground at boring.
 3. Description or soil classification of soils and rock encountered.
 4. Elevations or depth from surface for each change in strata.
 5. Identification of where samples were taken and percentage of recovery.
 6. Location of ground water at time of sampling and, if available, subsequent readings.
 7. Natural dry density in lbs./sq. ft. for all strata.
 8. Unconfined compressive strength in tons/sq. ft. for all strata.
 9. Water content (percent). Liquid Limit (percent) and plastic limit (percent).
 10. Standard penetration in blows/ft.
- 2.03 Soil boring logs shall be accompanied by a plan drawn to scale showing location of borings in relation to the tracks, the elevation of ground surface at each boring, and the elevation of the top of rail of the tracks.
- 2.04 Soil investigation by auger, wash, or rotary drilling method is not acceptable.
- 2.05 Borings shall be taken no more than two (2) feet from the field stake which marks the boring location. The stake should not be disturbed during boring operations. Lost stakes shall be reinstalled.
- 2.06 Unless a boring hole is actively being worked, it shall be securely covered or otherwise protected until permanently filled. When work at each boring hole is completed, the hole shall be properly filled.
- 2.07 Access to the boring locations must be approved by the Railroad

Company(s). When possible, access shall be from public roads. Licenses for Entry, Insurance and Flag Protection must be obtained by the Contractor in accordance with all applicable MBTA Specifications.

- 2.08 Boring operations shall be confined to each boring location to the extent possible.

The Contractor shall take necessary precautions to prevent damage to structures and facilities. The site shall be restored to a condition satisfactory to the Railroad Company(s).



**MASSACHUSETTS BAY
TRANSPORTATION
AUTHORITY**

RAILROAD OPERATIONS DIRECTORATE

XIII

FIBER OPTIC CABLE SPECIFICATIONS

SECTION 1. GENERAL

- 1.01 The purpose of the following standards is to provide basic information about the MBTA's requirements with respect to the design and construction of fiber optic cables on MBTA Railroad Property to fiber optic cable companies and their Contractors.
- 1.02 All work performed on or affecting MBTA Railroad Property must be designed and constructed in accordance with the Commuter Rail Design Standards (Vol. I and II), MBTA Book of Standards, Railroad Operations Specifications and the following standards. Additional job specific requirements will be contained in the MBTA's Fiber Optic License Agreement and can be obtained by contacting:

AGM for Real Estate and Asset Development
Ten Park Plaza
Boston, MA 02116

The Director of Engineering for MBTA Railroad Operations or their designated representative will be responsible for the approval of all work. No modifications, changes or deletions will be made without their approval.

SECTION 2. PROJECT REVIEW AND COORDINATION

- 2.01 All Drawings and specifications shall be reviewed and approved by the MBTA and Railroad Company(s) prior to construction. The MBTA must approve the construction schedule and sufficient Railroad Company(s) personnel must be available before work begins.
- 2.02 If another fiber optic cable company has previous or exclusive rights along the proposed route, the alignment and cable location must be approved in accordance with existing agreements.
- 2.03 The fiber optic cable companies must coordinate the construction with others to minimize the disruptions to the MBTA railroad operations.

SECTION 3. CONDUCT OF WORK

- 3.01 In order to minimize the manpower requirements of the Railroad Company(s) and afford better control, supervision, and protection, the Contractor will conduct their work sequentially and minimize the number of crews and their proximity. Crews should be confined geographically to an area that can be covered easily by a minimum number of Railroad Company(s) personnel. This can be accomplished by a block method of construction. A construction block will be used and is a 1-4 mile segment of right of way in which up to 3 fiber optic cable installation crews can work. The crews can work within the construction block, but cannot work outside of it. The construction block

must move as a unit along the right of way. The crews cannot work two blocks concurrently.

SECTION 4. CONSTRUCTION SCHEDULE

- 4.01 The fiber optic company or its Contractor will submit a schedule of work to the MBTA for approval. The schedule will be based on methods of construction acceptable to the MBTA and Railroad Company(s). No work shall begin prior to approval by the MBTA.
- 4.02 Any changes or modifications to the schedule proposed by the fiber optic company or its Contractor must be submitted to and approved by the MBTA prior to implementation. The MBTA, however, may be required to change or modify the construction schedule on account of its operations, maintenance requirements, or manpower shortages. In this event, the MBTA will give the fiber optic cable company as much advance notice as possible.
- 4.03 Construction schedules will be reviewed and updated every two (2) weeks or as required.

SECTION 5. ESTIMATE OF EXPENSES

- 5.01 An estimate of anticipated expenses will be provided based on durations provided by the fiber optic cable company or their Contractor and construction schedules approved by the Railroad Company(s). Any changes in the schedule will cause the estimate to be revised. The fiber optic cable company or their Contractor will be responsible for all of the costs incurred by the MBTA and Railroad Company(s) in support of the construction activities. This includes design review, engineering support, administration and supervision.

SECTION 6. BILLING

- 6.01 The fiber optic cable company or its Contractor will be required to pay for railroad protective services in advance of costs incurred.

SECTION 01568

CONSTRUCTION SAFETY

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This Section specifies requirements to establish a practical, sound, and effective program for the prevention of construction accidents, and to assign specific responsibilities to Contractors for program compliance.
- B. Contractors and their supervisors must control hazardous activities and conditions within their respective areas of contract responsibility.

1.2 SUBMITTALS

- A. Safety and Health Plan: The contractor shall, within thirty (30) days after receipt of the award of a contract, submit for approval to the MBTA, a detailed operational Safety and Health Plan.
- B. Safety Supervisor: The Contractor shall within thirty (30) days after receipt of the award of a contract submit the resume of the qualifications and work experience of the designated Safety Supervisor proposed for assignment to the Project. No construction work shall begin until the project Safety Supervisor has been approved by the MBTA. The Safety Supervisor shall have a minimum of 5 years of experience in construction safety or a related field.
- C. Monthly Accident Experience Summary: The Contractor shall submit an Accident Experience Report monthly during the course of construction to the MBTA.
- D. Industrial Industry Records: Prior to start of work, the Contractor shall submit their Injury/Illness Records for the previous 3 years. In addition, the Contractor shall submit annually to the MBTA all subsequent Illness/Injury Reports for the duration of the project.

PART 2 - PRODUCTS

None

PART 3 - EXECUTION

3.1 SAFETY AND HEALTH PLAN

- A. The Contractor shall submit a project Safety and Health Plan. At a minimum, the plan shall include the following sections:
- i. Emergency Action Plan
 - ii. First Aid Facilities
 - iii. Serious Accidents
 - iv. Emergency Telephone Numbers
 - v. Protection of the Public
 - vi. Site Visits
 - vii. Substance Abuse/Prevention/Testing

3.2 SAFETY SUPERVISOR

- A. Complete daily safety inspections of the job site and contiguous public areas, and take any corrective actions to eliminate unsafe conditions.
- B. Establish and implement a project safety training program for supervisors and employees as applicable to their job.
- C. Attend project safety meetings.
- D. Review Foreman accident and investigation reports, and initiate corrective action to prevent reoccurrence.
- E. Maintain copies of all Contractor Safety Reports.
- F. Assist Foremen in accident investigations.
- G. Encourage establishment of incentive programs designed to recognize individual employee safety efforts and contributions towards improved safety.
- H. Prepare a Safety Audit Checklist and complete the checklist each week during the course of construction. The completed Audit Checklists shall be submitted to the Authority weekly.
- I. The Safety Supervisor needs to be on the project site when major work tasks are being performed. During work periods when the Contractor is not performing contract work, the Safety Supervisor can be absent from the project site with permission from the Authority.

3.3 ACCIDENT INVESTIGATION

- A. Serious accidents shall be reported immediately to the MBTA Resident Engineer. Contractors shall issue standing orders to all supervisors directly in charge of operations that the scene of the accident shall not be disturbed, except for rescue or other emergency measures, until otherwise directed. Contractor's forces either witnessing or party to the accident shall be detained at the site to provide detailed accounting of facts.
- B. All reports shall be submitted to the MBTA. The accident investigation shall generate appropriate recommendations for corrective actions to prevent similar recurrence of similar accidents.
- C. The requirements of MBTA Safety Procedure 7.3 Contractor Safety Violation Program shall be followed by the Contractor when completing an accident report.

3.4 FIRST AID FACILITIES

- A. In formulating the Health and Safety Plan, the Contractor shall provide for the establishment and staffing of appropriate first aid facilities for the treatment of on the job injuries.
- B. Off-site medical treatment of employee injuries shall be performed at medical facilities named in the Contractor's Safety Submittal.

3.5 EMERGENCY TELEPHONE NUMBERS

To ensure that emergency actions are promptly taken, Contractors shall post emergency telephone numbers in conspicuous places.

3.6 ORIENTATION PROGRAM

- A. The Contractor shall establish and maintain an orientation program for new employees which shall include:
 - i. For each individual the hazards present in their work assignment and in the general area in which he will be working.
 - ii. Personal protective equipment required.
 - iii. Instruction in the proper procedure for reporting unsafe job conditions which he/she may encounter.

3.7 RIGHT OF WAY SAFETY AWARENESS

- A. All Contractor and sub-contractor personnel shall complete either the MBTA Rapid Transit right-of-way safety training or the MBCR Commuter Rail right-of-way safety training prior to entering the project site. ROW safety training will be required on all MBTA property including the RR track, stations, parking garages and maintenance car houses. Personnel will not be allowed on the job site unless they have attended a Right-of-Way Safety Awareness training session. Workers are required to carry their certification card while on site.

CONTRACT NO.
YEAR

CONSTRUCTION SAFETY
01568-3

MBTA
08/12

3.8 OSHA

- A. The Contractor shall comply with the OSHA 1926 Construction Safety Standards that apply to the project work. The Contractor shall meet the reporting requirements, and employers with eleven (11) or more employees must meet recordkeeping requirements.
- B. All Contractor and Sub-Contractor personnel shall possess an OSHA 10 Hour Certification card when working on the project site.
- C. All fatality cases and/or serious accidents and illness shall be reported to OSHA immediately by phone to an Occupational Safety and Health Area Office. Employers must report immediately all blasting accidents.
- D. Part of the OSHA requirements is that each employer must post in a prominent location the "Safety and Health Protection on the Job" poster. The poster briefly states the intent and coverage of the Act. Failure to post this document is a citable offense under the Act.

3.9 PROSECUTION OF THE WORK

- A. The Contractor shall take all reasonable precautions in the performance of the work to protect the safety and health of its employees and members of the public and shall comply with all applicable MBTA, Local, State and Federal safety and health regulations and associated reporting requirements.
- B. The Contractor Safety Supervisor is charged with sole responsibility of on-site safety management under the direction of the Contractor Project Superintendent. All potential safety hazards identified shall be promptly corrected. The Safety Supervisor shall complete daily reviews of the project site and document then results on the inspection.
- C. The MBTA shall notify the Contractor of any non-compliance and of the corrective action required. This notice, when delivered the Contractor or the Contractor's representative at the site of the work, shall be deemed sufficient notice of the non-compliance and corrective action required after receiving the notice, the contractor shall immediately take corrective action. If the contractor fails or refuses to take corrective action promptly, the MBTA may, without prejudice to other legal or contractual rights, issue an order stopping all or part of the work; and may subject contractor to safety violation assessments as deemed appropriate by the MBTA. Resumption of work may be issued by the MBTA Safety Department.
- D. The Contractor shall maintain an accurate record of exposure data on all accidents and incidents occurring under this contract and report this data in a manner prescribed by the MBTA.
- E. The Contractor shall be responsible for all its lower-tier sub-contractor's and vendor's compliance.
- F. Contractor management shall make a commitment for accident prevention and fire prevention. Safety shall take precedence over schedule and production. Enforcement action is mandatory.

3.10 WORK AUTHORIZATIONS

A. The following work authorizations will be issued by the MBTA:

- i. Excavation
- ii. Hot Work
- iii. Confined Space Entry
- iv. Cranes and Suspended Platforms

3.11 WORKING NEAR THE THIRD RAIL

A. When working on or near the third rail, when the power is off, the contractor must have a third rail high-voltage warning device on the job site approved by the MBTA Power Department. This device will warn work crews if the third rail becomes energized at any time during work activity involving the right-of-way.

3.12 HAZARDOUS SUBSTANCES

A. Any Contractor who uses substances on the hazardous substances list to which workers might be exposed under either normal work conditions or reasonable foreseeable emergency conditions resulting from work place operations must provide those workers with the required hazardous substance information.

3.13 PERSONAL PROTECTIVE EQUIPMENT

A. All Contractor personnel must wear the required personal protective equipment when on the job site. Personal protective equipment includes hard hats, safety vest, safety glasses and proper footwear.

3.14 PROTECTION OF THE PUBLIC

- A. All necessary precautions to prevent injury to the public or damage to property of others shall be taken. The public is defined as all persons not employed by or under contract or subcontract to the MBTA. Installation of temporary barriers and/or fencing designated to protect the public shall be reviewed and approved by the MBTA. Precautions shall include but not be limited to the following:
- B. Work shall not be performed in any area occupied by the public unless specifically permitted by the contract or in writing by the MBTA.

3.15 SUBSTANCE ABUSE/PREVENTION/TESTING PROGRAM

A. The Contractor shall establish a substance abuse policy and testing program that includes the following elements:

- Deterrence

- Treatment and Rehabilitation
- Detection
- Enforcement

The MBTA reserves the right to approve the proposed substance abuse program prior to commencing the contract.

3.16 CONDUCT OF TOURS

- A. Group tours must be cleared through the MBTA, allowing maximum advance notice and in compliance with MBTA Policy and Procedures.
- B. MBTA will coordinate the tour arrangements and ensure notification to the Contractors Project Manager.

3.17 HOUSEKEEPING

- A. A basic concept in any effective accident prevention program is "good housekeeping." No one item has a great impact on the overall success of a safety program for a construction project. The importance of good housekeeping is such that it must be planned from the beginning of the job and carefully supervised through the final cleanup.
- B. During the course of construction, work areas, passageways and stairs, in and around buildings and structures, shall be kept clear of debris. Construction materials shall be stored in an orderly manner. Storage areas and walkways on the site shall be maintained free of depressions, obstructions and debris.

PART 4 - MEASUREMENT AND PAYMENT

- A. No separate measurement or payment will be made for work required under this Section.



UNITED STATES DEPARTMENT OF LABOR

SEARCH

A to Z Index | En español | Contact Us | FAQs | About OSHA

OSHA

OSHA QuickTakes

Newsletter

RSS Feeds

Print This Page

Text Size

Occupational Safety & Health Administration We Can Help

What's New | Offices OSHA

- Home Workers Regulations Enforcement Data & Statistics Training Publications Newsroom Small Business Anti-Retaliation

Regulations (Standards - 29 CFR) - Table of Contents

- Part Number: 1926
Part Title: Safety and Health Regulations for Construction
Standard Number: 1926
Title: Table of Contents

PART 1926 -- SAFETY AND HEALTH REGULATIONS FOR CONSTRUCTION

Subpart A -- General

- Sec.
1926.1 Purpose and scope.
1926.2 Variances from safety and health standards.
1926.3 Inspections - right of entry.
1926.4 Rules of practice for administrative adjudications for enforcement of safety and health standards.
1926.5 OMB control numbers under the Paperwork Reduction Act.
1926.6 Incorporation by reference.

Subpart B -- General Interpretations

- 1926.10 Scope of subpart.
1926.11 Coverage under section 103 of the act distinguished.
1926.12 Reorganization Plan No. 14 of 1950.
1926.13 Interpretation of statutory terms.
1926.14 Federal contracts for "mixed" types of performance.
1926.15 Relationship to the Service Contract Act; Walsh-Healey Public Contracts Act.
1926.16 Rules of construction.

Subpart C -- General Safety and Health Provisions

- 1926.20 General safety and health provisions.
1926.21 Safety training and education.
1926.22 Recording and reporting of injuries. [Reserved]
1926.23 First aid and medical attention.
1926.24 Fire protection and prevention.
1926.25 Housekeeping.
1926.26 Illumination.
1926.27 Sanitation.
1926.28 Personal protective equipment.
1926.29 Acceptable certifications.
1926.30 Shipbuilding and ship repairing.
1926.31 Incorporation by reference.
1926.32 Definitions.
1926.33 Access to employee exposure and medical records.
1926.34 Means of egress.
1926.35 Employee emergency action plans.

Subpart D -- Occupational Health and Environmental Controls

- 1926.50 Medical services and first aid.
1926.51 Sanitation.
1926.52 Occupational noise exposure.
1926.53 Ionizing radiation.
1926.54 Nonionizing radiation.
1926.55 Gases, vapors, fumes, dusts, and mists.
1926.56 Illumination.
1926.57 Ventilation.
1926.58 [Reserved]
1926.59 Hazard communication.
1926.60 Methyleneedianiline.
1926.61 Retention of DOT markings, placards and labels.
1926.62 Lead.
1926.64 Process safety management of highly hazardous chemicals.
1926.65 Hazardous waste operations and emergency response.
1926.66 Criteria for design and construction for spray booths.

Subpart E -- Personal Protective and Life Saving Equipment

- 1926.95 Criteria for personal protective equipment.
1926.96 Occupational foot protection.
1926.97 [Reserved]
1926.98 [Reserved]
1926.99 [Reserved]
1926.100 Head protection.

1926.101 Hearing protection.
1926.102 Eye and face protection.
1926.103 Respiratory protection.
1926.104 Safety belts, lifelines, and lanyards
1926.105 Safety nets
1926.106 Working over or near water.
1926.107 Definitions applicable to this subpart.

Subpart F -- Fire Protection and Prevention

1926.150 Fire protection.
1926.151 Fire prevention.
1926.152 Flammable and combustible liquids.
1926.153 Liquefied petroleum gas (LP-Gas).
1926.154 Temporary heating devices.
1926.155 Definitions applicable to this subpart.
1926.156 Fixed extinguishing systems, general.
1926.157 Fixed extinguishing systems, gaseous agent.
1926.158 Fire detection systems.
1926.159 Employee alarm systems.

Subpart G -- Signs, Signals, and Barricades

1926.200 Accident prevention signs and tags.
1926.201 Signaling.
1926.202 Barricades.
1926.203 Definitions applicable to this subpart.

Subpart H -- Materials Handling, Storage, Use, and Disposal

1926.250 General requirements for storage.
1926.251 Rigging equipment for material handling.
1926.252 Disposal of waste materials.

Subpart I -- Tools -- Hand and Power

1926.300 General requirements.
1926.301 Hand tools.
1926.302 Power operated hand tools.
1926.303 Abrasive wheels and tools.
1926.304 Woodworking tools.
1926.305 Jacks - lever and ratchet, screw and hydraulic.
1926.306 Air Receivers.
1926.307 Mechanical power-transmission apparatus.

Subpart J -- Welding and Cutting

1926.350 Gas welding and cutting.
1926.351 Arc welding and cutting.
1926.352 Fire prevention.
1926.353 Ventilation and protection in welding, cutting, and heating.
1926.354 Welding, cutting and heating in way of preservative coatings.

Subpart K -- Electrical

GENERAL

1926.400 Introduction.
1926.401 [Reserved]

INSTALLATION SAFETY REQUIREMENTS

1926.402 Applicability.
1926.403 General requirements.
1926.404 Wiring design and protection.
1926.405 Wiring methods, components, and equipment for general use.
1926.406 Specific purpose equipment and installations.
1926.407 Hazardous (classified) locations.
1926.408 Special systems.
1926.409-1926.415 [Reserved]

SAFETY-RELATED WORK PRACTICES

1926.416 General requirements.
1926.417 Lockout and tagging of circuits.
1926.418-1926.430 [Reserved]

SAFETY-RELATED MAINTENANCE AND ENVIRONMENTAL CONSIDERATIONS

1926.431 Maintenance of equipment.
1926.432 Environmental deterioration of equipment.
1926.433-1926.440 [Reserved]

SAFETY REQUIREMENTS FOR SPECIAL EQUIPMENT

1926.441 Battery locations and battery charging.
1926.442-1926.448 [Reserved]

DEFINITIONS

1926.449 Definitions applicable to this subpart.

Subpart L -- Scaffolds

1926.450 Scope, application and definitions applicable to this subpart.

1926.451 General requirements.

1926.452 Additional requirements applicable to specific types of scaffolds.

1926.453 Aerial lifts

1926.454 Training requirements.

APPENDIX A TO SUBPART L -- Scaffolds

APPENDIX B TO SUBPART L -- Scaffolds

APPENDIX C TO SUBPART L -- Scaffolds

APPENDIX D TO SUBPART L -- Scaffolds

APPENDIX E TO SUBPART L -- Scaffolds

Subpart M -- Fall Protection

1926.500 Scope, application, and definitions applicable to this subpart.

1926.501 Duty to have fall protection.

1926.502 Fall protection systems criteria and practices.

1926.503 Training requirements.

APPENDIX A TO SUBPART M -- DETERMINING ROOF WIDTHS

APPENDIX B TO SUBPART M -- GUARDRAIL SYSTEMS

APPENDIX C TO SUBPART M -- PERSONAL FALL ARREST SYSTEMS

APPENDIX D TO SUBPART M -- POSITIONING DEVICE SYSTEMS

APPENDIX E TO SUBPART M -- SAMPLE FALL PROTECTION PLANS

Subpart N -- Cranes, Derricks, Hoists, Elevators, and Conveyors

1926.550 [Reserved].

1926.551 Helicopters.

1926.552 Material hoists, personnel hoists and elevators.

1926.553 Base-mounted drum hoists.

1926.554 Overhead hoists.

1926.555 Conveyors.

1926.556 [Removed].

Subpart O -- Motor Vehicles, Mechanized Equipment, and Marine Operations

1926.600 Equipment.

1926.601 Motor vehicles.

1926.602 Material handling equipment.

1926.603 Pile driving equipment.

1926.604 Site clearing.

1926.605 Marine operations and equipment.

1926.606 Definitions applicable to this subpart.

Subpart P -- Excavations

1926.650 Scope, application, and definitions applicable to this subpart.

1926.651 Specific Excavation Requirements.

1926.652 Requirements for protective systems.

APPENDIX A TO SUBPART P -- SOIL CLASSIFICATION

APPENDIX B TO SUBPART P -- SLOPING AND BENCHING

APPENDIX C TO SUBPART P -- TIMBER SHORING FOR TRENCHES

APPENDIX D TO SUBPART P -- ALUMINUM HYDRAULIC SHORING FOR TRENCHES

APPENDIX E TO SUBPART P -- ALTERNATIVES TO TIMBER SHORING

APPENDIX F TO SUBPART P -- SELECTION OF PROTECTIVE SYSTEMS

Subpart Q -- Concrete and Masonry Construction

1926.700 Scope, application, and definitions, applicable to this subpart.

1926.701 General requirements.

1926.702 Requirements for equipment and tools.

1926.703 Requirements for cast-in-place concrete.

1926.704 Requirements for precast concrete.

1926.705 Requirements for lift-slab construction operations.

1926.706 Requirements of masonry construction.

APPENDIX TO SUBPART Q -- REFERENCES TO SUBPART Q OF PART 1926

Subpart R -- Steel Erection

1926.750 Scope.
1926.751 Definitions.
1926.752 Site layout, site-specific erection plan and construction sequence.
1926.753 Hoisting and rigging.
1926.754 Structural steel assembly.
1926.755 Column anchorage.
1926.756 Beams and columns.
1926.757 Open web steel joists.
1926.758 Systems-engineered metal buildings.
1926.759 Falling object protection.
1926.760 Fall protection.
1926.761 Training.

APPENDIX A TO SUBPART R -- GUIDELINES FOR ESTABLISHING THE COMPONENTS OF A SITE-SPECIFIC ERECTION PLAN: NON-MANDATORY GUIDELINES FOR COMPLYING WITH § 1926.752(e)

APPENDIX B TO SUBPART R -- [RESERVED]

APPENDIX C TO SUBPART R -- ILLUSTRATIONS OF BRIDGING TERMINUS POINTS: NON-MANDATORY GUIDELINES FOR COMPLYING WITH § 1926.757(a)(10) and § 1926.757(c)(5)

APPENDIX D TO SUBPART R -- ILLUSTRATION OF THE USE OF CONTROL LINES TO DEMARCATÉ CONTROLLED DECKING ZONES (CDZs): NON-MANDATORY GUIDELINES FOR COMPLYING WITH § 1926.760(c)(3)

APPENDIX E TO SUBPART R -- TRAINING: NON-MANDATORY GUIDELINES FOR COMPLYING WITH § 1926.761

APPENDIX F TO SUBPART R -- PERIMETER COLUMNS: NON-MANDATORY GUIDELINES FOR COMPLYING WITH § 1926.756(e) TO PROTECT THE UNPROTECTED SIDE OR EDGE OF A WALKING/WORKING SURFACE

APPENDIX G TO SUBPART R -- FALL PROTECTION SYSTEMS CRITERIA AND PRACTICES FROM § 1926.502: NON-MANDATORY GUIDELINES FOR COMPLYING WITH § 1926.760(d)

APPENDIX H TO SUBPART R -- DOUBLE CONNECTIONS: ILLUSTRATION OF A CLIPPED END CONNECTION AND A STAGGERED CONNECTION: NON-MANDATORY GUIDELINES FOR COMPLYING WITH § 1926.756(c)(1)

Subpart S -- Tunnels and Shafts, Caissons, Cofferdams, and Compressed Air

1926.800 Underground construction.
1926.801 Caissons.
1926.802 Cofferdams.
1926.803 Compressed air.
1926.804 Definitions applicable to this subpart.

APPENDIX A TO SUBPART S -- DECOMPRESSION TABLES

Subpart T -- Demolition

1926.850 Preparatory operations.
1926.851 Stairs, passageways, and ladders.
1926.852 Chutes.
1926.853 Removal of materials through floor openings.
1926.854 Removal of walls, masonry sections, and chimneys.
1926.855 Manual removal of floors.
1926.856 Removal of walls, floors, and material with equipment.
1926.857 Storage.
1926.858 Removal of steel construction.
1926.859 Mechanical demolition.
1926.860 Selective demolition by explosives.

Subpart U -- Blasting and Use of Explosives

1926.900 General provisions.
1926.901 Blaster qualifications.
1926.902 Surface transportation of explosives.
1926.903 Underground transportation of explosives.
1926.904 Storage of explosives and blasting agents.
1926.905 Loading of explosives or blasting agents.
1926.906 Initiation of explosive charges - electric blasting.
1926.907 Use of safety fuse.
1926.908 Use of detonating cord.
1926.909 Firing the blast.
1926.910 Inspection after blasting.
1926.911 Misfires.
1926.912 Underwater blasting.
1926.913 Blasting in excavation work under compressed air.
1926.914 Definitions applicable to this subpart.

Subpart V -- Power Transmission and Distribution

1926.950 General requirements.
1926.951 Tools and protective equipment.
1926.952 Mechanical equipment.
1926.953 Material handling.
1926.954 Grounding for protection of employees.
1926.955 Overhead lines.

- 1926.956 Underground lines.
- 1926.957 Construction in energized substations.
- 1926.958 External load helicopters.
- 1926.959 Lineman's body belts, safety straps, and lanyards.
- 1926.960 Definitions applicable to this subpart.

Subpart W -- Rollover Protective Structures; Overhead Protection

- 1926.1000 Rollover protective structures (ROPS) for material handling equipment.
- 1926.1001 Minimum performance criteria for rollover protective structures for designated scrapers, loaders, dozers, graders, and crawler tractors.
- 1926.1002 Protective frames (roll-over protective structures, known as ROPS) for wheel-type agricultural and industrial tractors used in construction.
- 1926.1003 Overhead protection for operators of agricultural and industrial tractors.

APPENDIX A TO SUBPART W -- Figures W-14 through W-28

Subpart X -- Stairways and Ladders

- 1926.1050 Scope, application, and definitions applicable to this subpart.
- 1926.1051 General Requirements.
- 1926.1052 Stairways.
- 1926.1053 Ladders.
- 1926.1054-1926.1059 [Reserved]
- 1926.1060 Training Requirements

APPENDIX A TO SUBPART X -- Ladders

Subpart Y -- Commercial Diving Operations

GENERAL

- 1926.1071 Scope and application.
- 1926.1072 Definitions.

PERSONNEL REQUIREMENTS

- 1926.1076 Qualifications of dive team.

GENERAL OPERATIONS PROCEDURES

- 1926.1080 Safe practices manual.
- 1926.1081 Pre-dive procedures.
- 1926.1082 Procedures during dive.
- 1926.1083 Post-dive procedures.

SPECIFIC OPERATIONS PROCEDURES

- 1926.1084 SCUBA diving.
- 1926.1085 Surface-supplied air diving.
- 1926.1086 Mixed-gas diving.
- 1926.1087 Liveboating.

EQUIPMENT PROCEDURES AND REQUIREMENTS

- 1926.1090 Equipment

RECORDKEEPING

- 1926.1091 Recordkeeping requirements.
- 1926.1092 [Removed]

APPENDIX A TO SUBPART Y -- EXAMPLES OF CONDITIONS WHICH MAY RESTRICT OR LIMIT EXPOSURE TO HYPERBARIC CONDITIONS

APPENDIX B TO SUBPART Y -- GUIDELINES FOR SCIENTIFIC DIVING

Subpart Z -- Toxic and Hazardous Substances

- 1926.1100 [Reserved]
- 1926.1101 Asbestos
- 1926.1102 Coal tar pitch volatiles; interpretation of term.
- 1926.1103 13 Carcinogens (4-Nitrobiphenyl, etc.).
- 1926.1104 alpha-Naphthylamine.
- 1926.1105 [Reserved]
- 1926.1106 Methyl chloromethyl ether.
- 1926.1107 3,3'-Dichlorobenzidine (and its salts).
- 1926.1108 bis-Chloromethyl ether.
- 1926.1109 beta-Naphthylamine.
- 1926.1110 Benzidine.
- 1926.1111 4-Aminodiphenyl.
- 1926.1112 Ethyleneimine.
- 1926.1113 beta-Propiolactone.
- 1926.1114 2-Acetylaminofluorene.
- 1926.1115 4-Dimethylaminoazobenzene.
- 1926.1116 N-Nitrosodimethylamine.
- 1926.1117 Vinyl chloride.
- 1926.1118 Inorganic arsenic.
- 1926.1127 Cadmium.

1926.1128 Benzene.
 1926.1129 Coke oven emissions.
 1926.1144 1,2-dibromo-3-chloropropane.
 1926.1145 Acrylonitrile.
 1926.1147 Ethylene oxide.
 1926.1148 Formaldehyde.
 1926.1152 Methylene Chloride.

Subpart AA-BB -- [RESERVED]

Subpart CC -- Cranes and Derricks in Construction

1926.1400 Scope.
 1926.1401 Definitions.
 1926.1402 Ground conditions.
 1926.1403 Assembly/Disassembly--selection of manufacturer or employer procedures.
 1926.1404 Assembly/Disassembly--general requirements (applies to all assembly and disassembly operations).
 1926.1405 Disassembly--additional requirements for dismantling of booms and jibs (applies to both the use of manufacturer procedures and employer procedures).
 1926.1406 Assembly/Disassembly--employer procedures--general requirements.
 1926.1407 Power line safety (up to 350 kV)--assembly and disassembly.
 1926.1408 Power line safety (up to 350 kV)--equipment operations.
 1926.1409 Power line safety (over 350 kV).
 1926.1410 Power line safety (all voltages)--equipment operations closer than the Table A zone.
 1926.1411 Power line safety--while traveling.
 1926.1412 Inspections.
 1926.1413 Wire rope--inspection.
 1926.1414 Wire rope--selection and installation criteria.
 1926.1415 Safety devices.br> 1926.1416 Operational aids.
 1926.1417 Operation.
 1926.1418 Authority to stop operation.
 1926.1419 Signals--general requirements.
 1926.1420 Signals--radio, telephone or other electronic transmission of signals.
 1926.1421 Signals--voice signals--additional requirements.
 1926.1422 Signals--hand signal chart.
 1926.1423 Fall protection.
 1926.1424 Work area control.
 1926.1425 Keeping clear of the load.
 1926.1426 Free fall and controlled load lowering.
 1926.1427 Operator qualification and certification.
 1926.1428 Signal person qualifications.
 1926.1429 Qualifications of maintenance & repair employees.
 1926.1430 Training.
 1926.1431 Hoisting personnel.
 1926.1432 Multiple-crane/derrick lifts--supplemental requirements.
 1926.1433 Design, construction and testing.
 1926.1434 Equipment modifications.
 1926.1435 Tower cranes.
 1926.1436 Derricks.
 1926.1437 Floating cranes/derricks and land cranes/derricks on barges.
 1926.1438 Overhead & gantry cranes.
 1926.1439 Dedicated pile drivers.
 1926.1440 Sideboom cranes.
 1926.1441 Equipment with a rated hoisting/lifting capacity of 2,000 pounds or less.
 1926.1442 Severability.

Appendix A to Subpart CC of part 1926--Standard Hand Signals

Appendix B to Subpart CC of part 1926--Assembly/Disassembly--Sample Procedures for Minimizing the Risk of Unintended Dangerous Boom Movement

Appendix C to Subpart CC of part 1926--Operator Certification--Written Examination--Technical Knowledge Criteria

APPENDIX A TO PART 1926 -- DESIGNATIONS FOR GENERAL INDUSTRY STANDARDS INCORPORATED INTO BODY OF CONSTRUCTION STANDARDS.

SOURCE: 44 FR 8577, Feb. 9, 1979; 44 FR 20940, Apr. 6, 1979, unless otherwise noted.

EDITORIAL NOTE: At 44 FR 8577, Feb. 9, 1979, and corrected at 44 FR 20940, Apr. 6, 1979, OSHA reprinted without change the entire text of 29 CFR Part 1926 together with certain General Industry Occupational Safety and Health Standards contained in 29 CFR Part 1910, which have been identified as also applicable to construction work. This republication developed a single set of OSHA regulations for both labor and management forces within the construction industry.

Editorial Note: The Federal Register of August 2, 1995, page 39254 issued a Final Rule; correcting amendment. OSHA will maintain the existing fall protection requirements for steel erection activities pending rulemaking that addresses the steel erection industry. This affected 1926.104, 1926.105, 1926.107, 1926.500, and 1926.753.

[55 FR 42328, Oct. 18, 1990; 55 FR 47687, Nov. 14, 1990; 58 FR 26627, May 4, 1993; 58 FR 35077, June 30, 1993; 59 FR 215, Jan. 3, 1994; 59 FR 36695, July 19, 1994; 59 FR 40729, Aug. 9, 1994; 59 FR 40964, Aug. 10, 1994; 60 FR 5131, Jan. 26, 1995; 60 FR 39254, Aug. 2, 1995; 61 FR 5507, Feb. 13, 1996; 61 FR 9227, March 7, 1996; 61 FR 31427, June 20, 1996; 61 FR 46025, Aug. 30, 1996; 62 FR 1493, Jan. 10, 1997; 63 FR 1152, Jan. 8, 1998; 63 FR 1919, Jan. 13, 1998; 63 FR 3813, Jan. 27, 1998; 63 FR 13338, March 19, 1998; 63 FR 17093, April 8, 1998; 63 FR 20098, April 23, 1998; 63 FR 33450, June 18, 1998; 63 FR 35137, June 29, 1998; 64 FR 18810, April 16, 1999; 66 FR 5265, Jan. 18, 2001; 70 FR 76985, Dec. 29, 2005; 71 FR 2885, Jan. 18, 2006; 71 FR 16675, April 3, 2006; 75 48130, Aug. 9, 2010]

 Next Standard (1926 Subpart A)

MBTA SPECIAL INSTRUCTIONS

April 1, 2003

PAGE 1

APPENDIX M

MBTA SPECIAL INSTRUCTIONS

MARCH 2003

Table of Contents

LETTER OF TRANSMITTAL REGARDING SPECIAL INSTRUCTIONS.....2

1. ACCESS TO AUTHORITY PROPERTY..... 2

2. INSURANCE REQUIREMENTS.....6

3. SUBMITTAL OF SPECIFICATIONS, DRAWINGS, DESIGN AND METHODS OF CONSTRUCTION.....6
(Applies to non-MBTA Construction Contracts. MBTA Construction Contracts are covered under Division I)

4. OPERATIONAL RESTRICTIONS..... 7

5. PROTECTION SERVICES.....10

6. ANNUAL CERTIFICATION OF HI-RAIL EQUIPMENT.....11

MBTA SPECIAL INSTRUCTIONS

April 1, 2003

PAGE 2

MBTA SPECIAL INSTRUCTIONS

APRIL 2003

LETTER OF TRANSMITTAL REGARDING SPECIAL INSTRUCTIONS

The Subway Operations, Bus Operations, Safety, Systemwide Maintenance & Improvements, Operations Support, and the Design and Construction Departments of the MBTA have determined that certain limitations regarding Contractor's activities are required while working on a construction project.

These Supplementary Conditions are included herein to augment the MBTA Standard Specifications, Division I - General Requirements, Section 00700 General Conditions, Article 6 - Prosecution and Progress, Paragraph 6.04 Limitations of Operations with additional information, which is applicable to construction projects.

However, for non-MBTA construction projects where Division I does not apply, such as in the case of rights to construct on MBTA property granted under a lease or license agreement, the enclosed Special Instructions are still applicable unless otherwise directed.

Contract drawings and specifications for non-MBTA construction projects, relative to all work that will be performed within or directly adjacent to MBTA property, must be submitted to the Authority's Chief Engineer of Design and Construction, Director of Subway Operations, Director of Bus Operations, Director, of Systemwide Maintenance & Improvements, Director of Operations Support, Director of Safety, and the Director of Real Estate. The addresses and phone numbers are listed on the next page. The special instructions contain information to be complied with by the owner, contractors, and others associated with the project.

Applicable provisions of the special instructions plus additional requirements from other MBTA departments must be included in the contract specifications as instructions to the contractor when performing work on or adjacent to MBTA property. Permission to perform work on MBTA property will be granted by the Director of Real Estate only when contract plans and specifications are approved by the MBTA.

The enforcement of any of the following conditions shall not be construed as waiving any of the rights of the Authority in any of the other conditions of an MBTA contract.

A meeting to further discuss MBTA requirements may be arranged by contacting the offices of those listed in Article 1.a. and/or b. herein.

1. ACCESS TO AUTHORITY PROPERTY

- A. For MBTA Contractors Only: An owner or Contractor who wishes permission to enter upon or perform work over, on, under or adjacent to Authority property shall submit to the offices of the Authority's Chief Engineer of Design and Construction, the Director of Bus Operations, the Director of Subway Operations, Director of Systemwide

MBTA SPECIAL INSTRUCTIONS

April 1, 2003

PAGE 3

Maintenance & Improvements, and the Director of Operations Support, a request in writing, a minimum of forty-two (42) days prior to the owner or the Contractor's planned commencement of any of the above stated activities. Addresses of the above are as follows:

MBTA's Chief Engineer of Design and Construction
6th Floor
10 Park Plaza
Boston, MA 02116
617 222-3116

Director of Systemwide Maintenance & Improvements
500 Arborway
Jamaica Plain, MA 02130
617 222-5454

Director of Subway Operations
10th Floor
45 High Street
Boston, MA 02110
617 222-4554

Director of Bus Operations
10th Floor
45 High Street
Boston, MA 02110
617 222-3368

Director of Operations Support
10th Floor
45 High Street
Boston, MA Q2110
617 222-5460

Director of Safety
2nd Floor
21 Arlington Avenue
Charlestown, MA 02129
617 222-4244

- B. Non-MBTA Construction Contractors For Lessees or Licenses of the MBTA Only: An owner or Contractor who wishes permission to enter upon or perform work over, on, under or adjacent to Authority property shall submit to the offices of the MBTA's designated representative for real estate listed below, a request in writing, a minimum of forty-two (42) days prior to the owner or the Contractor's planned commencement of any of the above stated activities. The designated representative will distribute plan sets to the above MBTA departments and will coordinate departmental approvals. Application forms and instructions for obtaining access to MBTA property

MBTA SPECIAL INSTRUCTIONS

April 1, 2003

PAGE 4

can be obtained by visiting the designated representative's website listed below and selecting "MBTA" and "Licensing."

License Administrator
Massachusetts Realty Group
20 Park Plaza, Suite 1120
Boston, MA 02116
617-316-1654
www.mbtarealty.com

The designated representative reports directly to:

MBTA Director of Real Estate
5th Floor
10 Park Plaza
Boston, MA 02116
617 222-3255

- C. Requests shall specify the name of the owner or the contractor, the reasons for entering the property, where the property will be entered, each individual location where work of a different nature is to be performed, the nature of such work, and the number of days, including time schedule, the owner or the contractor intends to remain on the property at each location. The Authority will process such requests and meet with the owner or contractor to work out a schedule and phasing for the work plus other arrangements including financial. The Authority shall request a list of the names of each individual who will enter upon or perform work on Authority property.
- D. The owner or contractor shall notify the representative of the Design and Construction Department and the appropriate Operations Director at least seventy-two (72) hours prior to entering the property as agreed upon earlier with the Authority. The owner or contractor shall notify the Design and Construction, and Operations Departments immediately if the job is to be closed down unexpectedly and shall again notify the Authority as specified above when work will commence.
- E. The owner or contractor shall make all necessary arrangements with the Authority before entering upon the property and perform the work in accordance with an MBTA approved work schedule. The owner or contractor shall not enter MBTA property or perform any work on Authority property without the presence of an assigned MBTA representative from the Design and Construction Department or the Operations Department who is responsible for monitoring the work of that owner or contractor for the Authority. Working on Authority property without an assigned MBTA representative present shall be cause for immediate eviction from the property.
- F. The owner or contractor must have in place a method of payment for all Authority support services such as flagging, work trains, power shut offs, etc., prior to commencement of any work. This will be processed through a written force account agreement between the Authority and the owner or contractor prior to commencement of work. Direct billing to contractors for Authority support services requires the contractor's authorized representative to agree in writing that the company will reimburse the Authority for those support services, including overhead and fringe benefits. Once the Authority receives the signed statement from the contractor, the General Accounting

MBTA SPECIAL INSTRUCTIONS

April 1, 2003

PAGE 5

Office will open a reimbursable account for specific Authority department(s) to charge costs, and the contractor will be billed directly.

- G. The work associated with this project, except as hereinafter expressly provided, will be done without interruption of or change in the regular work or operation of vehicles of the Authority. No work shall be done affecting the operations of vehicles or operations of stations until the contractor has submitted details of his procedures to the Design and Construction and the applicable Operations representatives thirty (30) working days prior to start of work and has secured written permission to proceed.
- H. The Authority reserves the right to require work affecting the safety of the operations to be performed at prescheduled non-operating periods from approximately 1:30 a.m. to 5:00 a.m. daily (1:30 a.m. - 4:30 a.m. effective); 1:30 a.m. to 6:00 a.m. Sunday (1:30 a.m.-5:30 a.m. effective). The contractor will not be permitted to remain within the track right-of-way after 5:00 am. (6:00 a.m. Sunday). The Authority may, during emergencies or at times when the Authority work forces are required to work in the area of the contractors work, order the contractor to cease work and remove his work forces and equipment from the property leaving the right-of-way in a safe operating condition. The Authority also reserves the right to stop or postpone any contractor's previously approved work if, in the Authority's opinion, such work is being performed in a manner that will endanger and/or delay the Authority's regular work or operations.
- I. The owner or contractor shall make their own provisions for electric power, compressed air, water, ventilation, and disposal of seepage water. No use of existing MBTA utilities will be permitted unless approved in advance by the Authority.
- J. The owner or the contractor's attention is directed to other projects that will be ongoing simultaneously in the work area. The Authority will determine priorities for site access between this project and others.
- K. The Authority reserves the right to deny the contractor access to the right of way because of operational requirements, adverse weather conditions or emergency track, signal, and power repairs. The contractor shall reasonably expect to be denied access to the site a total of 10 (ten) days per calendar year, this does not include the following holidays; New Year's Day, President's Day, Patriot's Day, Memorial Day, Bunker Hill Day, Independence Day, Labor Day, Columbus Day, Veteran's Day, Thanksgiving Day, and Christmas Day. In addition, right of way access may be denied on days when various Special Events impact service as well as during Red Sox home games on the Green Line.

Furthermore, the contractor shall also expect to have his access to the site delayed a total of 4 (four) times per month. Each delay shall be 60 (sixty) minutes or less. The contractor shall make allowances for these possible events in their bid. Due to increased stopping distances associated with slippery rail conditions, non-emergency access will not be allowed within ten (10) feet of the centerline of the track under adverse weather conditions.

- L. The contractor shall perform his work at all times so as to cause no interruption of service during operating hours and shall at all times after performing work during either operating hours or non-operating hours leave the Authority's property in a clean and safe operating condition.

MBTA SPECIAL INSTRUCTIONS

April 1, 2003

PAGE 6

- M. On occasion, the Authority will operate work cars, test trains, security trains, and/or hirait Vehicles in, the area of the work. At no time during these occurrences will the contractor be allowed to work on the right-of-way, except with the approval of the Authority or the Authority personnel providing protection services as defined in Protection Services.

2. INSURANCE REQUIREMENTS

- A. The owner or Contractor's for MBTA Construction Contracts insurance requirements shall conform to the latest version of MBTA Standard Specifications, Division 1 - General Requirements, Section 00700 .General Conditions, Article 5 .Legal Relations and Responsibility to the Public, Paragraph 5.04 . Insurance Requirements. Owners or Contractors under a lease or license agreement with the MBTA shall provide insurance in accordance with the requirements of said agreement.

3. SUBMITTAL OF SPECIFICATIONS DRAWINGS, DESIGN AND METHODS OF CONSTRUCTION

(Applies to non-MBTA Construction Contracts. MBTA Construction Contracts are covered under Division I)

- A. An owner or contractor or others performing a non-MBTA construction contract that requires performing construction over, on, under or adjacent to the Authority's property shall submit to both the Design and Construction Department and to the appropriate Operations Department two (2) sets each of contract drawings and specifications at the 30%, 60%, 90% and 100% phases of design of the project. 100% drawings and specifications must be submitted forty-two (42) days prior to the planned commencement of any work.
- B. The contractor's drawings and specifications shall define the work in detail and a Professional Engineer registered in the Commonwealth of Massachusetts shall stamp the final drawings. The contractor or owner shall also submit a crane or heavy equipment location, if used, with dimensions to the face of abutments and structures and calculations of crane equipment loading on Authority structures showing no adverse effect on any structures. All calculations shall be stamped by a Professional Engineer registered in the Commonwealth of Massachusetts. The drawings must include any excavation support systems, shoring, underpinning, protective shielding, or any work required for the protection of MBTA property.
- C. Unless otherwise agreed to in advance, the owner or contractor's structures shall not attach to, be placed against, pass through, or impose any loads upon any structures or facilities owned by the MBTA.
- D. All construction work shall be performed in strict conformity with final plans and specifications that have been reviewed and approved by the MBTA. Any changes requested by the owner or contractor which affect MBTA property or operations must be submitted to the MBTA for review and approval at least 30 days prior to the planned commencement of the work. Approvals or rejections shall be submitted by the MBTA within thirty (30) days following submission to the MBTA for review.

MBTA SPECIAL INSTRUCTIONS

April 1, 2003

PAGE 7

- E. The owner or the contractor performing construction work over, on, under, or adjacent to Authority property shall submit to the Director of Design four (4) sets each of the design, drawings and specifications of any earth support system, shoring, underpinning, protective shielding, or any work required for the protection of the Authority's facilities and property, a minimum of forty-two (42) working days prior to the planned commencement of any of the above work. The design, drawings and specifications shall define in detail the methods of construction and materials to be used. The design and drawings shall be stamped and signed by a Professional Engineer registered in the Commonwealth of Massachusetts.
- F. Unless otherwise agreed to in advance, earth support structures or shoring systems shall not be attached to any structure owned by the MBTA, nor shall MBTA structures be use to support loadings or be used for excavation support.
- G. Engineering drawings of MBTA structures are available for reference or duplication at the MBTA Plan Room, 500 Arborway, Jamaica Plain, MA 02130. For information call the Technical Librarian at 617-222-5285.

4. OPERATIONAL RESTRICTIONS

- A. The owner or contractor is made aware that the work will be performed adjacent to or over operating tracks, signal lines, communication lines, power lines, cables and other facilities belonging to the Authority. The owner or contractor is to take all due precautions to protect the Authority's facilities, utilities, and operations during the course of his work. When in the opinion of the Authority's Chief Engineer of Design and Construction, Director of Subway Operations, Director of Systemwide Maintenance & Improvements, Director of Operations Support, or their representatives, the contractor's work would cause hazard to the Authority's facilities, infrastructure, or to the safe operation of the transit system, the Authority will assign qualified personnel deemed necessary to protect the property, facilities and operations, all at the expense of the contractor.
- B. The contractor is specifically prohibited from conducting any operations next to or over the right-of-way that have the potential to adversely impact the operations of Authority revenue service during normal operating hours (approximately 5:00 a.m. to 1:30 a.m.). Certain work adjacent to the right-of-way, described below as hazardous work, may take place during restricted revenue hours at the discretion of the Chief of Orange, Red, Green, or Blue Line Operations as applicable and require flagmen present.
- C. Access to the MBTA right-of-way, which encompasses all MBTA property (fence to fence, wall to wall, and property line to property line over which Authority vehicles operate, including sidings and yards), is. contingent upon Owner or Contractor compliance with the "MBTA Right-of-Way Safety Rulebook" that outlines Right-of-Way Safe Practices for Access on or Near the Right-Of-Way.

As specified in the Right of Way Safety Rulebook, all persons who access the MBTA right of way must attend a one-day, eight-hour training class conducted by Subway Operations Training and the Safety Department Attendees must successfully complete the Right of Way Safety Training in order to

MBTA SPECIAL INSTRUCTIONS

April 1, 2003

PAGE 8

receive a Right of Way license. The license is valid for a two-year period after which the person must attend the Authority's Right of Way re-certification class. To register for the "Right of Way Safety" class, contact:

Supervisor and Chief Rules Examiner of Training
 Cabot RTL Training
 275 Dorchester Avenue, 2nd floor
 South Boston, MA 02127
 Telephone: (617) 222-5377

D. The Authority will consider the property; facilities and operations fouled or subject to hazard when the following occurs:

1. When any object or operation is or can be brought nearer than ten (10) feet to the centerline of operating track.
2. When an object or excavation is brought nearer than four (4) feet to a signal or communication line.
3. When an object or excavation is brought nearer than ten (10) feet to a power line or cable.
4. When explosives are used in the vicinity of the premises. Explosives shall not be used on or adjacent to the Authority's property or facilities without written consent of the Authority's Chief Engineer of Design and Construction and then shall be used only by a licensed blaster, licensed in the Commonwealth of Massachusetts, at times and under conditions acceptable to the Authority.
5. When cranes, trucks, power shovels, pile driver or any other equipment are working in positions that failure with or without load could occur nearer than 10 feet to the centerline of an operating track.

It shall be the responsibility of the contractor to inform the Chief of Orange, Red, Green, or Blue Line Operations as applicable in writing thirty (30) working days prior to all times when they intend to perform hazardous work as described above. Submittal must include a site plan, the reasons for entering the property, where the property will be entered, each individual location where work of a different nature is to be performed, the nature of such work, and number of days, including time schedule, the contractor intends to remain on the property at each location. Failure of the contractor to provide the appropriate Line Chief with the specified advanced notice of hazardous work will result in the stoppage of work by the Authority.

D. The Contractor will be allowed on the right-of-way only after normal revenue service (approximately 1:30 a.m. to 5:00 a.m.). On occasion, the Authority will operate work cars in the area of the project work during non-revenue hours. At no time during these occurrences will the contractor be allowed to work on the right-of-way except with the approval of the Authority. The contractor shall coordinate their schedule at least twenty-four (24) hours in advance with the Authority.

E. No weekday/weekend transit service interruptions will be allowed on this project. The contractor must schedule all work requiring a shutdown of revenue service and/or station and/or platform operations during non-revenue hours.

MBTA SPECIAL INSTRUCTIONS

April 1, 2003

PAGE 9

- F. Prior to the contractor leaving any work site, at the completion of each workday, the contractor shall ensure that the site is in proper condition to permit normal transit operations to resume. If, in the opinion of the Authority, the site is not suitable for normal transit operations due to conditions caused by the contractor, the Authority will allocate a suitable number of personnel to rectify the site. The owner or his contractor shall be charged full costs of such personnel and necessary equipment, including the full cost of replacement services during the cleanup period.
- G. In the event that the contractor does not adhere to the work period limitations of the special conditions and causes delay in returning the right-of-way to revenue service at the end of any work period, the owner or his contractor shall pay the Authority for substitute bus service a sum not to exceed \$120.00 per hour per bus for the entire duration of the delay and including mobilization and demobilization of the bus service. The minimum charge shall be (3) hours per bus per delay... The owner or the contractor will reimburse the Authority for the hourly costs of personnel used during such delays (egg., supervisors, officials, gatepersons, flagpersons, and automotive). The required number of buses to adequately accommodate all Authority customers who are inconvenienced by the delay shall be at the sole discretion of the Authority's Bus Operations Department. Whatever sum of money may become due and payable to the Authority by the owner or his contractor under this article may be retained out of money belonging to the contractor in the hand and possession of the Authority. This article shall be construed and treated by the parties to the contract not as imposing a penalty upon the contractor for failing fully to complete the work within the periods as specified herein, but as liquidation damages to compensate the Authority for additional costs incurred by the Authority because of the failure of the contractor to fully complete said work within the work periods specified.
- H. The contractor shall assume full responsibility for the safety of all their work. They shall perform the work in a manner that will ensure the safety of both personnel and property. The contractor shall prevent against safety hazards, and the exposure of persons and equipment to hazardous and/or potentially hazardous conditions. All, work in the construction of the project shall comply with the requirements of the Authority, Department of Labor, Occupational Safety and Health Administration (OSHA) provisions, as well as those of state and local regulations. Safe breathing levels must conform to the Massachusetts Department of Environmental Protection (DEP) standards. In the case of conflict of regulations, the most stringent will apply. If the standards are not met, the Authority has the right to stop the work until such time as the contractor is in compliance with standards.

5. PROTECTION SERVICES

- A. When the contractor is performing work in the vicinity of Authority rights-of-way or public areas, the Authority will require the contractor to have at the site such authorized and qualified personnel as may be required to adequately protect the Authority's customers, employees, property, facilities and operations from hazardous conditions.
- B. The need for protection services is outlined and described in the Authority's Right-of-Way Safety Rulebook. The appropriate Line Chief, or their representative, shall determine what protection services are required and assign flagging personnel, officials, supervisors, coordinators or any other such personnel as may be required to ensure the safety of the Authority's operations. Personnel shall be provided from the Authority's workforce in such numbers as the Line Chief determines.

MBTA SPECIAL INSTRUCTIONS

April 1, 2003

PAGE 10

Costs for all protection services and supplies shall be the responsibility of the owner or contractor. No work will be allowed if flagmen are required, but not on duty.

- C. When it is determined that protection services are required, the contractor must notify the Authority twenty-four (24) hours in advance and before 10.00 a.m. on the workday preceding the day that protection services will be required. Requests for protection services for weekends and/or holidays, must be made on the preceding Friday before 10.00 a.m., or before 10.00 a.m. on the workday preceding the holiday.

Requests for protection services for Non-Operating hours 1.30 a.m.—5.00 a.m. and in order for the work to be included on the Night Orders you must contact the:

Planning and Scheduling Coordinator
 Maintenance of Way
 617-222-5419.

Requests for protection services for Operating hours 5.00 a.m.-1.30 a.m. and in order for the work to be included on the Day Orders, you must contact:

Orange, Red, Green, or Blue Line Superintendent as applicable.
 617-222-5844 (Orange); 617-222-5099(Red);
 617-222-5982 (Green); 617-222-5532 (Blue).

It will be at the sole discretion of the Authority whether the contractor will be allowed to perform work on any particular day or night.

- D. The contractor will be required to provide each flagperson on duty with properly functioning safety equipment as approved by the Authority's Safety Department. This equipment includes but is not limited to: orange safety cones, red, yellow, and green flags, airhoms, hardhats, safety goggles, and hearing protection. The contractor will not be allowed on or adjacent to the right-of-way if flagging personnel are not equipped with required safety personal protective equipment.
- E. The contractor will supply properly functioning Authority-frequency portable radios to each flagperson on duty on a daily basis.. The contractor will be responsible for storing and maintaining radios throughout the life of the contract.
- F. All workers employed by the contractor who are to work within the Authority's stations, track area, right-of-way or adjacent to the traction power system or any high voltage electrical cables, shall be required to attend a safety awareness course at the Authority's Subway Operations Training School. The course is to make the contractor's personnel aware of the particular hazards related to the Authority's operations.
- G. All personnel working on the project site in the immediate vicinity of, or within the right-of-way, are required to wear orange reflective safety vests, similar to standard Authority equipment as specified in the Right-of-Way safety Rulebook.
- H. Work activities necessitating the traction power system (third rail and catenary) deenergization will require the services of an Authority power lineperson on site at all times and the contractor is responsible for any. costs incurred by the Authority as. a result of this action.

MBTA SPECIAL INSTRUCTIONS

April 1, 2003

PAGE 11

- I. Prior to the implementation of the contracted work, and throughout the life of the contract, the contractor will be required to supply professionally rendered signs, as directed by the Authority's Marketing Department. These signs will include, but are not limited to, the following:
1. Informational signs for revenue service diversion.
 2. Station directional and stairway, platform, exit closing signs.
 3. General project informational signs for Authority customers.
- J. Upon the direction of the Authority's Chief Engineer of Design and Construction, Director of Safety, and or Director of Subway Operations or their representatives, the contractor will be required to supply and install partitions and wooden barricades to cordon off the work site; such partitions and barricades shall be maintained and remain graffiti free by the contractor for the duration of the project.
- K. Upon direction from the Authority's Chief Engineer of Design and Construction and / or Director of Subway Operations or their representatives, the contractor will supply the following when site conditions warrant:
1. Emergency and temporary lighting.
 2. Exhaust fans of sufficient size and numbers to adequately ventilate the work site, tunnel and or adjacent stations.
 3. Fire and / or garden hose for the purpose of dust control.
- L. It shall be the responsibility of the contractor to keep the Authority informed prior to all times when they intend to perform hazardous work. Failure of the contractor to provide the Authority with suitable advance notice of hazardous work will result in the stoppage of the work by the Authority until such time as sufficient numbers of protection personnel are on duty at the site.

6. ANNUAL CERTIFICATION OF HI-RAIL EQUIPMENT

- A. All equipment used by the contractor on Authority property shall be inspected by the Maintenance of Way engineer and/or the MBTA Safety Department for clearance and safety standards, and shall not be used if considered unsafe. All contractor/ subcontractor equipment (including hi-rail) operators must be trained, certified, and properly licensed. Documentation of same must be readily available and provided to the Authority upon request. If the contractor equipment is involved in a derailment or near miss incident or an accident, which caused injury or exposed personnel to injury and or caused damage to Authority property, that equipment will be subject to the Impound Policy Procedure.
- B. Contractor equipment to be used on or in the vicinity of the track shall be in first class condition, so as to positively prevent any failure that would cause delay in Authority operations or damage to its property or compromise the health and safety of personnel working on the project. Equipment shall not be placed or operated within the fouling distance of track without first obtaining the permission of the Authority.
- C. The contractor shall not, at any time, operate equipment or machinery over Authority's right-of-

MBTA SPECIAL INSTRUCTIONS

April 1, 2003

PAGE 12

way without the use of hi-rail gear. All equipment that the contractor proposes to operate shall 'be modified to operate over the Authority's track and special work (e.g., switches, crossover frogs third rail, and restraining rail). Qualified Authority personnel shall control the movement of all hi-rail equipment at all times while operating on the Authority right-of-way. The contractor shall supply a portable radio for each hi-rail vehicle entering the Authority's right-of-way. No hi-rail equipment will be allowed on Authority's property without a functioning portable radio tuned to an Authority frequency.

- D. The contractor shall furnish hi-rail equipment capable of operating within the strict confines of the right-of-way. No Authority owned equipment is available for the contractor's use. In addition to equipment necessary to complete the work on a regular basis, the contractor shall be required to have on site sufficient standby equipment capable of: a) removing disabled equipment from the right-of way, and b) replacing disabled equipment in order to return the right-of-way to normal operating status by the end of the designated work period. As part of the pre-qualification statement, the contractor shall furnish an itemized list of all equipment to be used on the project, including:
1. Type of equipment (e.g., pickup, flatbed or dump trucks, excavator, cranes, etc.).
 2. Make, model and date of manufacture.
 3. Ownership.
 4. Present use and date of availability.
 5. Location where equipment may be inspected by Authority personnel during the prequalification period.
- E. The contractor shall have proof of competency for hi-rail operators (e.g., documentation, that the operator of hi-rail equipment is certified to operate that specific piece of equipment). The Authority reserves the right to review the lesson plan and audit the training class. The hi-rail operator will be responsible for ensuring and documenting that the vehicle is safe for operation and that all required equipment is present and properly secured. This must be done on a daily basis prior to operating the equipment.
- F. The contractor is required to have an Annual Certification of hi-rail equipment (separate form the Registry Inspection) signed by a competent person (e.g. Manufacturer's representative) asserting to the fact that the equipment is Original Equipment Manufacturer (OEM), that it conforms to the latest standards, was installed per the manufacturer's specification, and is functioning properly.
- G. The contractor must keep a copy of the Manufacturer's Operating Manual or instructions onboard the hi-rail equipment at all times.
- H. The operator shall operate the hi-rail equipment at a reasonable speed for the existing conditions, being alert for another vehicle (or any other obstruction along the right of way). In addition, said operator must maintain a safe spacing of traveling equipment.
- I. The contractor's hi-rail vehicles must be equipped with a horn (warning device), and an exhaust gas purifier.
- J. All equipment when used in tunnels and or darkness must conform to the Authority's standards for

MBTA SPECIAL INSTRUCTIONS

April 1, 2003

PAGE 13

headlights and marker lights. In addition, when vehicles are operating in tandem such as rail carts; flat cars, etc., such vehicles must be equipped with a flashing/strobe light when the lead vehicle is other than the operating vehicle. Diesel powered equipment only will be allowed in the tunnel and shall be removed from the tunnel each night unless otherwise permitted by the Director of Subway Operations.

K. Contractors must comply with the Authority's Propane Gas policy.

L. Contractor's doing "hot work" must have appropriate permits and follow all applicable rules and procedures for same.

THIS PAGE IS INTENTIONALLY LEFT BLANK

DOCUMENT A00808

PROJECT UTILITY COORDINATION FORM

THIS PAGE INTENTIONALLY LEFT BLANK



Project Utilities Coordination (PUC) Form

8/26/2024
Revision
Date:

CONTACTS AND GENERAL UTILITY INFORMATION

City/Town: Lawrence		Project File #: 608930		PUC Completed by: jgstrom@dot.state.ma.us		Utility Pole Set: Ngrid/Verizon									
Route/Street: Lawrence Manchester Rail Trail		Asst. Dist. Const /Dist. Utility Reimb. Eng Peter Tramontozzi@dot.state.ma.us 857 368 4085 Amanda Klemm@dot.state.ma.us/781-570-1154		Mass DOT PM: Lawrence.Cash@dot.state.ma.us (857) 368-9353		Scheduled Ad Date: 9/7/2024		Total Poles Relocated: 3 in Force Acc - 2 by WR#s		8/26/2024 PRINTED					
Consultant: Municipality Consultant - TEC, Inc. w/ Survey by GPI		Contact: Jody Trunfio Lauren Nicholson		Office # (978) 808-0252 (978) 794-1792		Cell # (978) 375-4245 (978) 808-0252		Email jtrunfio@theengineeringcorp.com LNicholson@theengineeringcorp.com							
Utility Company	Contact	Office #	Cell #	Email	Scope, Budget, Duration Submitted		Reimbursement			Potential for District Initiated Early Relocation *		Utilities On Bridge/Structure		Utilities Underground (UG) /Aerial (OH)	
					Yes	No	Agreement	Non-Reimb'l	Notes	YES	NO	YES	NO	UG	OH
Nation Grid Elec Distribution	Alec Noel-Birdsong Murli Gupta		(781) 907-3509 (781) 296-6483	Alec.Noel-Birdsong@nationalgrid.com murli.gupta@nationalgrid.com	X		X			3 poles, and Guys. One pole near Water St. Review guying needs. UPL 1571 Lowell St being relocated due to curb conflict.		X		X	
NGrid Electric 23kV Distribution(sub-Trans) on RR	Steve Towle		(781) 907-2263	Steven.Towle@natonalgrid.com		X		X		Existing transmission wires and poles to remain.(1 Guy Relocation). OHW's will remain electrified during all construction activities.		X		X	
Street Lighting	Jeffrey DiDomenico	(978) 620-3431		JDiDomenico@cityoflawrence.com		X		N/A	X	Town Owned - Contract items to R&R.		X		X	
Crown Castle	Christopher Stevens Mark Bonanno	(508) 621-1874	(978) 881-4543	Christopher.Stevens@crowncastle.com mark_bonanno@crowncastle.com			X		X	One OHW Transfer on Lowell St. - no req 4 reimbursement. 2020 05 08 Leasing facilities in AT&T conduit along rail.		X		X	
Comcast	Wendy Brown(Lead) Timothy Broderick(fiber) Ed Thomson(Coax) Joseph, Gregory (Fiber)	(978) 848-5163 781-281-7741 (617)685-0258 xx	(978) 399-5871 x 617) 279-1827 x	wendy_brown@comcast.com Timothy_Broderick@comcast.com Ed_Thomson@comcast.com Gregory_Joseph@comcast.com	X		X			Lowell street - must raise current OHW to accommodate VZ going onto pole from existing bridge crossing. Remove old fiber on Merrimack RR bridge and install new fiber in prop conduit. One MH on both ends of Merrimack RR river bridge - 5x7x7" MH's installed per contract item, MH frame and covers supplied by Comcast.		X	X	X	X
Verizon	Paul E Diamantopoulos Stacey Manseau		(508) 245 5522	paul.e.diamantopoulos@verizon.com staceymanseu@vz.net	X		X			Poles moving on Lowell Street, duct bank R&R, conduit on bridge: 6-4" conduits over Lowell Street bridge, TMH 2 to TMH 255. No steel risers required by VZ. 4" PVC risers to extend 6" above finish at UPL's 1570 + 1576.		X		X	X
Lawrence IT	Carlos Castillo Bryan Hopkins	(978)902-2091 (781)890-5070 ext. 6952	(978)771-1317 (617)686-6111	carlos.castillo@cityoflawrence.com bhopskins@com.net	X		X			2- 288 fiber cables over the railroad bridge will be replaced with 3000' of new cable - Contract items for All Conduit and UG. Conn Tract pull wire & splice		X	X	X	X
AT&T	Erica Hudson James Araujo	(781) 221-8400 x7038 (781) 221-8400 x7042	(781) 460-1236	erica_hudson@sienaeengineeringgroup.com James.Araujo@sienaeengineeringgroup.com	X		X			Conduit along Merrimack river brg + Path under Lowell street. Approx. 50 feet - UG conduit relocation at Lowell street for precast bridge install. Contractor to perform civil work to dig up existing conduit, AT&T to provide UG crew to move conduit.		X	X	X	X
MBTA	Christine Bresnahan Jack Connors (Keolis salvage lead)	(617) 222-3361 (617) 593-1851		cbresnahan@mbta.com john.connors@keolis.com		X		N/A		No MBTA Bus. Lawrence has 99 yr. lease on rail trail. Contractor and utilities to acquire access license from MBTA. Coordinate with Jack C, for existing train rails and OTM.		X		X	X
MCI-Vz Bz	Stephen Parretti Tremain Fernandes	(508) 248-1305		stephen.parretti@verizon.com		X		X		UG Conduit currently on rail over Merrimack Br expected to be removed from site soon 2022 09 28		X	X	X	X
Central Rivers Power	John Robichaud Skip Medford	(603) 617-6165		jrobichaud@crpower.com SMedford@parnetvideo.com		X		X		2021 04 15 In limits, but no conflicts. Central Rivers Power to be kept in the loop as project progresses. Must contact before accessing property around the canals.		X		X	X
For Information Only															
Eversource Gas	Jocelyn Forcier Kyle Benoit			jocelyn.forcier@eversource.com kyle.benoit@eversource.com						No extension of CI LP gas on Lowell St bridge. No capital improvements within project corridor.					
Lawrence City Eng	Jorge Jaime	(978) 620-3163	(978) 620-3090	jajame@cityoflawrence.com						Water Extension across Lowell St bridge. Coordinate city for installment.					
Lawrence Water	Brian Pena	(978) 620-3110		bpena@cityoflawrence.com											
Lawrence Sewer	Brian Pena	(978) 620-3110		bpena@cityoflawrence.com											
Greater Lawrence Sanitary District	Cheri Cousens	(978) 685-1612		ccousens@glwd.org											
Lawrence Water	William Hale	(978) 620-3110		whale@cityoflawrence.com											
Atlas Hazmat	Ric Nunes Michael Ringuette	978 423 4550 781 301 1418		ric.nunes@atlas.com michael.ringuette@atlas.com						Hazmat survey of project site. Findings to be included in project documents for bidders to see.					
No Facilities or No Conflicts															
Police Camera	Angel Mejia	(978) 490-0135		ameja@nwpd.com						No police camera's expected to be disturbed from project.					
Lawrence Fire	Jeffrey DiDomenico	(978) 620-3431		JDiDomenico@cityoflawrence.com						No fire alarm in project area					
First Light	Keith Mellor Heather Araujo	(781) 482-4840		kmellor@firstlight.com haraujo@firstlight.com						2023 11 1 - No facilities					
Pan Am Railways CSX	Michael Sliper Ted Krug	(978) 663-1077		mksliper@csx.com tkrug@csx.com						2024 3 6 - No involvement per Mike Sliper					
Extenet	Adam Little	(866) 892-5327		noc@extenetsystems.com alittle@extenetsystems.com						2021 04 19 In limits, aerial service at Manchester St. Contact law if anything changes.					

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:
South canal and Merrimack River access from adjacent areas often occurs from Essex Co property(Hydro electric dam owner) and/or involves the canal wall, and in some cases canal level adjustments are desired. For those reasons, and for project coordination and worker safety generally, any coordination with or notification to (CRP's OM team) for work on or around the canals (bridges) is recommended - John Robichaud (Operations Manager w/ CRP). Coordination team for CRP for any access around the canal bridges - Jillian Lawrence <jlawrence@centralriverspower.com>; Media Sehatzadeh <mshatzadeh@centralriverspower.com>; Shawn Gregg <sgregg@centralriverspower.com>; Johnathan Robichaud <jrobichaud@centralriverspower.com>; Curtis Mooney <cmooney@centralriverspower.com>
2023 8 2 - TEC: Antenna in place for the interconnect at intersections along RT.28 - assumed any traffic conduit for interconnect is no longer in use

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 (City of Lawrence). The information provided is the best available information prior to project advertisement.

PUC FORM - CONTINUED

8/26/2024 PRINTED

Project File #: 608930

City/Town: Lawrence

Route/Street: Lawrence Manchester Rail Trail

is 'enabling' (prep) work, by the Contractor, necessary prior to starting first series of utility relocations:

Yes	No
X	

Has any of the Utility work been identified to work concurrently

Yes	No
X	



RESPONSIBLE PARTY	DESCRIPTION - Utility Relocation Phases, Tasks and Activities	Estimated Duration (Work Days) by Utilities				Concurrent / Exclusive Utility Work				Access Restraint & Limitations of Operations Notes		
		U = Utility Co.	C = Contractor	Exclusive Utility on site	Concurrent Utilities	Contractor Off-Site	Contractor Concurrent	Contractor Concurrent	Potential Access Restraint (Yes/No) YES			
U = Utility Co.	Enabling work by the Contractor - Call in dig safe to mark out UG, Coordinate with MassDOT to mark poles, Curb and Back of SW, Coordinate with DURE to meet all Utilities and walk site to confirm Prop. Pole Re-locations and delineation of work. Coord with DURE to send 30 day notices for pole relocations. - Note- Consider advance work for Prop CB & DMH near Prop UP, Prop Mast Arm foundations that should be done prior to pole moves, Relocation of existing signal services to pole being relocated. Signal and Street lighting, need a NGrid Work Req # and this puts the Contractor in the Utility Pole Relocation schedule. Request WOPs from NGrid Electric for Disconnect/Reconnects for Existing / Proposed Signal, Cobra heads, and other work as necessary. Any tree trimming required for utility poles. Contractor to coordinate with Central Rivers Power (hydro electric dam owner at 9 South Broadway St, Lawrence) and include CRP in daily schedule/operations. Utilities to acquire MBTA access license for work on trail - trail property on 99yr ATC lease from MBTA, Reference # MBTA-17527 construction plan Canvas). Contractor to coordinate with Keolis/ MBTA RR ops as they want to salvage all rail and OTM within the project - contractor to sign a 3rd party agreement to deliver and stake rails/OTM to Keolis if applicable.											
C = Contractor	Order of utility operations at Merrimack River bridge: 1 - remove steam and condensate line, keep existing utilities on bridge live. 2 - build new conduit duct bank, and move existing utilities into new duct bank(permanent position). 3 - remove existing ties and conduits on bridge. 4 - build new bridge deck.											
UTILITY OPERATIONS - Preconstruction Notifications												
Task: 1	Prime Contractor											
c	Access license from MBTA - Construction plan Canvas #MBTA-17527											
c	MBTA/ Keolis to salvage all steel rails and OTM on site. No 3rd party agreement for contract required. MassDOT contractor to remove all RR ties, stack steel rails, and OTM for Keolis in an accessible location for salvage contractor to pick up. Contractor to coordinate locations with Keolis to determine removing/ stacking existing rail/ OTM when project starts.											
c	Notify COLAW when work begins to notify anyone camping out on rail trail to vacate property											
c	Coordinate with CRP (Central Rivers Power - hydro electric dam owner) for access and worker protection when performing work over canal bridges (south canal and Merrimack).											
Task: 2	Utilities											
u	MBTA access license: allow 9 months for access licenses to be obtained for any work on 99 year lease property											
	Sub-Total											0
Task: 3	Traffic signal work @ Rt28/ Water Street											
	Utility Co. Prime contractor, Sub contractors, NGrid Electric											
c	Prop. Traffic Signal Service: This work will require a WO from NG for an overhead service connection and min 90 days advanced notice - Contractor to pay all fees for NG to install digitalis and connect cable to secondary pole line and meter. Contractor to install riser, sweeps, ug conduit and cable in accordance with NG Standards and approved WO #. (NGrid New Service request will confirm if this pole is acceptable for the new overhead Service Connection.)											
c	Call in WOP# to disconnect LPL 6322.12-90. Confirm with city of Lawrence if they want it and stacked in their DPW yard - item# 82.3.71 - TYP for any LPL's R&S.											
	Sub-Total											0
Task: 4	UTILITY OPERATIONS - OHW, VZ UNG, AT&T Fiber, City Water, Comcast @ RR Bridge over Merrimack and Lowell Street											
u	Utility Co. Ngrid + Ngrid Transmission											
u	R&R LPL's: #1571 (Lowell Street), #881-84 (Broadway street), #2133 (on Railroad street)											4
u	Sets Secondaries, transfers Services											16
u	Ngrid to coordinate with Crown Castle as they are in the electrical space											
c	Prop LPL's: service pole @ 14-20 - right (private service pole for existing electrical connection) to be included in item #813.11											
c	Prop LPL's: service pole @ 25+60 - left (private service pole for existing electrical connection) to be included in item #813.11											
	Sub-Total											20
Task: 5	Utility Co. Crown Castle @ Lowell Street											
u	Transfer Fiber cable in Electrical Space											5
	Sub-Total											5
Task: 6	Utility Co. AT&T											
u	@ RR Bridge Over Merrimack River (Metro Cable)											
c	30 days advanced notice for anticipated cable splicing											
u	Install conduits and HH's for AT&T over Merrimack RR bridge per contract items											
u	Proof conduit, install interduct, and relocate/re-pull fiber using new conduits and manholes installed by MassDOT											
u	Splice, wreck out old fiber and coaxial along existing conduits, pole transfers, pull new fiber through new conduit @ Lowell Street (Core Cable)											
c	MassDOT contractor provide UndGmrd crew to excavate conduit/cable											
u	Provide UndGmrd crew to move cable excavated by MassDOT contractor											
	Sub-Total											44

DESCRIPTION - Utility Relocation Phases, Tasks and Activities

RESPONSIBLE PARTY	DESCRIPTION	Estimated Duration (Work Days) by Utilities (Lead time not included)	Concurrent / Exclusive Utility Work				Access Restraint & Limitations of Operations Notes	
			Utility working with other Utilities on site	Utility working with other Utilities on-site	Contractor Off-site operations on physical site (while Utility Contractor and Utility are working on-site but NOT in the same vicinity)	Contractor Concurrent	Potential Access Restraint (Yes/No) YES	Should an AR be considered for the Contractor?
C = Contractor U = Utility Co.	Task: 7 Utility Co. Comcast @ RR Bridge over Merrimack River							
	u Cut overs from Comcast fiber to new conduit path (requires 10 Business Days notice for Night cut overs)	5			x			CRP - recommends notification to their Operations team for worker safety and project coordination. MBTA continues to own property.
	c Install conduits and manholes for Comcast over Merrimack RR bridge with contract items. Comcast supplies frames and covers.	5				x		
	u Proof conduit and relocate/ re-pull 6 bundles of fiber using new conduits and manholes installed by MassDOT	15				x		Splice same time as AT&T, Comt
	u Splice, wreck out old fiber and coaxial along existing conduits, pole transfers, pull new fiber through new conduit	3				x		
	u Wreck out fiber from old pole line within project limits	28				x		
	Task: 8 Utility Co. Lawrence ITS/CommTract @ RR Bridge over Merrimack River							
u Cut existing fiber cable and install 3000 ft of 288 count single mode fiber backbone cable	1				x			
u New cable to be installed in the new conduit duct bank to be installed by others	1				x			
u Splice and test new fiber cable into existing backbone cable	4				x		Splice same time as AT&T, CC	
c Wreck out old fiber cable and conduits on bridge - to be included in bridge item	1							
u Remove all pole attachment hardware, top poles, and dispose of materials	7							
Task: 9 Utility Co. Verizon @ Lowell Street								
c VZ has to go overhead to demo the bridge. This has to be done first to move out of existing ducts on bridge and go OH. Contractor to install Conduit From TMHs to Poles on east and west side of bridge with 36" min sweeps.	44				x			
u Transfer All active Copper and Fiber lines in Bridge to OWH.	4				x			
u Clean and or abandon Old TMH - Adjust MH to Grade	1				x			
u Remove existing pole # 1571	49							
Task: 10 Water main install over proposed Lowell street bridge								
c Confirm details with City of Lawrence for watermain install								
	Total of all OHW and Pole Work	153						
Stage : 1 Phase : B	Enabling work by the Contractor - Coordinate with Utilities to adjust Structures in advance of Full Depth Box Widening and Milling and Paving. Set grades for all structures to be adjusted. Work under this stage is not covered under force accounts.							
	UTILITY OPERATIONS - Adjust/ Regulate castings in SW and roadway area under mill and pave, SW and RW Reconstruction							
	u Eversource Gas adjust GAS gates	3						DUCE Estimate
	u NGrid adjust EMHs	3						DUCE Estimate
	c Contractor Adjusts Water, Drainage, Sewer, Traffic signal HH, Street lighting, HH	6						DUCE Estimate
	Sub-Total	6						
	IMPORTANT BASIS NOTES - FOR CONTRACTOR							
	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 unimpeded access 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-March. 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) - in included 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.							

Project Name: Lawrence Rail Trail										Municipality: ECY, Inc. for the Municipality									
Project File No.: 608930										Respon. for Design: ECY, Inc. for the Municipality									
Revision Date: 4/25/24										Design Stage: ROW change to be done by:									
Notes: 1) Offsets are measured to center of pole unless otherwise noted.										3) Occupant: P = Power, T = Telephone, C = Cable TV, F = Fire Alarm, JO = Joint Owned, SO = Sole owned									
2) A Design Exception for Horizontal Offset will be required when either the existing or proposed distance from face of curb to face of pole is less than 16".										4) Locations shall not be changed without approval of MassDOT and/or the Utility Companies									
Existing Pole Information										Proposed by Designer									
Line No.	Sheet No.	Pole No.	Streetlight	Owner	Risers	Station	Offset	Cut	Fill	Total of new P/L's	Relocate/Relocate	Reason	Station	Offset	GPS Coordinates (MA State Plane NAD 83) Northing	Existing	Design Exception Req. (Horizontal Offset)	Designer Comments	MassDOT / Utility Company Comments
LAWRENCE RAIL TRAIL A (CONSTRUCTION BASELINE)																			
1	59	UNK				0+81.51	38.80	RI	N/A	N/A	Relocate	Services Connection to Lighting Load Center	1+23.51	19.16	3500208.978	746958.426	N	Presumed to be owned by NG Propose pole to provide electrical service for lighting load center. Work needed to be completed by contractor. Unable to locate LPL number Unable to access pole location	Work Required by contractor
2	59	TBD				1+23.42	49.78	RI	N/A	1	Proposed Pole								
3	59	UNK		NG	1 Riser	2+18.02	27.26	RI	N/A	N/A	Relocate								
4	59	UNK		NG	1 Riser	3+13.19	31.64	RI	N/A	N/A	Relocate								
5	59	UNK		NG	1 Riser	4+24.77	24.84	RI	N/A	N/A	Relocate								
6	59	13		NG		4+39.45	24.38	RI	N/A	N/A	Relocate								
7	59	13-1		NG		4+39.45	34.16	RI	N/A	N/A	Relocate								
8	59	UNK		NG		10+47.89	23.67	RI	N/A	N/A	Relocate								
9	60-61	8815		NG		10+48.31	33.90	RI	N/A	N/A	Relocate								
10	60-61	8815-1		NG		11+51.67	24.00	RI	N/A	N/A	Relocate								
11	61	UNK				12+69.50	0.71	RI	N/A	N/A	Relocate	In path	12+51.67	7.97	3581174.207	746958.165	N	Presumed to be owned by NG Measured center of pole to face of curb (subtract 6 in for pole). Presumed to be owned by NG	Face account by NGold Electric Certified Item 8623.71
12	61	8814				12+69.50	0.71	RI	N/A	N/A	Relocate	In path							
13	61	622	F			12+69.59	3.82	LI	N/A	N/A	Remove	In path							
14	61	8817		NG		13+12.52	-73.38	LI	N/A	N/A	Relocate								
LAWRENCE RAIL TRAIL B (12) (CONSTRUCTION BASELINE)																			
15	61	20	X	NG		24+48.75	68.89	LI	N/A	N/A	Relocate								
16	61	8818		NG		25+28.93	30.74	LI	N/A	N/A	Relocate								
17	61	1219	X		1 Riser	25+32.01	12.48	RI	N/A	N/A	Relocate								
18	61	UNK		NG		26+49.88	9.70	LI	N/A	N/A	1	Proposed Pole	In Path	30+55.19	10.94	3581410.823	746953.071	N	No pole number located; presumed to be privately owned. Existing lighting load center. Pole number to be included. Work required to be completed by contractor. Work Required by contractor
19	62	8819		NG		26+48.13	23.03	LI	N/A	N/A	Relocate								
20	62	8820		NG		27+48.85	30.76	RI	N/A	4"	Relocate								
21	62	8821		NG		30+04.39	8.26	RI	N/A	12"	Relocate								
22	62	8822		NG		31+42.13	59.87	RI	N/A	N/A	Relocate								
23	63	UNK		NG		31+47.65	31.39	RI	N/A	N/A	Relocate								
24	63	1454		NG		32+71.00	53.91	RI	N/A	N/A	Relocate								
25	63	1455		NG		33+09.85	41.40	LI	N/A	N/A	Relocate								
26	63	UNK		NG		34+30.99	46.56	LI	N/A	N/A	Relocate								
27	63	8823		NG		34+09.26	12.07	RI	N/A	N/A	Relocate								
28	63	917		NG		35+07.93	25.48	LI	N/A	N/A	Relocate								
29	63	8824		NG		36+13.98	41.97	RI	N/A	4"	Relocate								
30	64	8825		NG		36+47.56	41.97	RI	N/A	N/A	Relocate								
31	64	8826		NG		40+70.37	-11.24	LI	N/A	N/A	Relocate								
32	64	8827		NG		42+47.40	-13.54	LI	N/A	N/A	Relocate								
33	64	8828		NG		42+47.40	-13.54	LI	N/A	N/A	Relocate								
34	64	8829		NG		42+47.40	-13.54	LI	N/A	N/A	Relocate								
35	64	8830		NG		46+45.09	13.58	LI	N/A	N/A	Relocate								
36	64	8831		NG		46+45.09	13.58	LI	N/A	N/A	Relocate								
37	64	8832		NG		46+45.09	13.58	LI	N/A	N/A	Relocate								
38	64	8833		NG		46+45.09	13.58	LI	N/A	N/A	Relocate								
39	64	8834		NG		46+45.09	13.58	LI	N/A	N/A	Relocate								
40	64	8835		NG		46+45.09	13.58	LI	N/A	N/A	Relocate								
41	64	8836		NG		46+45.09	13.58	LI	N/A	N/A	Relocate								
42	64	8837		NG		46+45.09	13.58	LI	N/A	N/A	Relocate								
43	64	8838		NG		46+45.09	13.58	LI	N/A	N/A	Relocate								
44	64	8839		NG		46+45.09	13.58	LI	N/A	N/A	Relocate								
45	64	8840		NG		46+45.09	13.58	LI	N/A	N/A	Relocate								
SIDEWALK (5-FT HMA CONSTRUCTION BASELINE)																			
46	64	UNK		NG		50+04.38	-13.24	LI	N/A	N/A	Relocate								
47	64	8014		NG		50+04.38	16.85	RI	N/A	1F	Relocate								
48	64	8015		NG		51+10.61	-19.43	LI	N/A	N/A	Relocate								
49	64	8016		NG		51+26.97	13.40	RI	N/A	3Z	Relocate								
50	69	8017		NG		51+14.01	12.84	RI	N/A	N/A	Relocate								
51	69	8018		NG		51+16.03	15.48	RI	N/A	1F	Relocate								
52	69-70	8019		NG		51+16.02	12.13	RI	N/A	1F	Relocate								

Project Name: Lawrence Rail Trail
 Respon. for Design: Municipality
 Project File No.: 608930 Prepared By: EC, Inc.
 Revision Date: 4/26/24 Design Stage: Final
 Notes: 1) Offsets are measured to center of pole unless otherwise noted.
2) A Design Exception for Horizontal Offset will be required when either the existing or proposed distance from face of curb to face of pole is less than 18".

3) Occupant, P = Power, T = Telephone, C = Cable TV, F = Fire Alarm, JO = Joint Owned, SO = Sole owned
 4) Locations shall not be changed without approval of MassDOT and/or the Utility Companies

Existing Pole Information												Proposed by Designer					MassDOT / Utility Company Comments			
Sheet No.	Line No.	Pole No.	Streetlight Poles by Project by Owner	Owner occupant	Risers list by owner	Station	Offset	Cut 6 inch + Changes Only	Fill	Total of new P/Ls	Relocate	Reason	Station	Offset	GPS Coordinates (MA State Plane NAD 83) Northing	GPS Coordinates (MA State Plane NAD 83) Easting	Min. Offset (ft) Face of Curb to face of Pole (Subtract 6 in for pole)	Design Exception Req. (Horizontal Offset)	Designer Comments	MassDOT / Utility Company Comments
LAWRENCE RAIL TRAIL B (22) (CONSTRUCTION BASELINE)																				
53	70	8030		NG		71+62.57	26.043	LI	N/A	RF	Retain									
54	70	8033		NG		72+00.03	24.875	RI	N/A	N/A	Retain								Presumed to be owned by NSG	
55	70	8021		NG		73+48.73	20.898	LI	N/A	N/A	Retain								Presumed to be owned by NSG	
56	70	UNK				73+48.40	24.971	RI	N/A	N/A	Retain								Presumed to be owned by NSG	
57	70	UNK				73+53.32	33.028	RI	N/A	N/A	Retain								Presumed to be owned by NSG	
58	70	2088				74+46.80	27.171	LI	N/A	N/A	Retain								Presumed to be owned by NSG	
59	71	8022		NG		75+47.46	-16.815	LI	N/A	N/A	Retain									
60	71	8023		NG		77+33.55	-13.682	LI	N/A	N/A	Retain									
61	71	8024		NG		79+44.18	-14.649	LI	N/A	N/A	Retain									
62	72	8025		NG		81+46.05	-12.862	LI	N/A	N/A	Retain									
63	72	8026		NG		83+47.85	-13.520	LI	N/A	N/A	Retain									
64	72	8027		NG		85+47.76	-13.070	LI	N/A	N/A	Retain									
65	72	8028		NG		87+45.96	-13.281	RI	N/A	N/A	Retain									
RAILROAD STREET (CONSTRUCTION BASELINE)																				
66	67	2132				609+29.89	18.024	RI	N/A	N/A	Retain									
67	67	2133	X			601+15.27	18.380	RI	N/A	N/A	Relocate	In curb ramp opening	601+20.11	19.643	743281.007	743281.007	1.5	N	Measure center of face to face of curb (subtract 6 in for pole), presumed to be owned by NSG	NG'd force account
68	67	2134				601+18.28	18.215	RI	N/A	N/A	Retain								Presumed to be owned by NSG	
LOWELL STREET (CONSTRUCTION BASELINE)																				
69	10	1587				8+12.78	16.700	RI	N/A	N/A	Retain									
70	10	1589	X			8+83.14	17.411	RI	N/A	N/A	Retain								Presumed to be owned by NSG	
71	10	1589-1				8+73.80	-9.27	LI	N/A	N/A	Retain								Presumed to be owned by NSG	
72	10	1590				9+09.45	18.988	RI	N/A	N/A	Retain								Presumed to be owned by NSG	
73	10	84				9+43.39	-18.256	LI	N/A	N/A	Retain								Presumed to be owned by NSG	
74	10	1571				10+06.46	17.792	RI	N/A	N/A	Relocate	In proposed work	10+00.71	19.648	3082420.881	744518.131	1.5	N	Measure center of face to face of curb (subtract 6 in for pole), presumed to be owned by NSG	NG'd force account
75	00	1572	X			11+09.85	19.932	RI	N/A	N/A	Retain								Presumed to be owned by NSG	
76	00	1573				11+77.88	18.947	RI	N/A	N/A	Retain								Presumed to be owned by NSG	
77	00	1574				12+78.31	18.297	RI	N/A	N/A	Retain								Presumed to be owned by NSG	

Total: 5

THIS PAGE IS INTENTIONALLY LEFT BLANK

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:

MDAR ALERT*:

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:

* Please note:
 EDRR Species (MAM, Hogweed, Pepperweed, Kudzu, etc.)
 Tree of Heaven 1) stands of >20 trees; 2) >5 trees near nursery, landscape company, or highway rest area where trucks stop

Upon completion, please submit form to MassDOT District Engineer and Landscape Design Section in Boston office.

DOCUMENT A00811

WATERING LOG
for
MassDOT Plantings

Watering Log for MassDOT Plantings

Project Description:

Contract No.:

Plant Locations/s:

Project No.:

(Attach planting plan/s as necessary)

Notes:

Separate logs shall be kept to track areas or plants with different watering schedules. Trees shall receive a minimum of 10 gallons with each watering and shrubs a minimum of 5 gallons. Provide note that if watering is not performed as scheduled due to rain. Record date of rainfall and amount.												
Date Watered												
Landscape Contractor Initial												
Prime Contractor Initial												
Date Watered												
Landscape Contractor Initial												
Prime Contractor Initial												

Each week, following watering, Log shall be submitted to the MassDOT Engineer.
6/15/2018

DOCUMENT A008013

**Alternative Transportation Corridor Lease Agreement
By and Between
MBTA and City of Lawrence**

THIS PAGE INTENTIONALLY LEFT BLANK

LEASE AGREEMENT

This LEASE AGREEMENT (the "*Lease*") is entered into this 27 day of 08, 2024 (the "*Commencement Date*") by and between the **MASSACHUSETTS BAY TRANSPORTATION AUTHORITY**, a body politic and corporate, and a political subdivision of the Commonwealth of Massachusetts duly established and existing pursuant to Massachusetts General Laws, Chapter 161A ("*Landlord*" or "*MBTA*") and the **CITY OF LAWRENCE**, a municipal corporation and a body politic and corporate having an address of 200 Common Street, Lawrence, Massachusetts 01840 ("*Tenant*" or "*City*").

WHEREAS, MBTA is the owner of the right-of-way known as Manchester-Lawrence Branch, (the "*MBTA ROW*"), which MBTA ROW is located in the City of Lawrence, and which comprises a portion of the Premises, as defined herein.

WHEREAS, the Federal Highway Administration (the "*FHWA*") has or will provide MassDOT with funds in an amount (the "*Appropriation*") sufficient to pay for eighty percent (80%) of the costs associated with the design and construction of a transportation path on the Premises (the "*Multi-Use Path*"), which Multi-Use Path will comprise a portion of the Manchester/Lawrence Multiuse Path.

WHEREAS, as a condition of providing the Appropriation, the FHWA requires, among other things, that Tenant coordinate and oversee the design of the Multi-Use Path and that Landlord coordinate and oversee the construction of the Multi-Use Path.

WHEREAS, Tenant has completed and the FHWA has approved the final design plans and specifications for the Multi-Use Path.

WHEREAS, as a further condition of providing the funds for the construction of the Multi-Use Path, the FHWA requires that the City obtain possession of the Premises prior to the solicitation of bids for the construction of the Multi-Use Path.

NOW, THEREFORE, FOR CONSIDERATION PAID, the receipt and sufficiency of which is hereby acknowledged, Landlord and Tenant hereby agree as follows:

**ARTICLE I
FUNDAMENTAL LEASE PROVISIONS**

1.1 Reference Subjects

Each reference in this Lease to any of the following subjects shall incorporate the following information:

Commencement Date:	As defined above.
Premises:	The parcel of land owned by Massachusetts Bay Transportation Authority, of approximately 7,900 linear feet, in the City of Lawrence, MA, as shown on Exhibit A.
Landlord:	Massachusetts Bay Transportation Authority
Tenant:	City of Lawrence
Term:	Ninety-nine (99) years, commencing on the Commencement Date (subject to Section 2.2 hereof).
Rent:	Ten and 00/100 Dollars (\$10.00).
Permitted Uses:	Subject to Article II below, the Premises shall be used for the operation, maintenance and repair of a transportation path for pedestrians, bicycles, and other non-motorized vehicles, and for no other uses except those specifically approved in writing by MBTA.
Design Plans:	The plans and specifications for the Multi-Use Path approved by the FHWA, identified as <i>Exhibit B</i> and incorporated herein by this reference.

1.2 Exhibits

The Exhibits listed below are attached hereto and incorporated into this Lease:

- Exhibit A – Plan of the Premises
- Exhibit B -- Design Plans
- Exhibit C -- Certificates of Insurance
- Exhibit D -- Tenant’s Beneficial Disclosure Statement
- Exhibit E -- Evidence of Authority

**ARTICLE II
PREMISES, TERM AND USE**

2.1 Premises

Landlord leases the Premises to Tenant and Tenant leases the Premises from Landlord for the Term, subject to matters of record existing as of the Commencement Date and matters referred to herein, to all of which Tenant shall conform.

Notwithstanding any provision of this Lease to the contrary, this Lease is not intended to transfer land or easements for purposes protected by or to create a perpetual right to any use that may be subject to protection by Article XCVII (97), as amended by the Amendments to the Constitution of the Commonwealth of Massachusetts or by legislation enacted to pursuant thereto.

2.2 Term

The term of this Lease shall be for a period of ninety-nine (99) years (the "*Term*"). The Term shall commence on the Commencement Date and shall terminate on the ninety-ninth (99th) anniversary of the day immediately preceding the Commencement Date (the "*Term Expiration Date*"), unless terminated sooner as hereinafter provided.

2.3 Landlord Reservation of Rights

Notwithstanding anything to the contrary contained herein, Landlord hereby reserves and retains the following rights and easements in and with respect to the Premises:

- a. Landlord reserves the right to enter upon any portion of the Premises for any purpose deemed necessary by the Landlord in connection with the construction, reconstruction, or maintenance of any Landlord-owned conduits, inner ducts, manholes, hand holes or other installations appurtenant thereto, or in connection with the construction, reconstruction, or maintenance of any property of Landlord adjacent to the Premises, or in connection with rights granted to third parties to use and occupy portions of the Premises as further set forth herein. Throughout any such entry, Landlord shall maintain and/or require its contractors to maintain insurance as required by, and in accordance with, the terms and conditions of Section 9.6 herein, and Landlord may require its contractors to maintain such additional coverages deemed necessary by Landlord.
- b. Landlord reserves the right to use, or to allow any party to use the Premises, or to grant and relocate licenses, leases or easements for any use so long as such use does not materially interfere with the Permitted Uses of the Premises. Tenant shall cooperate with Landlord in this regard to accommodate any such use by Landlord or such other party, provided Tenant shall incur no monetary obligations with respect thereto. Without limitation, such other uses may include utilities, wireless telephone facilities (including, without limitation, cellular and PCS), fiber optic lines and communications facilities, microwave and other antennas, and all types of cable communications, and any other uses that do not materially interfere with the permitted uses of the Premises. Without limitation, the foregoing reservation by Landlord includes, whether the same now exist or are hereafter installed or used after the date of this Lease, the right to locate any or all such facilities (including, without limitation, towers, antennas, cables,

fiber, above-ground, below-ground, indoor and outdoor equipment) and other improvements on and within the Premises so long as such use does not materially interfere with the Permitted Uses of the Premises. All rights (including, without limitation, revenue therefrom) pertaining to all such other uses are specifically reserved to, and shall be the sole property of, Landlord. Tenant agrees to cooperate with Landlord and any designated party in connection with any exercise by Landlord of its rights hereunder. Throughout any such use, Landlord shall maintain and/or require its grantees and their contractors to maintain insurance as required by, and in accordance with, the terms and conditions of Section 9.6 herein, and Landlord may require its grantees and their contractors to maintain such additional coverages deemed necessary by Landlord.

2.4 Early Termination

If the Premises shall cease to be used for the Permitted Uses or shall be used for any other purposes, this Lease shall terminate upon notice from Landlord and the Tenant's leasehold estate in the Premises shall revert to Landlord.

If at any time during the Term, Landlord determines, in its sole discretion but subject to any provisions or conditions of the Appropriation, that all or any portion of the Premises are needed for highway, railroad or transportation-related purposes, this Lease may be terminated by Landlord by giving Tenant eighteen (18) months' prior written notice of Landlord's intention to terminate this Lease. If such notice is given by Landlord, then the Term shall end on the date set forth in such notice with respect to all or such portion of the Premises designated in such notice, all with the same force and effect as though the Term had originally been scheduled to expire on such date. Landlord may likewise terminate the Lease as to any portion of the Premises Landlord determines, in its sole discretion is needed for highway, railroad or other transportation-related purposes.

Where termination or modification of this Lease for any reason requires permanent or temporary total or partial displacement to Tenant prior to or at the expiration of the Lease Term, Tenant waives any benefits that Tenant may be deemed entitled to under the Uniform Relocation Assistance and Real Property Acquisition Act of 1970, as amended, and Tenant shall thereafter be excluded from any relocation benefits available under said act or amendment.

2.5 Uses of Premises

Tenant agrees that the Premises shall be used and occupied by Tenant only for the Permitted Uses.

- a) Tenant shall maintain the Premises in good repair and in clean condition, in compliance with all applicable laws and regulations, including, without limitation, making all necessary repairs and maintenance. Such maintenance shall be at no cost, expense, or liability to Landlord.
- b) Except as otherwise expressly set forth in this Lease, it shall be the responsibility of the Tenant to obtain any and all necessary permits and approvals for the Permitted Uses, at the Tenant's sole cost and expense. Landlord will cooperate in all reasonable respects, but at no expense to Landlord, with the Tenant in connection with obtaining such permits and approvals as Tenant reasonably wishes to seek for the Permitted Uses, and Landlord shall sign such permits and applications as reasonably necessary, provided that (i) the Landlord incurs no obligation or liability in connection therewith, (ii) no such permit or approval shall materially adversely affect any of Landlord's adjacent or proximate real property or

otherwise, in Landlord's reasonable determination, adversely affect or interfere in a material way with any of Landlord's operations or obligations.

- c) Tenant shall not perform any act or any practice which may injure the Premises. Tenant shall, in its use of the Premises, comply with the requirements of all applicable governmental laws, rules and regulations. Tenant shall not cause or permit any unlawful conduct, unreasonable annoyance or nuisance to exist or arise at the Premises or otherwise on account of the exercise of the rights granted to Tenant hereunder. The Premises shall be open to the public, and Tenant shall establish reasonable policies governing access to the Premises by the public. Such policies shall be subject to review and approval by Landlord. Tenant shall not charge any fee or other consideration, or receive any other benefit for the use of the Premises.

2.6 Construction Period Restrictions

Notwithstanding any provision of this Agreement to the contrary, Tenant's right to use or occupy the Premises for the Permitted Uses shall be suspended prior to the Substantial Completion Date (as hereinafter defined), and Tenant shall not enter upon the Premises for any purpose prior to the Substantial Completion Date without the prior written consent of Landlord, which consent shall not be unreasonably withheld, conditioned or delayed provided that such entry or purpose will not interfere with MassDOT's Work (as hereinafter defined).

ARTICLE III CONDITION OF PREMISES

3.1 Acceptance of Premises by Tenant

Landlord shall have no obligation with respect to the condition of the Premises except as expressly set forth in this Lease. Tenant's occupancy shall be deemed an acknowledgement that the condition of the Premises is fully satisfactory and suitable for the Permitted Uses and Tenant's purposes under this Lease. Tenant has leased the Premises after a full and complete examination of the Premises and appurtenant areas, as well as title thereto, and accepts the same in their present condition. Tenant further acknowledges that neither Landlord nor any officer, agent, employee or other person acting under Landlord, disclosed or undisclosed, has made or implied any representations or warranties other than those expressly set forth in this Lease concerning the Premises, their condition, title thereto, future plans of Landlord with respect to the Premises or appurtenant areas, or this Lease.

Tenant's rights herein are granted subject to existing easements, leases, licenses and other rights to the extent that such rights are still in effect and applicable. Landlord shall use reasonable efforts to provide Tenant with copies of the documents that establish the location and term of existing easements, leases, licenses and other rights (if any) of record to the extent that such easements, leases, licenses and other rights are still in effect and applicable.

Tenant expressly agrees that if there is any encroachment onto the Premises by a third-party, Landlord will have the sole right to cure said encroachment and to obtain revenue from such cure or to permit such encroachment, provided that such cure does not materially interfere with Tenant's use of the Premises.

Tenant acknowledges that there may be surface and subsurface utilities on and adjacent to the Premises and agrees to exercise extreme caution in performance of the Permitted Uses. Tenant shall comply with Massachusetts General Laws, Chapter 82, Section 40 (said statute also known as the "Dig Safe" law) and the regulations promulgated pursuant thereto including but not limited to the Code of Massachusetts Regulations, more particularly, 220 CMR 99.00 et seq. Any damage to any such utilities caused by Tenant shall be the sole responsibility of Tenant. If Tenant does not immediately repair any utilities it has damaged, Landlord may, but shall not be required to repair any utilities damaged by Tenant immediately and without notice in case of emergency. In the event Landlord exercises such right, Tenant shall pay to Landlord immediately upon demand all of Landlord's cost of performing such repairs plus a fee equal to five percent of the Landlord's cost of performing such repairs to reimburse Landlord for its administrative costs.

ARTICLE IV RENT AND ADDITIONAL CONSIDERATION

4.1 Amount of Rent

Tenant covenants and agrees to pay Landlord rent in the amount of Ten and 00/100 Dollars (\$10.00) upon the execution of this Lease. The parties acknowledge and agree that the mutual promises and covenants contained herein constitute additional consideration hereunder, the receipt and sufficiency of which are hereby acknowledged.

ARTICLE V MassDOT and Tenant IMPROVEMENTS

5.1 MassDOT Improvements

Subject to Section 5.2 below, Landlord shall at its own cost construct the Multi-Use Path on the Premises in accordance with the Design Plans and the terms and conditions of the Appropriation ("MassDOT Work"). MassDOT shall be solely responsible for procuring the contractor and subcontractors in connection with MassDOT's work, and shall be solely responsible for managing and overseeing said Work. MassDOT shall obtain and pay for any and all applicable federal, state and local permits, inspections, and approvals necessary to construct and perform MassDOT's Work. Prior to the Substantial Completion Date, Landlord reserves the right to remove any rail infrastructure or other materials located or existing on the Premises as of the date hereof.

MassDOT shall commence MassDOT Work as soon as practicable after the Commencement Date, and expects that said Work will be substantially complete no later than **10/14/2027** (the "**Target Substantial Completion Date**"). MassDOT's failure to substantially complete its Work by the Target Substantial Completion Date shall not be a default hereunder or otherwise render MassDOT liable for damages. MassDOT's Work shall be "substantially complete" when (a) the Work is completed in accordance with the Design Plans, other than any details of construction, mechanical adjustment or any other similar matter, the non-completion of which does not materially interfere with Tenant's use of the Premises for the Permitted Uses, and (b) notifies Tenant in writing thereof (the date of such notice, the "**Substantial Completion Date**"). MassDOT shall perform or complete any details of construction, mechanical adjustment or any other similar matter not completed by the Substantial Completion Date as soon as practicable thereafter.

Throughout MassDOT's Work, MassDOT shall require its contractors and subcontractors to maintain insurance as required by, and in accordance with, the terms and conditions of Section 9.6 herein, and MassDOT may require its contractors to maintain such additional coverages deemed necessary by MassDOT.

5.2 MassDOT Obligations Subject to Appropriation

Notwithstanding any provision of this Lease to the contrary, MassDOT's obligations to construct the Multi-Use Path shall be limited by and subject to the availability of the Appropriation for such construction. In the event that MassDOT fails to receive all or any portion of the Appropriation, reasonably determines that the Appropriation will not be available to reimburse MassDOT for any construction costs, or is unable to lawfully use all of any portion of the Appropriation to pay for any construction costs, then (a) MassDOT will within thirty (30) days so notify the Tenant, (b) MassDOT shall have the option, but not the obligation, to terminate this Lease upon ten (10) days' prior written notice to Tenant, and (c) Tenant shall after consultation with MassDOT as to whether the construction of the affected portion of the Multi-Use Path will be commenced and completed within a reasonable time thereafter, have the option (upon thirty (30) days' prior written notice to Landlord), but not the obligation, to terminate this Lease as to any portion of the Premises upon which the construction of the Multi-Use Path has not been, and based on said consultation with MassDOT, will not be commenced and completed by MassDOT within a reasonable time thereafter.

5.3 Tenant's Permitted Improvements

Except as set forth in this section or in Article VI and Article XI below, Tenant shall not construct any improvements on, or make any modifications or alterations to the Premises without the prior written consent of Landlord, which consent may be granted or withheld in Landlord's sole discretion. Tenant may add minor amenities to the Multi-Use Path such as signage, benches, pavement markings, and landscaping without the Landlord's prior written consent, provided that the installation of such amenities conforms to any applicable FHWA, MassDOT, or MBTA regulations, guidance, or standards for a Multi-Use Path ("**Permitted Amenities**").

Tenant acknowledges and affirms that, in conjunction with development and mitigation requirements, CSP-109 Brookline, LLC will construct a ramp at the end of Burlington Avenue, as more particularly shown as "Location of Future Ramp by Others" on *Exhibit A*, to ensure accessibility to the Multi-Use Path.

5.4 Tenants Election for MassDOT to Perform Tenant's Non-Participating Improvements

Tenant may in writing request, prior to the Substantial Completion Date set forth in Section 5.1, that MassDOT have its contractor perform for the benefit of the Tenant certain work that is outside the scope of the MassDOT's Work under Section 5.1 ("Tenant's Non-Participating Improvements"). If MassDOT agrees to have its contractor perform the Tenant's Non-Participating Improvements, MassDOT and Tenant will memorialize in a separate written agreement the scope of that work, its price, and other material terms concerning the Tenant's Non-Participating Improvements, and Tenant shall timely pay the cost of the Tenant's Non-Participating Improvements in cash or its equivalent, so that both Landlord's and Tenant's interests in the Premises shall always be free of liens and for labor and materials. If any lien relating to the Tenant's Non-Participating Improvements constructed pursuant to said agreement is filed against the Premises, then Tenant shall discharge the same by payment or by filling any necessary bond within thirty (30) days after Tenant has notice from any source of such lien. Tenant's Non-Participating Improvements shall

not include any of MassDOT's Work; and MassDOT shall remain responsible for the cost of MassDOT's Work as set forth in Section 5.1 and 5.2.

ARTICLE VI TENANT'S PERMITTED IMPROVEMENTS

6.1 Design Guidelines

Any improvements to the Premises which, pursuant to this Lease, Tenant is required or permitted to make (hereafter referred to as "**Tenant's Permitted Improvements**") shall be in conformity with this Lease, all applicable federal, state and local laws, ordinances, regulations and codes, including, without limitation, the Americans With Disabilities Act of 1990, 42 U.S.C. section 12101, et seq., the Massachusetts Environmental Policy Act, applicable rules and regulations of MassDOT, MBTA, and Tenant's insurance policies.

6.2 Design Approval

Tenant shall not commence construction of any Tenant's Permitted Improvements until Landlord has approved plans and specifications for the proposed work.

Prior to commencing construction of any Tenant's Permitted Improvements, Tenant shall submit to Landlord a certificate of an architect or engineer licensed in the Commonwealth of Massachusetts or an opinion of an attorney licensed in the Commonwealth of Massachusetts, stating that all applicable local, state and federal permits have been obtained for the proposed work, and that the proposed work, if constructed in accordance with the plans and specifications submitted to Landlord pursuant to the preceding paragraph, will comply with all applicable laws, codes and regulations. Said certificate or opinion shall be in form reasonably acceptable to Landlord and shall state that Landlord may rely without further investigation on such certificate or opinion.

6.3 Permits

It shall be the Tenant's responsibility to obtain and pay for any and all applicable federal, state and local permits, inspections, and approvals necessary to construct any Tenant's Permitted Improvements.

Prior to commencing construction of any Tenant's Permitted Improvements, Tenant shall provide Landlord with a written statement addressed to Landlord from Tenant's attorney, licensed architect or engineer containing the following: (i) a list of all permits and approvals required for the construction of the Tenant's Permitted Improvements, and (ii) a statement confirming that all such permits and approvals have been obtained.

6.4 Changes in Plans

If Tenant desires to make any material change in the plans and specifications after approval by Landlord, Tenant shall submit the proposed change to Landlord for its approval.

6.5 Contracts for Construction of Tenant's Permitted Improvements

As used in this Article, the term "contractor" shall mean any person or entity that provides labor and/or materials for the construction, repair, restoration or rehabilitation of any portion of the Premises, whether or not paid by Tenant, but excluding third-party materials suppliers.

Tenant shall select and propose to Landlord one or more qualified contractors to construct the Tenant's Permitted Improvements. Tenant agrees that it shall not select any contractor who is then debarred from public contracting pursuant to M.G.L. Chapter 29, § 29E. Said selection(s) shall be subject to Landlord's approval. Tenant shall enter into written contracts for all construction services to be provided by its contractor(s). Said contracts shall obligate Tenant to pay all fees and costs related to the constructions of the Tenant's Permitted Improvements. Upon request of Landlord, a complete copy of each such contract shall be furnished to Landlord.

6.6 General Provisions Governing Construction of Tenant's Permitted Improvements

- A. No contractor shall commence construction of any Tenant's Permitted Improvements until all permits, certificates, and approvals required by law for the commencement of such construction have been issued.
- B. Once commenced, the construction of each Permitted Improvement shall be diligently and continuously prosecuted.
- C. Each contractor shall warrant to the Tenant and Landlord that all materials and fixtures furnished by such contractor will be new and of recent manufacture, except as may otherwise be required by the plans and specifications as approved by Landlord, and that all construction work will be of good quality, free from faults and defects. Construction work not conforming to these requirements may be considered defective and not in conformity with the terms of this Lease.
- D. Each contractor shall be obligated to confine its operations to the portion of the Premises within which its construction work is to be performed, and shall not store materials or equipment elsewhere on the Premises unless permitted by Landlord. Storage of materials or equipment shall be limited to what is reasonably necessary for the construction of the Tenant's Permitted Improvements.
- E. Each contractor shall be obligated at all times to keep the Premises reasonably free from accumulation of waste materials or rubbish caused by its operations. At the completion of the contractor's work, the contractor shall remove all waste materials and rubbish from the Premises as well as all tools, construction equipment, and surplus materials. If any contractor fails to comply with these provisions, it shall be the responsibility of Tenant to cause such compliance and to immediately remedy any non-compliance. All construction waste shall be disposed of in a lawful manner.
- F. Each contractor under a contract with Tenant shall be required to furnish and keep in force a performance bond and a labor and material payment bond in an amount sufficient to guarantee the faithful performance of its obligations under such contract and to pay all obligations arising in connection therewith. Such bonds shall be in a form and with such sureties as Landlord may approve.
- G. When any construction of Tenant's Permitted Improvements is in progress, Tenant shall require its general contractor to maintain insurance as required by, and in accordance

with, the terms and conditions of Section 9.1 herein, and may require Tenant and/or its general contractor to maintain such additional or different coverages deemed necessary by Landlord which may include, without limitation, so-called "Builders Risk Insurance."

6.7 Payment for Tenant's Permitted Improvements

In no event shall any work related to the Tenant's Permitted Improvements, or any other improvements constructed by, on behalf of or under Tenants or Landlord's approval thereof, give rise to any lien on Landlord's interest in the Premises. Tenant shall pay the entire cost of all Tenant's Permitted Improvements promptly in cash or its equivalent so that both Landlords' and Tenant's interests in the Premises shall always be free of liens for labor and materials. If any lien relating to Tenant's Permitted Improvements constructed by, on behalf of or under Tenant is filed against the Premises, then Tenant shall discharge the same by payment or by filing any necessary bond within thirty (30) days after Tenant has notice from any source of such lien. Tenant's Permitted Improvements shall not include MassDOT's Work; and MassDOT shall be responsible for the cost of MassDOT's Work as set forth in Sections 5.1 and 5.2.

6.8 Nonconforming Improvements

In its construction of the Tenant's Permitted Improvements, Tenant shall insure that there is no materials deviation from the plans and specifications as approved by Landlord, except and only to the extent that changes have been requested in writing and have been approved in writing by Landlord. Landlord's representatives may enter upon the Premises from time to time on reasonable notice to Tenant for the purpose of inspecting the work being performed by Tenant, and such entry shall not be construed to be a violation of the Tenant's right to use and occupancy of the Premises.

In the event Tenant shall fail to comply with the foregoing requirements in proceeding with construction or modification of all or any part of the Tenant's Permitted Improvements, the Landlord may, within a reasonable time after discovery thereof, direct in writing that the Tenant modify or reconstruct such portion or portions of the Tenant's Permitted Improvements as deviate from the approved plans and specifications, or any change with respect to same, in order to bring them into conformance therewith. Tenant shall promptly comply with such a directive. In addition to any other remedies available to it under law or under this Lease, Landlord may enforce the provisions of this paragraph by an action in a court of appropriate jurisdiction to compel specific performance.

6.9 As Built Drawings

Tenant shall provide Landlord with a complete set of "as built" plans and specifications for the Tenant's Permitted Improvements constructed by Tenant for which plans and specifications are required by this Lease, together with copies of all final permits and approvals issued by federal, state or local agencies and state or local plumbing gas, electrical, building and other inspectors.

In addition, Tenant shall advise Landlord in writing whenever Tenant permanently relocates or modifies in any material respect any utility services within the Premises, including, but not limited to, the addition or rerouting of any electric, gas, water or sewer service or line.

6.10 Mechanics' Liens

No mechanics', materialmen's or similar liens shall ever attach against Landlords' interests in and to the Premises by reason of any work performed by Tenant on or to the Premises. If any such lien shall be put on record, Tenant agrees promptly (but in any event, within thirty (30) days of the date

that such lien is put on record) to arrange for the discharge of said lien by payment, bonding or otherwise as may be required to discharge said lien of record.

**ARTICLE VII
UTILITIES**

7.1 Utilities

Tenant shall pay the appropriate suppliers for all water, gas, fuel oil, electricity, telephone and any other utilities and communications services used by Tenant on the Premises, and Tenant shall instruct said suppliers to bill Tenant directly therefore. Upon request, Tenant shall supply Landlord with such documentation as Landlord may reasonably request to verify compliance with the foregoing. Tenant shall also pay all costs associated with the installation, repair and maintenance of the wires, pipes, conduits, and other equipment needed to deliver utilities to the Premises, and shall procure, without cost to Landlord, any and all necessary permits, licenses, or other authorizations required for the lawful and proper installation and maintenance of such utility systems. Landlord agrees to cooperate and, if necessary, join with Tenant in any application required for obtaining or continuing such services.

Landlord makes no warranty or representation as to the availability of water, gas, or any other utility service, and Landlord shall not be in default hereunder or be liable for any damages directly or indirectly, resulting from Tenant's inability to obtain such services or from the limitation, curtailment, rationing or restriction on use of water, electricity, gas or any other form of energy or utility service.

**ARTICLE VIII
TAXES**

8.1 Tenant to Pay All Taxes

In the event real estate taxes or property taxes shall be levied on the Premises or any part thereof for any reason, Tenant agrees to pay any such taxes when and as due. Tenant shall also be responsible for payment of all taxes levied on any good or services sold on the Premises, and any other taxes arising out of Tenant's occupancy, use, sub-leasing, alterations, maintenance, improvement, or operation of the Premises.

**ARTICLE IX
INSURANCE**

9.1 Required Liability Insurance

Tenant shall, at its sole cost and expense, obtain and keep in full force and effect, throughout the Term and for a reasonable time thereafter at least equaling any applicable statute of limitations period where necessary to provide coverage for claims asserted based on events occurring during the Term (and shall cause each of its contractors that will enter upon the Premises to obtain and keep during the period of the applicable contract and for a reasonable time thereafter at least equaling any applicable statute of limitations period where necessary to provide coverage for claims asserted based on events occurring during the term of such contract), adequate insurance coverage for the benefit of Landlord, but in no even shall such insurance coverage be less than the following types and amounts of coverage:

- A. Commercial General Liability Insurance with combined limits for bodily injury and property damage liability of \$1,000,000 per occurrence and \$2,000,000 in the aggregate. Such insurance shall apply to: (i) liability arising out of the intentional or negligent acts, omissions or other activities of the Tenant and its contractor(s) and their respective employees, agents, contractors, subcontractors, representatives and any other party for whom the Tenant or its contractor(s) is legally responsible; (ii) liability assumed under contract; and (iii) liability imputed to the Tenant or its contractor(s) through the activities of independent contractors. Coverage shall be written on an occurrence basis and shall include but not be limited to:
- Products and completed operations hazard
 - Contractual liability covering this contract
 - Personal Injury coverage
 - Property damage
 - Coverage for the so-called “x, c, u hazards”, i.e., collapse of buildings, blasting, and damage to underground property.
- B. Massachusetts Worker’s Compensation insurance in compliance with applicable federal and Massachusetts law.
- C. Automobile Liability Insurance covering all of Tenant’s owned, rented, leased or borrowed vehicles in accordance with applicable automobile insurance laws of the Commonwealth of Massachusetts, with limits of \$1,000,000 combined single limits for bodily injury and property damage liability. Coverage shall be written on a per accident basis.
- D. Umbrella Liability coverage, providing excess coverage over the above named primary policies. Coverage shall be written on an occurrence basis with limits of not less than \$3,000,000 combined single limit. The coverage provided by the policy shall afford coverage that is no less broad than the underlying policies.
- E. Such additional or different coverages and/or coverage amounts as Landlord may reasonably require from time to time while this Lease is in effect, or as may be required pursuant to applicable law.
- F. If any required coverage is to be self-insured, it must be approved by Landlord prior to execution of contract. The City shall provide a Certificate of Self-Insurance for the coverage amounts listed above prior to the execution of the contract.

9.2 Required Property Insurance

From and after the Substantial Completion Date, if and to the extent there are any buildings constructed by, for or on behalf of the Tenant on the Premises, Tenant, at its sole cost and expense, shall keep in full force and effect property insurance on the Premises, all improvements thereon and equipment and property installed or used in, on or about the Premises, naming Landlord and Tenant as their respective interests may appear, in amounts sufficient at all times to prevent Landlord from becoming a co-insurer under the provisions of applicable policies of insurance, but, in any event, at least equal to the full replacement cost thereof, without deduction for depreciation,

against all risks of direct physical loss or damage as may from time to time be included within the definition of an “All Risk” or “Broad Form” property insurance policy and extended to include coverage against earthquake, earth movement, flood (including back-up of sewers and drains), sprinkler leakage, breakdown of boilers, machinery and electrical equipment, war risk, nuclear reaction, lightning, wind storm, hail, explosion, riot, civil commotion, aircraft, vehicles, smoke, demolition and such other risks as Landlord may reasonably designate. The insurance also shall cover increased cost of construction, demolition and debris removal coverage, and contingent liability arising out of the enforcement of building laws and ordinances governing repair and reconstruction and shall include an agreed amount provision. The replacement cost of all improvements and of any other property installed or used in, on or about the Premises shall be determined at least once every thirty-six (36) months by Landlord. The City may self-insure subject to approval by Landlord.

9.3 Other Insurance Policy Requirements

Through the Massachusetts Interlocal Insurance Association, Inc. (“MIIA”), the non-profit member-based corporation serving the insurance needs of Massachusetts cities and towns, or through its successor or through another provider or providers, Tenant’s insurance will comply with the following provisions, unless commercially unavailable to Tenant:

- A. Duly executed certificate of insurance evidencing all insurance policies specified above, shall be submitted to Landlord prior to Landlord’s execution of this Lease, which certificates shall be attached hereto as *Exhibit C*. At least thirty (30) days prior to the expiration of each such insurance policy, Tenant shall furnish Landlord with the re-issuance of a policy continuing the insurance in force as required hereunder. Tenant’s contractor(s) performing work or conducting activities under this Lease shall submit certificates of insurance within ten (10) days of the award of their subject contract or license. Certificates shall be addressed to Landlord. Landlord is entitled to rely upon the information provided in the certificates. Tenant agrees that, if any certificate of insurance required hereunder does not conform with the requirements set forth in this Article IX, that said certificate does not confer rights to the certificate holder, or otherwise disclaims responsibility for Landlord’s reliance thereon, Tenant must deliver to Landlord endorsements demonstrating the specified additional insured status of Landlord and/or providing substantially and unequivocally that Landlord may, but shall not be obligated to, make premium payments to prevent such cancellation for non-payment of premiums and that such payments shall be accepted by the insurer.
- B. All insurance to be provided hereunder shall be with insurance companies licensed or approved by the Commonwealth of Massachusetts and shall have a Best’s Rating of not less than “A-minus”, Financial Size Code IX.
- C. All insurance to be provided hereunder shall provide Landlord with a minimum of thirty (30) days prior notice of cancellation or nonrenewable or ten (10) days prior notice in case of cancellation due to the nonpayment of any premium.
- D. Except for Workers’ Compensation and Automobile Liability insurance policies, all insurance policies specified above shall be endorsed to name Landlord as an additional insured.

This provision must be specifically stated as being endorsed to each required insurance policy on the certificate of insurance evidencing such coverage.

- E. All insurance maintained by the Tenant's contractor(s), except Worker's Compensation and Automobile Liability insurance policies, shall provide that insurance for the benefit of Landlord shall be primary and non-contributory. This provision must be specifically stated as applying to each required policy on the certificate of insurance evidencing such coverage.

Landlord hereby retains the right to periodically review the types and amounts of insurance being maintained by Tenant and to require additional insurance or higher coverage limits to the extent that such additional insurance is commercially available and reasonably prudent under the then existing circumstances.

If Tenant fails either to acquire the insurance required by this Article IX, or to pay the premium for such insurance, Landlord may, in addition to any other rights or remedies available to Landlord, and notwithstanding any other provisions of this Lease concerning notice and cure of defaults, acquire such insurance and pay the requisite premiums for them. Such premiums will be payable by Tenant to Landlord immediately upon demand.

In proof of any damages which Landlord may claim against Tenant arising out of Tenant's failure to maintain insurance, Landlord will not be limited to the amount of unpaid insurance premium but rather Landlord will also be entitled to recover as damages for such breach, the amount of any uninsured loss (to the extent of any deficiency in the insurance required by the provisions of this Lease), damages, costs and expenses of suits, including attorneys' fees arising out of damage to, or destruction of, the Premises occurring during any period for which Tenant has failed to provide such insurance.

9.4 Personal Property at Tenant's Risk

All of the furnishings, fixtures, equipment, effects, improvements and property of every kind, nature and description of Tenant shall be at the sole risk and hazard of Tenant, and if the whole or any part thereof shall be destroyed or damaged by fire, water or otherwise, or by the leakage or bursting of water pipes, no part of said loss or damage is to be charged to or to be borne by Landlord or the Federal Highway Administration, except that Landlord shall in no event be indemnified or held harmless or exonerated from any liability to Tenant or to any other person, for any injury, loss, damage or liability to the extent caused by the gross negligence or willful misconduct of Landlord, or its agents, servants, or employees acting within the scope of their agency, service or employment.

9.5 Application of Insurance Proceeds

In the event of any partial or total damage to or destruction of an insured building, structure, or other improvement, Tenant shall: (i) give immediate notice thereof to Landlord, (ii) proceed immediately to establish and collect all valid claims which may have arisen against insurers based upon any such damage or destruction, and (iii) promptly repair or reconstruct the damaged building, structure or other improvement upon the same general plan and dimensions and to the same general quality as before the damage or destruction. Such repair or reconstruction shall be performed in accordance with the requirements of Article VI hereof. All proceeds of any insurance claim shall be held in trust and applied only for the purpose of repairing or reconstructing the buildings, structures or other improvements which have been destroyed or damaged.

9.6 Landlord’s Required Insurance

Throughout Landlord’s entry onto the Premises under Section 2.3 (a), Landlord’s or its grantees’ use of the Premises under Section 2.3(b), and MassDOT’s Work under Section 5.1, and for a reasonable time thereafter at least equaling any applicable statute of limitations period where necessary to provide coverage for claims asserted based on events occurring during such entry, use or work, Landlord and/or MassDOT (applicable) shall cause each of its contractors and grantees that will enter upon the Premises to obtain and keep in force and effect adequate insurance coverage which in no event shall be less than the types and amounts of coverage specified in Sections 9.1 (A) through 9.1 (C).

9.7 Self-Insurance by the City

Notwithstanding any provision hereof to the contrary, all insurance requirements concerning the Tenant may be covered by the insurance program of the City of Lawrence, in accordance with the terms of such insurance program, which may include or solely rely on self-insurance.

**ARTICLE X
INDEMNIFICATION**

10.1 Assumption of Risk

Tenant, without waiving or abridging any defenses or immunity from liability it may be able to assert against a party other than the Landlord, assumes all risk of damage or injury to any person or property located in, on or about the Premises from any cause except to the extent that: (a) such damage or injury occurs prior to the Substantial Completion Date as a result of MassDOT’s Work, (b) such damage or injury is caused by the gross negligence or willful misconduct of Landlord or its agents, employees, or contractors acting within the scope of their agency, employment or contract, (c) such damage or injury is caused by any person using or occupying all or any portion of the Premises pursuant to Landlord Reservation of Rights set forth in Section 2.3 hereof, or (d) such damage or injury is caused by any person using or occupying all or any portion of the Premises pursuant to an existing easement, lease, license or other right to the extent that such rights are still in effect and applicable as of the Commencement Date.

10.2 Release of Landlord

Except for matters set forth in Sections 10.1(a) through 10.1(d), Tenant hereby releases Landlord from any responsibility for Tenant’s losses or damages related to the condition of the Premises and Tenant covenants and agrees that it will not assert or bring, nor cause any third party to assert or bring, any claim, demand, lawsuit or cause of action (whether by way of original claim, cross claim, counterclaim, contribution claim, indemnification claim, third-party claim or fourth-party claim) (hereinafter “*Claims*”) against Landlord including, without limitation, claims for response actions, response costs, assessments, containment, removal and remedial costs, governmental oversight charges, including any overhead or response action costs incurred or assessed by the Massachusetts Department of Environmental Protection, fines and penalties, permit and annual compliance fees, reasonable attorney and expert fees, natural resource damages, property damages, including diminution in property value claims, and personal injury damages and damages related to a person’s illness or death relating to, or arising from, Tenant’s use of the Premises (or the use of the Premises by those permitted onto the Premises by Tenant) pursuant to this Lease.

10.3 Indemnification of Landlord by Tenant

If and to the extent permitted by law, Tenant hereby covenants and agrees to indemnify and hold harmless the Commonwealth of Massachusetts and the Landlord and their respective bond trustees and mortgagees, directors, officers, agents, and employees (collectively, the “*Indemnitee*”) from any and all claims, actions at law, suits in equity, losses, damage, costs (including reasonable attorney’s fees) or injury of whatever kind and nature, whether direct or indirect, arising out of the acts, omissions or negligence of Tenant, its agents, employees, contractors, or licensees during the Term in or about the Premises, or caused by any act, neglect, fault, work, improper conduct, omission, or breach of any covenant or condition of this Lease during the Term by Tenant, its agents, employees, contractors, or licensees. Tenant’s liability hereunder extends to the acts or omissions during the Term of any sub-tenant, and any agent, employee, contractor, or licensee of any sub-tenant.

Tenant agrees, to the extent permitted by law, to indemnify and hold Indemnitee harmless from and against all bills for labor performed and equipment, fixtures and materials furnished to Tenant, and applicable sales taxes thereon as required by Massachusetts law, and from and against any and all liens, bills or claims therefor against the Premises, and from and against all losses, damages, costs, expenses, suits, and claims whatsoever in connection with any improvements or alterations made by Tenant during the Term.

Notwithstanding any provision of this Lease to the contrary, if either of the indemnifications set forth in this Section 10.3 proves ineffective for any reason, except by virtue of the operation of law including without limitation M.G.L. c. 23A, § 3I, Landlord shall have the right to immediately terminate this Lease by written notice to Tenant.

10.4 Legal Proceedings

Landlord shall, as soon as reasonably possible, notify the Tenant in a timely manner by telephone and in writing (pursuant to Section 19.7 hereof) of any Claims against an Indemnitee that potentially fall within the scope of Sections 10.1 through 10.3 above. In the event Tenant is prejudiced by the Landlord’s failure to provide such notice in a timely manner, the Tenant shall have no obligation to defend or indemnify the Indemnitee with respect thereto. Subject to the preceding sentence and to the limitations set forth in Sections 10.1 through 10.3 above, during the Term, Tenant, at Tenant’s sole cost and expense, will defend by counsel satisfactory to Indemnitee, any and all suits may be brought and claims which may be made against Indemnitee, or in which Indemnitee may be impleaded with others, whether Indemnitee shall be liable or not, upon any such above-mentioned liability, loss, damages, expenses, costs of action, suits, interests, fines, penalties, claims, judgements and shall satisfy, pay and discharge any all judgments that may be recovered against Indemnitee in any such action or actions in which Indemnitee may be a party defendant, or that may be filed against the Premises, or any interests therein. Landlord will reasonably cooperate in and Tenant will have control over the defense and settlement of any such suits and claims defended by Tenant pursuant to Article X; provided, however, that Landlord’s consent shall be required with respect to any settlement affecting the Landlord, and Landlord’s consent with respect thereto shall not be unreasonably withheld. In the event of the failure of the Tenant to pay the sum or sums for which Tenant shall be liable as aforesaid, then Landlord may pay such sum or sums, with all interests and charges which may have accrued thereon, and such amount if so paid by Landlord shall be additional rent payable by Tenant to Landlord within thirty (30) days following the date on which demand therefor shall be made by Landlord. The foregoing indemnity shall survive the expiration or termination of this Lease and/or any transfer of all or any portion of the Premises, or of any interest in this Lease.

ARTICLE XI
MAINTENANCE, REPAIRS, SAFE OPERATION

11.1 Buildings, Structures and Grounds

On and after the Substantial Completion Date, Landlord will cooperate with Tenant to cause each contractor that performed all or any portion of MassDOT's Work to make good on any warranty provided by the contractor to the Landlord with respect to materials, fixtures, construction work, or otherwise, such that any faults and defects covered by any such warranty and not conforming thereto are addressed by the contractor pursuant to the warranty.

Otherwise, on and after the Substantial Completion Date, Tenant shall, at its sole cost and expense, maintain the Premises, the Multi-Use Path and any and all Tenant's Permitted Improvements, buildings, structures, and equipment located upon the Premises and make repairs, restorations, and replacements to any Tenant's Permitted Improvements and when needed to preserve them in good working order and condition, and of good appearance, regardless of whether the repairs, restorations and replacements are ordinary or extraordinary, foreseeable or unforeseeable, capital or non-capital, or the responsibility or not the responsibility of the Tenant, its agents, employees, contractors, invitees, or licensees (unless caused solely by the gross negligence or willful misconduct of Landlord, or its agents, servants or employees acting within the scope of their agency, service or employment).

Tenant shall, at its sole cost and expense, maintain any and all bridges, culverts, drainage systems, roads, private crossings, paths and sidewalks located upon or within the Premises, and/or that comprise the Multi-Use Path or any Tenant's Permitted Improvements, in good repair and shall promptly remove all accumulations of snow and ice therefrom. Tenant shall, at its sole cost and expense, perform any and all capital improvement or repairs to all bridges, culverts, drainage systems, roads, private crossings, paths and sidewalks located upon or within the Premises, and/or that comprise the Multi-Use Path. Landlord agrees to use good faith efforts to assist Tenant with finding and securing funding for the costs of said capital improvement or repairs. Tenant shall maintain, and if necessary replace, lawns, shrubbery, trees and ground discharge of substances in concentrations which will result in harm to water supply, fish and wildlife. All activities of Tenant shall preclude the discharge of substances in concentrations which will result in harm to water supply, fish and wildlife. Chemicals may not be used to control undesirable vegetation, insects or rodents without prior written approval of Landlord. Only those materials approved and registered by the U.S. Environmental Protection Agency for the specific purpose planned will be considered for use on the Premises. Tenant shall follow label instructions in the preparation and applications of pesticides and disposal of excess materials and containers.

All work performed by Tenant shall be accomplished in a manner so as to cause no unreasonable interference with any State highway.

11.2 Sanitation

Tenant, at its sole cost and expense, shall keep the Premises in a clean and sanitary condition at all times. Tenant shall be responsible for all litter pickup, trash disposal, cleaning and sanitation. Tenant shall strictly comply with all state and local laws and regulations regarding sanitation and public health.

11.3 Safe Operation of Facilities: Compliance with Laws

Tenant shall periodically inspect all areas of the Premises for the presence of unsafe and hazardous conditions and shall promptly remedy such conditions when found.

Unless expressly authorized by Landlord, Tenant shall not permit the sale or consumption of alcoholic beverages on the Premises.

This Lease shall be absolutely net to Landlord. Without in any way limiting Tenant's other obligations under this Article XI, Tenant shall, at Tenant's sole cost and expense, maintain the Premises and all buildings and improvements thereon in accordance with all applicable laws, rules, ordinances, requirements, and regulations of any board, bureau, commission, agency, body, or other entity of any municipal, county, state, federal or other governmental body now or hereafter having or acquiring jurisdiction over the Premises or the use or the improvement thereof (each a "***Governmental Authority***") over all or any part of the Premises and of all insurance companies insuring Tenant's interest in all or any part of the Premises.

ARTICLE XII HAZARDOUS MATERIALS

12.1 Hazardous Materials Activities

Tenant shall not cause any hazardous materials or toxic wastes, hazardous or toxic substances or hazardous or toxic materials (collectively, "***Hazardous Materials***") to be used, generated, stored, released or disposed of in, on, under or about, or transported to or from the Premises (collectively, "***Hazardous Materials Activities***") without first receiving Landlord's prior written consent, which may be withheld for any reason or revoked at any time. If Landlord consents to any such Hazardous Materials Activities, Tenant shall conduct them in strict compliance with all applicable Hazardous Waste Laws, as hereinafter defined, using all necessary and appropriate precautions, and shall not cause or permit any release or threat of release of Hazardous Materials. In the event of a release or threat of release of any (i) Hazardous Materials on account of any Hazardous Materials Activities of Tenant or its employees, agents, contractors, licensees or invitees, or (ii) any release or migration of Hazardous Materials within, onto or under the Premises from adjoining property owned by parties other than Landlord, Tenant shall, at its sole cost and expense, conduct and complete all investigations, studies, sampling and testing, and all remediation, removal and other actions necessary to clean up the release or eliminate the threat of release in accordance with all applicable legal requirements. Landlord shall not be liable to Tenant under this Lease for any Hazardous Materials Activities by Tenant, Tenant's employees, agents, contractors, licensees or invitees or any other third-party, whether or not consented to by Landlord.

For purposes of this Lease, "Hazardous Materials" shall include, but not be limited to, gasoline of all types and all substances defined as "hazardous substances", "toxic substances", "oil", "asbestos", "solid waste", "hazardous materials" or "hazardous wastes" in any federal, state or applicable local statute, law, ordinance, code, rule, regulation, order, decree, notice or policy now or hereafter enacted or promulgated concerning hazardous materials (collectively, "***Hazardous Waste Laws***").

Prior to using, storing or maintaining any Hazardous Materials on or about the Premises, Tenant shall provide Landlord with a list of the types and quantities thereof, and shall update such list as necessary for continued accuracy. Tenant shall also provide Landlord with a copy of any Hazardous

Materials inventory statement required by any applicable Hazardous Waste Laws, and any update filed in accordance with any applicable Hazardous Waste Laws. If Tenant's activities violate or create a risk of violation of any Hazardous Waste Laws, Tenant shall cease such activities immediately upon notice from Landlord. Tenant shall notify all government agencies required by law and Landlord, immediately by telephone and in writing of any release or discharge of Hazardous Materials or of any condition constituting a threat of release of Hazardous Materials.

Landlord and officers, employees, contractors or agents of Landlord may (but shall not be obligated to) enter upon the Premises at any time during the Term of inspect Tenant's compliance herewith or to determine whether Tenant or occupants of adjacent properties are complying with all applicable Hazardous Waste Laws, and may disclose any violation of any Hazardous waste Laws to any governmental agency. Landlord shall also have the right to establish test wells on or near the Premises to monitor whether any chemical levels are increasing on or near the Premises because of the activities of Tenant or other occupants of the Premises or adjacent properties. Landlord shall use its best efforts to minimize interference with the Tenant's business or that of other occupants of the Premises or adjacent properties, but shall not be liable for any interference caused thereby.

12.2 Indemnification for Hazardous Materials Activities

If and to the extent permitted by law, and except as provided by M.G.L. c. 23A, §31, and except for matters identified in the Phase 1 ESA and Hazardous Materials required to be remediated as part of Landlord's Work under Section 5.1, and except as to Hazardous Materials Activities of any person using or occupying all or any portion of the Premises pursuant to Landlord Reservation of Rights in Section 2.3 hereof or pursuant to an existing easement, lease, license or other right to the extent that such rights are still in effect and applicable as of the Commencement Date, Tenant hereby agrees to indemnify, hold harmless, and defend Indemnitee from and against all losses, damages, claims, liens, encumbrances, obligations, liabilities, actions, causes of action, response costs and expenses including reasonable attorney's, engineer's, and other costs and expenses and fees actually and reasonably incurred in connection therewith, suffered by, asserted or assessed against the Indemnitee, which arise during the Term from (i) Hazardous Materials Activities during the Term of Tenant or its agents, employees, contractors, or licensees, (ii) the Hazardous Materials Activities on the Premises during the Term of any persons other than those of Landlord or its agents, employees, or contractors, (iii) any currently existing Hazardous Materials or related conditions during the Term at, under, on, or in the Premises except to the extent such Hazardous Materials or related conditions were released, exacerbated or addressed by Landlord or its agents, employees, or contractors during the MassDOT's Work or from property off the Premises, and (iv) any release or migration of Hazardous Materials at, under, on, in, over or affecting the Premises during the Term unless caused by Landlord or its agents, employees, or contractors during the Term. The indemnification provided in this Section 12.2 shall also specifically cover, without limitation, costs incurred in connection with any investigation of site conditions or any cleanup, remediation, removal or restoration work required during the Term by any board, bureau, commission or body of any municipal, county, state, federal or other governmental body, now or hereafter having or acquiring jurisdiction over the Premises or the use of the improvement thereof (each a "**Governmental Authority**") because of the presence or suspected presence of Hazardous Materials at, under, on, in, over or affecting the Premises, or any allegation thereof, whether such claim proves to be true or false, and additional costs necessary to protect against the release or threat of release of Hazardous Materials at, on, in, under, over or affecting the Premises, into the air, any body of water or any adjacent and surrounding areas. Those costs may include, but are not limited to, diminution in the value of the Premises, damages for the loss of restriction on use of rentable or usable space or of any amenity of the Premises, sums paid in settlement of claims, attorney's fees, consultants' fees

and experts' fees, and the enforcement of Tenant's obligations hereunder. Landlord will reasonably cooperate in and Tenant will have control over the defense and settlement of any such suits and claims defended by Tenant pursuant to Article X; provided, however, that Landlord's consent shall be required with respect to any settlement affecting the Landlord, and Landlord's consent with respect thereto shall not be unreasonably withheld.

Except with respect to any known Hazardous Materials or related conditions at, under, on, or in the Premises as of the Effective Date of this Lease, this indemnification shall survive the expiration or earlier termination of this Lease and any transfer of all or any portion of the Premises, or of any interest in the Lease. Notwithstanding any provision of this Lease to the contrary, if the indemnification set for in this Section 12.2 proves ineffective for any reason, except by virtue of the operation of law including without limitation M.G.L. c. 23A, §31, Landlord shall have the right to immediately terminate this Lease by written notice to Tenant.

12.3 Notices of a Release of Hazardous Materials

Landlord and Tenant shall promptly notify the other by telephone and in writing (such notice to be given pursuant to Section 19.7 hereof) of all spills, releases or discharges of any Hazardous Materials; any condition constituting a threat of such spill, release or discharge; all failures to comply with any federal, state or local law, or with any regulation or ordinance; all inspections of the Premises by any regulatory entity concerning the same; all notices, orders, fines or communications of any kind from any Governmental Authority of third party that relate to the presence or suspected presence of any Hazardous Materials on the Premises or the migration or suspected migration of any Hazardous Materials from other property onto or beneath the Premises or to other property from the Premises; and all responses to interim cleanup action taken by or proposed to be taken by any government entity or private party on the Premises. Landlord and Tenant shall provide the other with copies of all notices with respect to any of the foregoing received from any federal, state or local authority or official or from any other third party. In the event Tenant is prejudiced by the Landlord's failure to provide timely notice, the Tenant shall have no obligation to defend or indemnify the Indemnitee under Article XII with respect thereto.

12.4 Remedial Work

If and to the extent covered by the Indemnification for Hazardous Materials Activities set forth in Section 12.2 and except as provided in Section 12.3, if any investigation, site monitoring, containment, cleanup, removal, restoration or other remedial work (the "**Remedial Work**") of any kind is necessary under any applicable local, state or federal laws or regulations, or is required by any Governmental Authority because of or in connection with the presence or suspected presence of Hazardous Materials on or under the Premises, Tenant shall have sole responsibility for all such Remedial Work and all costs and expenses of such Remedial Work shall be paid by Tenant.

Landlord shall have the right to contest the assertion by any Governmental Authority or any third party of any obligation or liability affecting Tenant, Landlord, or all or any portion of the Premises for performance of any Remedial Work. Landlord shall have the right to perform any Remedial Work, and if and to the extent covered by the Indemnification for Hazardous Materials Activities set forth in Section 12.2, Tenant shall reimburse Landlord for all costs and expenses incurred by Landlord in connection therewith as set forth above.

Failure by Landlord to object to any actions taken by Tenant shall not be construed to be an approval by Landlord of such actions. Nothing contained herein shall be construed as creating any obligation for Landlord to review any plans for Remedial Work, or to perform, or review Tenant's

or any other party's performance of any Remedial Work. However, in the event that Remedial Work is required, and Landlord elects to perform such Remedial Work, Tenant shall provide Landlord and its agents and employees with such access to the Premises as shall be required in connection therewith. Landlord shall have the right, in its sole discretion, to undertake such Remedial Work, and Landlord shall not be liable for any loss sustained by Tenant resulting from any Remedial Work undertaken by Landlord or from any other act or omission of Landlord in connection therewith except to the extent such loss is caused by the gross negligence or willful misconduct of Landlord, or its agents, servants, or employees acting within the scope of their agency, service or employment.

ARTICLE XIII INSPECTION AND ACCESS

13.1 Landlord's Right to Inspect Premises

Throughout the Term, Landlord and its representatives, including, without limitation, representatives of the Federal Highway Administration, shall have the right, but not the duty, to inspect the Premises for the purpose of ascertaining Tenant's compliance with the terms of this Lease. If requested by Landlord, Tenant shall provide a representative to accompany Landlord on each such inspection. Landlord shall also have the right to establish tests wells on or near the Premises to monitor chemical levels on or near the Premises.

13.2 Landlord's Access

Throughout the Term, Landlord and its representatives shall have the right to pass in, on and over the Premises for the purpose of maintenance, repair and/or replacement of Landlords' adjacent facilities.

Tenant shall allow any public or private utility holding an easement, license or permit regarding the Premises or any portion thereof, to enter the Premises and perform routine and emergency repairs and maintenance work.

ARTICLE XIV ACCOUNTING AND REPORTING

14.1 Repair and Maintenance Records

In addition to any other books and records maintained by Tenant which pertain to the Premises, the Multi-Use Path or any Tenant's Permitted Improvements or to the performance of the provisions and obligations of this Lease, Tenant shall maintain proper records of all repairs and maintenance made to the Premises, the Multi-Use Path and any Tenant's Permitted Improvements and shall make these available to Landlord for review, audit and analysis upon request. Tenant shall preserve all such books and records pertaining to the Premises, the Multi-Use Path or any Tenant's Permitted Improvements for a period of six (6) years following the close of each fiscal year of the Tenant.

ARTICLE XV

ASSIGNMENT AND SUBLETTING

15.1 Limitations

Tenant shall not assign, transfer, convey, sublet, encumber or dispose of its right, title or interest in the whole or any part of the Premises or in this Lease, nor enter into any agreement with any entity or person, except for employees of the Tenant, to exercise substantial management responsibilities for the operations authorized hereunder or any part thereof, without the prior written consent of Landlord, which may be withheld for any reason whatsoever.

The failure of a transferee or any other successor in interest to Tenant to assume the obligations of Tenant hereunder or to obtain the approval of Landlord as herein required shall not relieve such transferee or successor of such obligations or limit Landlord with respect to any rights, remedies or controls it may have under this Lease.

Any transfer by operation of law or otherwise of Tenant's interest in this Lease or of a controlling interest in Tenant's ownership so as to permit the exercise of substantial managerial influence over the operations of Tenant by such transferee shall be deemed a transfer of Tenant's interests in the Premises for the purposes of this Article XV. Tenant agrees to comply with the requirements of Massachusetts General Laws, Chapter 7C, Section 39, regarding the filing of updated beneficial interest disclosure statements.

**ARTICLE XVI
EMINENT DOMAIN**

16.1 Taking by Eminent Domain

If a substantial part of the Premises shall be taken for any public or quasi-public use under governmental law or by right of eminent domain and such taking would materially interfere with the use of the Premises by Tenant for the purposes contemplated by this Lease, then the Lease may be terminated by either Landlord or Tenant. Landlord or Tenant shall make such election by giving the other party written notice within sixty (60) days after the event giving rise to a right to terminate. Any such termination shall be effective thirty (30) days after the date of notice thereof.

Landlord reserves all rights to damages payable by reason of anything lawfully done in pursuance of any public or other authority and, by way of confirmation, Tenant grants to Landlord all of Tenant's rights to such damages and agrees to execute and deliver such further instruments of assignment thereof as Landlord may from time to time request. Where, as the result of a taking by eminent domain or for any other reason, the Lease is terminated or modified so as to require the permanent or temporary, total or partial displacement of Tenant from the Premises prior to or at the expiration of the Term, Tenant waives any benefits to which Tenant may be entitled under the Uniform Relocation Assistance and Real Property Acquisition Act of 1970, as amended, and Tenant shall be excluded from any relocation benefits available under said Act or any amendments thereto.

**ARTICLE XVII
RIGHT OF LANDLORD TO PERFORM**

17.1 Landlord's Right to Perform Tenant's Obligations

If Tenant fails to pay when due amounts payable under this Lease, except for payments of Rent, or to perform any of its other obligations under this Lease within the time permitted for its performance, then Landlord, after thirty (30) days' prior written notice to Tenant (or, in the case of any emergency, upon such notice or without notice, as may be reasonable under the circumstances) and without waiving any of its right under this Lease, may, but shall not be required to, pay such amount or perform such obligations.

All amounts paid by Landlord and all costs and expenses incurred by Landlord in connection with the performance of any such obligations (together with interest at the statutory rate) per annum from the date of Landlord's payment of such amount until the date of full repayment by Tenant) will be payable by Tenant to Landlord as additional rent on demand.

ARTICLE XVIII DEFAULTS AND REMEDIES

18.1 Events of Default by Tenant

The following events shall be deemed to be events of default by Tenant under this Lease:

- (a) Tenant shall fail to pay when due any sum of money due Landlord hereunder or any other payment or reimbursement due Landlord by the terms of this Lease, and such failure shall continue for a period of ten (10) days from the date when such payment was due.
- (b) Tenant shall fail to comply with any term, provision or covenant of this Lease, other than the failure to pay a sum of money due Landlord, and shall not cure such failure within thirty (30) days after written notice thereof to Tenant or, in the case of failures that cannot be cured within thirty (30) days, commence to cure such failure within thirty (30) days and thereafter diligently pursue such cure to completion.
- (c) Tenant shall attempt to assign, transfer, convey, sublet, encumber or dispose of any of its right, title or interest in the whole or any part of the Premises without the prior approval of Landlord.
- (d) Tenant shall abandon any substantial portion of the Premises or cease to use a substantial portion of the Premises for the Permitted Uses.
- (e) This Lease or the Premises or any part of the Premises are taken upon execution or by other process of law directed against Tenant, or are taken upon and subjected to any attachment by any creditor of Tenant or claimant against Tenant, and such attachment is not discharged within fifteen (15) days after its levy.
- (f) Tenant shall fail to contest diligently the validity of any lien or claimed lien and give sufficient security to Landlord to insure payment thereof or shall fail to satisfy any judgement rendered thereon and have the same released within ten (10) days after Tenant has notice from any source of such lien.
- (g) Tenant shall file a petition in bankruptcy or insolvency or for reorganization or arrangement under the bankruptcy law of the United States, or is dissolved, or makes an assignment for the benefit of creditors.
- (h) Involuntary proceedings under any such bankruptcy laws or for the dissolution of Tenant are instituted against Tenant, or a receiver or trustee is appointed for all or substantially all of

Tenant's property, and such proceeding is not dismissed or such receivership or trusteeship is not vacated within ninety (90) days after such institution or appointment.

(i) Tenant shall fail to use the Premises for the Permitted Uses or shall use the Premises for any other uses.

(j) Tenant shall fail to maintain the Premises in a safe, orderly and clean condition, and as otherwise required by this Lease.

18.2 Remedies of Landlord

Upon the occurrence of any of the events of default in Section 18.1, Landlord shall have, in addition to the rights set forth in Article XVII of this Lease and any other remedies available to Landlord at law or equity, the immediate option, or the option at any time thereafter, to immediately terminate this Lease and all rights of Tenant hereunder by written notice to Tenant and this Lease will come to an end on the date such notice is deemed delivered to Tenant as fully and completely as if the Term had expired. Upon the termination of this Lease, Tenant shall immediately quit and surrender the Premises to Landlord in accordance with the terms of Section 19.2 herein, but Tenant shall remain liable for damages as hereinafter provided. In the event Tenant fails to quit and surrender the Premises, Landlord may re-enter and repossess the Premises and any improvements or any part thereof and remove Tenant and those claiming through Tenant from the Premises without being deemed guilty or liable in any manner of trespass and without prejudice to any remedies for arrears of rent or other default. Termination under this paragraph shall not relieve Tenant from the payment of any sum then due to Landlord, or from any claim for damages previously accrued against Tenant. Tenant hereby waives all statutory and equitable rights to its leasehold after termination of this Lease by Landlord under this paragraph, including, without limitation, rights in the nature of further cure or redemption, if any.

18.3 Termination Damages

If this Lease is terminated for default, then Tenant covenants as an additional cumulative obligation after such termination, to pay all of Landlord's reasonable costs and expenses, including attorney's fees, related to (i) the termination of this Lease, (ii) the recovery of the Premises from Tenant, and (iii) the collection of the amounts due hereunder; all of said costs and expenses collectively referred to as "*Landlord's Termination Expenses.*" Landlord's Termination Expenses shall be due and payable immediately from time to time upon notice from Landlord.

18.4 Remedies Cumulative

The specific remedies to which Landlord or Tenant may resort under this Lease, and all other rights and remedies of Landlord and Tenant are cumulative, and any two or more may be exercised at the same time. Nothing in this Lease shall limit the right of Landlord to prove and obtain in proceedings for bankruptcy or insolvency an amount equal to the maximum allowed by any statute or rule of law in effect at that time.

18.5 Waiver of Relocation Assistance

Where termination or modification of this Lease for any reason requires permanent or temporary, total or partial, displacement to Tenant, prior to or at the expiration of this Lease, Tenant waives any benefit that Tenant may be deemed entitled to under the Uniform Relocation Assistance and Real Property Acquisition Act of 1970, as amended, and Tenant shall thereafter be excluded from any relocation benefits available under said act or amendments thereto.

**ARTICLE XIX
MISCELLANEOUS**

19.1 Quiet Enjoyment

Landlord agrees that, except as otherwise provided in this Lease, and so long as Tenant performs and observes the agreements, conditions and covenants of this Lease on its part to be performed and observed, Tenant's use and enjoyment of the Premises will not be disturbed by Landlord or anyone claiming by, through or under Landlord.

19.2 Surrender of Premises

At the end of the Term, or any extension or renewal thereof, or other sooner termination of this Lease, the Tenant peaceably will deliver to the Landlord possession of the Premises, together with the Multi-Use Path, all Tenant's Permitted Improvements, Permitted Amenities, and any other improvements or additions thereto, (unless Landlord has requested removal as a condition to approving construction of same) in the condition in which Tenant is required to maintain them under the terms of this Lease. Tenant may, upon termination of this Lease, remove all moveable furniture, trade fixtures, equipment, and other personal property belonging to Tenant, and Tenant shall repair any damage caused by such removal. Property not so removed shall be deemed abandoned by the Tenant, and Landlord may at its option, keep the same for its use or remove and dispose of the same in any manner as Landlord shall choose, and Tenant shall pay on demand any and all expenses incurred in such removal and disposal.

19.3 Holding Over

Tenant has no right to hold over at the end of the Term. If Tenant retains possession of the Premises or any part thereof after expiration of the Term or earlier termination of the Lease, Landlord may at its option, serve written notice upon Tenant that such holding over consists creation of tenancy at will, upon the terms and conditions set forth in this Lease, except for the rental rate, which shall be at market rent for comparable Multi-Use Paths in the Commonwealth at that time. If no such notice is given, then a tenancy at sufferance shall be deemed to be created and the rental described in the preceding sentence shall apply. The provisions of this paragraph shall not constitute a waiver by Landlord of any right or re-entry or any other remedy given by this Lease or otherwise available at law or equity; nor shall the acceptance of Rent operate as a waiver of Landlord's right to terminate this Lease for a default by Tenant hereunder.

19.4 Status Report

Recognizing that both Landlord and Tenant may find it necessary or desirable to establish to third parties, such as accountants, lenders, government agencies, or the like, the then current status of performance hereunder, either party, upon the written request of the other made from time to time, will promptly furnish a written statement on the status of any matter pertaining to this Lease. Without limiting the foregoing, Tenant shall at any time and from time to time, but only after ten (10) days' prior written notice from Landlord, execute, acknowledge and deliver a written statement certifying that this Lease is in full force and effect subject only to such modification as may be set out; that Tenant is in possession of the Premises and is paying rent as provided in this Lease or specifying the amount of any unpaid rent; and that there are not any uncured defaults on the part of the Landlord, or specifying such defaults if they are claimed. If Tenant fails to deliver such statement in a timely manner, Tenant shall be deemed to have acknowledged that this Lease is in full force and effect, without modifications except as may be represented by Landlord, and that there

are no uncured defaults in Landlord's performance. Any statement provided by either Landlord or Tenant hereunder may be relied upon by the other or any other party to whom Landlord or Tenant requests the statement be addressed.

19.5 Waiver

If either Landlord or Tenant waives the performance of any term, covenant or condition contained in this Lease, such waiver shall not be deemed to be a waiver of any subsequent breach of the same or any other term, covenant or condition herein. Furthermore, the acceptance of rent by Landlord shall not constitute a waiver of any preceding breach of this Lease by Tenant, regardless of Landlord's knowledge of such preceding breach at the time Landlord accepted such rent. Failure by either Landlord or Tenant to enforce any of the terms, covenants or conditions of this Lease for any length of time shall not be deemed to waive or to diminish the right of such party to insist upon strict performance in the future. No provision of this Lease shall be deemed to have been waived by either Landlord or Tenant unless such waiver is in writing and signed by a duly authorized representative of the party to be bound thereby.

19.6 No Brokerage

Landlord and Tenant each represents and warrants that no broker, agent, commission salesman or other person has represented it in connection with the procurement or consummation of this Lease. In the event any brokerage claims are asserted against Landlord predicated upon prior dealings with the Tenant, Tenant agrees to indemnify and hold Landlord harmless against any such claim.

19.7 Notices: Time of Essence

All notices and other communications require or permitted to be given under this Lease shall, unless otherwise expressly permitted hereunder, be in writing, signed by a duly authorized representative of the party giving notice and shall be deemed delivered when given: (a) upon hand delivery, (b) one (1) business day after being deposited with Federal Express or another reliable overnight courier service for next day delivery, or (c) three (3) business days after being deposited in the United States mail, certified, return receipt requested, postage prepaid; and address as follows:

Landlord or Tenant may, by notice given hereunder, at any time and from time to time, designate a different address to which notices shall be sent.

19.8 Landlord's and Tenant's Consent

MBTA's consent required by this Lease may be provided by the Chief Real Estate Officer.

Tenant's consent required by this Lease may be provided by the Mayor as authorized.

19.9 Status of Parties

Landlord reserves no control whatsoever over the employment, discharge, compensation of or services rendered by Tenant's employees, agents or contractors. Tenant covenants and agrees that it will neither hold itself out as, nor claim to be, a partner, agent, joint venturer, officer or employee of the Landlord by reason of this Lease, and that it will not, by reason of this Lease, make any claim, demand or application to or for any right or privilege applicable to an employee or officer

of the Commonwealth of Massachusetts. Nothing contained in this Lease shall create or be construed as creating a partnership or joint venture between Landlord and Tenant or constitute Tenant as an agent of Landlord.

19.10 Governing Law

This Lease will be governed by and construed in accordance with the law of the Commonwealth of Massachusetts, and all legal actions brought in connection with this Lease shall be brought in courts within the Commonwealth of Massachusetts.

19.11 Entire Agreement

This Lease, together with its Exhibits, whether physically appended to this document or incorporated by reference without being so appended, contains all of the agreements of the parties and supersedes any previous negotiations. There are no agreements between Landlord and Tenant with respect to the subject matter of this Lease other than those set forth in this Lease and its Exhibits.

19.12 Headings

The headings herein are for convenience of reference only and shall in no way define, increase or limit the scope or intent of any provision of this Lease.

19.13 Partial Invalidity

If any term or provision of this Lease, or the application thereof to any person or circumstance, shall to any extent be deemed invalid or unenforceable, the remainder of this Lease, or the application of such term to persons or circumstances other than those to which it is invalid or unenforceable, shall not be affected thereby, and each other term and provision of this Lease shall remain valid and enforceable to the fullest extent permitted by law.

19.14 Force Majeure

In any case where either Landlord or Tenant is required to perform any act pursuant to this Lease, delays caused by or resulting from war, fire, flood, unusually severe weather, strikes or other causes beyond such party's reasonable control shall not be counted in determining the time during which such act shall be completed, whether such time be designated by a fixed date, a fixed time or a "reasonable" time, and such time shall be deemed to be extended by the period of the delay.

19.15 Recording

Landlord and Tenant agree not to record this Lease. Both parties will, at the request of either party, execute, acknowledge and deliver a Notice of Lease in recordable form. Such notice shall contain only the information required by law for recording. Tenant shall be responsible for the preparation of any plans required for the recording of any such notice and the recording costs thereof.

19.16 No Agreement Until Signed

No legal obligations shall arise with respect to the Premises or other matters herein until this Lease is executed and delivered by Land and Tenant, with all required signatures.

19.17 Accord and Satisfaction

No acceptance by Landlord of a lesser sum than any charge due hereunder shall be deemed to be other than an acceptance of the earliest installment of such charge due, nor shall any endorsement or statement on any check or any letter accompanying any check or payment as rent or other charge be deemed an accord and satisfaction, and Landlord may accept such check or payment without prejudice to Landlord's right to recover the balance of such installment or pursue any other remedy provided in this Lease.

19.18 Successors and Assigns

This Lease and the covenants and conditions herein contained shall inure to the benefit of and be binding upon Landlord, its successors and assigns, and shall be binding upon Tenant, its successors and assigns, and shall inure to the benefit of Tenant and only such transferees of Tenant as are permitted hereunder.

19.19 State Employees Barred from Interest

No official, employee or consultant of the Commonwealth of Massachusetts or Landlord shall have any personal interest, direct or indirect, in this Lease, nor shall any such official, employee or consultant participate in any decision relating to this Lease which affects their personal interest or the interests of any corporation, partnership, or association in which they are directly or indirectly interested. Tenant has on or prior to the date hereof delivered to Landlord and to the Commonwealth of Massachusetts Division of Capital Asset Maintenance and Management ("DCAMM") Tenant's Beneficial Interest Disclosure Statement, a copy of which is attached hereto as *Exhibit D*. Tenant agrees in case of any change of Tenant's interest in the Premises during the Term, that it shall deliver to Landlord and to DCAMM a new Beneficial Interest Disclosure Statement within (30) days of such change.

19.20 Limitation of Liability

No official, employee, agent, officer or consultant of the Commonwealth of Massachusetts or Landlord shall be personally liable to Tenant or to any partner or shareholder thereof, or to any successor in interest of person claiming by, through, or under Tenant or any partner or shareholder thereof, in the event of any default or breach of this Lease, or for any amount which may become due or on any claim, cause or obligation whatsoever under the terms of this Lease.

No official, employee, agent, officer, or consultant of the City of Lawrence or Tenant shall be personally liable to Landlord or to any partner or shareholder thereof, or to any successor in interest of person claiming by, through, or under Landlord or any partner or shareholder thereof, in the event of any default or breach of this Lease, or for any amount which may become due or on any claim, cause or obligation whatsoever under the terms of this Lease.

All claims against Landlord and Tenant shall be governed by the provisions of this Lease and Chapter 258 of the Massachusetts General Laws.

Except as between Landlord and Tenant under the terms and conditions of this Lease, nothing herein shall be construed, act, and/or operate to alter, limit, waive, eliminate, terminate, or otherwise modify statutory provisions, exemptions, exceptions, limits, and/or defenses available to either party under any applicable statutes and/or regulations relating to any claims or causes of actions asserted against either party.

19.21 Non-discrimination

Tenant agrees that it shall not, because of race, color, national origin, ancestry, age, sex, religion, physical or mental handicap, or sexual orientation, discriminate against any qualified employee, applicant for employment, subcontractor, or person or firm seeking to provide goods or services to Tenant, or deny any person access to the Premises or to any activities or programs carried out upon the Premises. Tenant shall comply with all applicable federal and state statutes, rules, and regulations prohibiting discrimination in employment or public accommodation. Tenant shall use the Premises in compliance with all other requirements imposed by or pursuant to Title 49, Code of Federal Regulations, Department of Transportation, Subtitle A, Office of the Secretary, Part 21, Nondiscrimination in Federally-assisted programs of the Department of Transportation-Effectuation of Title VI of the Civil Rights Act of 1964, as said Regulations may be amended. In the event of breach of any of the above nondiscrimination covenants, Landlord shall have the right to terminate this Lease and reenter and repossess the Premises and hold the same as if this Lease had never been made or issued.

19.22 Counterparts

This Lease may be executed in any number of counterparts and each of such counterparts shall, for all purposes, be deemed to be an original and all such counterparts shall together constitute but one and the same Lease.

19.23 Tenant's Due Authority and Compliance with Laws

Tenant has on or prior to the date hereof delivered to Landlord: (i) Agent Authorization Form, a copy of which is attached hereto as Exhibit E; and (ii) the categorical exclusion dated June 16, 2020, a copy of which is attached hereto as Exhibit F, confirming there is little or no potential for significant impact from this project.

19.24 Executive Order 526

By signing this Lease, the Tenant hereby certifies under the pains and penalties of perjury that the Tenant currently complies with and will continue to comply with all federal and state laws, rules and regulations promoting fair employment practices or prohibiting employment discrimination and unfair labor practices and shall not discriminate in the hiring of any applicant for employment nor shall any qualified employee be demoted, discharged or otherwise subject to discrimination in the tenure, position, promotional opportunities, wages, benefits or terms and conditions of their employment because of race, color, national origin, ancestry, age, sex, religion, disability, handicap, sexual orientation or for exercising any rights afforded by law.

19.25 Minority-, Women-, and Service Disabled Veteran-Owned Business Enterprises

Landlord encourages to the greatest extent possible, the active and meaningful equity participation of Minority-Owned Business Enterprises (MBEs), Women-Owned Business Enterprises (WBEs) and Service Disabled Veteran-Owned Business Enterprises (SDVBE), as certified by the Commonwealth of Massachusetts Supplier Diversity Office. Landlord also encourages Tenant to use, to the greatest extent possible, MBEs, WBEs and SDVBES to provide services and materials. Tenant agrees, to the greatest extent possible, to purchase supplies and services concerning this Lease from certified MBEs, WBEs and SDVBES.

[Signature page of this Lease follows.]

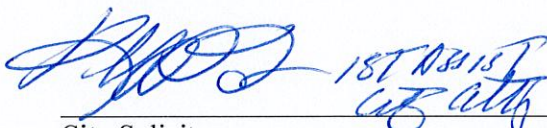
IN WITNESS WHEREOF, Landlord and Tenant have caused this Lease to be signed and delivered as an instrument under seal by their duly authorized officers or representatives as of the date first set forth above.

MASSACHUSETTS BAY TRANSPORTATION AUTHORITY

By: _____

Richard Henderson
Chief Real Estate Officer

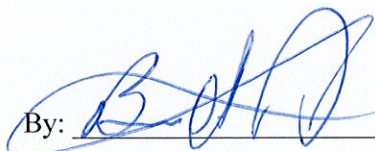
Approved as to form:



City Solicitor

*1st No. 15
City*

CITY OF LAWRENCE

By:  _____

Brian A. DePeña
Mayor of Lawrence

**EXHIBIT A
PLAN OF PREMISES**

See Survey Plan Recorded at Essex County North Registry of Deeds at Plan Page 18491

**EXHIBIT B
DESIGN PLANS**

Exhibit B is the set of plans and specifications for the Multi-Use Path in the City of Lawrence, MA, from the Beginning Project Station 0+70.00 to the End Project Station 88+45, as approved by the FHWA, which are incorporated herein by reference. The plans prepared for the Massachusetts Department of Transportation, Highway Division, by The Engineering Corp, entitled "Lawrence Manchester Rail Corridor (LMRC) Rail Trail in the City of Lawrence Essex County", dated 11/29/2023 consisting on that date of 224 pages, with all amendments through the final Plans and Specifications and Estimate set of plans as approved by the FHWA (the "Design Plans"). Sheet 1 of 224 of the Design Plans is attached hereto and incorporated herein by reference. The entire set of Design Plans is on file with the Massachusetts Department of Transportation, Massachusetts Bay Transportation Authority, and the City of Lawrence, and incorporated herein by reference.

EXHIBIT C
CERTIFICATES OF INSURANCE

EXHIBIT D
TENANT'S BENEFICIAL DISCLOSURE STATEMENT

**Disclosure of Beneficial Interest
In Real Property Transaction**

THIS FORM CONTAINS A DISCLOSURE OF THE NAMES AND ADDRESSES OF ALL PERSONS WITH A DIRECT OR INDIRECT BENEFICIAL INTEREST IN THE REAL ESTATE TRANSACTION DESCRIBED BELOW.

1. Public agency involved in this transaction: CITY OF LAWRENCE

2. Complete legal description of the property:

THE PROPERTY KNOWN AS **The Lawrence Manchester Rail Corridor** AS SHOWN BY TAX ASSESSOR'S MAP and PARCEL No.'s

3. Names and addresses of all persons who have or will have a direct or indirect beneficial interest in the real property described above.

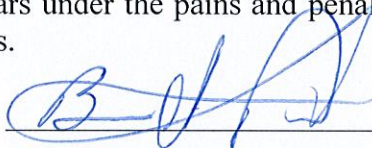
NONE

The undersigned certifies that none of the persons listed above is an official elected to public office in the Commonwealth of Massachusetts except as noted below:

Name	Title or Position
<u>None</u>	<u>None</u>

4. This section must be signed by the individual(s) or organization(s) entering into this real property transaction with the City of Lawrence. If this form is signed on behalf of a corporation, it must be signed by a duly authorized officer of that corporation. The undersigned acknowledges that any changes or additions to the list of persons with beneficial interests (Item 5, above) will require the filing of a new disclosure statement.

The undersigned swears under the pains and penalties of perjury that this form is complete and accurate in all respects.

Signature: 

Typed Name: Brian A. DePena

Date: 08-27-24

EXHIBIT E
EVIDENCE OF AUTHORITY

THIS PAGE IS INTENTIONALLY LEFT BLANK



**WORK
ZONE
SAFETY**

Temporary Traffic Control

*Typical Details and
Massachusetts Guidelines
for MassDOT, Municipalities,
Utilities, and Contractors*

SHEET INDEX (1 OF 3)

<u>GENERAL</u>	<u>PAGE</u>
NOTES AND GUIDELINES.....	1-9
FIG. 1: TYPICAL TRAFFIC CONTROL DEVICES.....	10
FIG. 2: PAVEMENT EDGE DROP-OFF GUIDANCE.....	11
FIG. 3: TYPICAL DEVICE SPACING; (AT 30 MPH).....	12-13
FLAGGING GUIDANCE.....	14-15
FIG. 4-5: TYPICAL PEDESTRIAN DEVICES.....	16-17
 <u>STATIONARY OPERATIONS</u>	
FIG. 6: TWO LANE UNDIVIDED ROADWAY; HALF OF ROADWAY CLOSED; WORK NEAR CURVE.....	18-19
FIG. 7: TWO LANE UNDIVIDED ROADWAY; HALF OF ROADWAY CLOSED.....	20-21
FIG. 8: TWO LANE UNDIVIDED ROADWAY; SHOULDER CLOSED.....	22-23
FIG. 9: TWO LANE UNDIVIDED ROADWAY WITH TRAVERSABLE SHOULDER; HALF OF ROADWAY CLOSED; MAINTAIN TWO-WAY TRAFFIC.....	24-25
FIG. 10: FOUR LANE UNDIVIDED ROADWAY; RIGHT LANE CLOSED.....	26-27
FIG. 11: FOUR LANE UNDIVIDED ROADWAY; LEFT LANE CLOSED.....	28-29
FIG. 12: FOUR LANE UNDIVIDED ROADWAY; HALF OF ROADWAY CLOSED.....	30-31
FIG. 13: MULTILANE DIVIDED ROADWAY; RIGHT LANE CLOSED.....	32-33
FIG. 14: MULTILANE DIVIDED ROADWAY; LEFT LANE CLOSED.....	34-35
FIG. 15: MULTILANE DIVIDED ROADWAY; CENTER LANE OR RIGHT/CENTER LANES CLOSED.....	36-37
FIG. 16: MULTILANE DIVIDED ROADWAY; CENTER LANE OR LEFT/CENTER LANES CLOSED.....	38-39

SHEET INDEX (2 OF 3)

<u>STATIONARY OPERATIONS (CONT.)</u>	<u>PAGE</u>
FIG. 17: MULTILANE DIVIDED ROADWAY; RIGHT SIDE OF OFF RAMP CLOSED.....	40-41
FIG. 18: MULTILANE DIVIDED ROADWAY; LEFT SIDE OF OFF RAMP CLOSED.....	42-43
FIG. 19: MULTILANE DIVIDED ROADWAY; ROADWORK BEYOND ON RAMP.....	44-45
FIG. 20: MULTILANE DIVIDED ROADWAY; ROADWORK BEYOND OFF RAMP.....	46-47
FIG. 21: MULTILANE DIVIDED ROADWAY; TYPICAL RAMP CLOSURE.....	48-49
FIG. 22: MULTILANE DIVIDED ROADWAY; TYPICAL CLOVERLEAF RAMP CLOSURE.....	50-51
FIG. 23: MULTILANE DIVIDED ROADWAY; TYPICAL RAMP CLOSURE; ADVANCE SIGNING.....	52-53
FIG. 24: FOR MULTILANE DIVIDED ROADWAY; PLACEMENT OF TEMPORARY PORTABLE RUMBLE STRIPS.....	54-55
 <u>MOBILE OPERATIONS</u>	
NOTES FOR MOBILE OPERATIONS.....	56
FIG. 25: ANY ROADWAY; BEYOND RIGHT SHOULDER.....	57
FIG. 26: ANY ROADWAY; SHOULDER.....	58
FIG. 27: DIVIDED ROADWAY; MEDIAN WORK.....	59
FIG. 28: UNDIVIDED TWO LANE ROADWAY; HALF OF ROADWAY CLOSED.....	60
FIG. 29: MULTILANE DIVIDED ROADWAY; LEFT LANE.....	61
FIG. 30: MULTILANE DIVIDED ROADWAY; RIGHT LANE.....	62
FIG. 31: MULTILANE DIVIDED ROADWAY; CENTER LANE.....	63
FIG. 32: POST-STORM CLEANUP OPERATION.....	64

SHEET INDEX (3 OF 3)

<u>EMERGENCY RESPONSE</u>	<u>PAGE</u>
NOTES FOR TRAFFIC EMERGENCY/INCIDENT OPERATIONS...	65
FIG. 33: ANY ROADWAY; SHOULDER ENCROACHMENT.....	66
FIG. 34: TWO LANE ROADWAY; NO SHOULDER; TRAVEL LANE ENCROACHMENT.....	67
FIG. 35: TWO LANE ROADWAY; TRAVERSABLE SHOULDER; SINGLE LANE ENCROACHMENT.....	68
FIG. 36: TWO LANE ROADWAY; TRAVERSABLE SHOULDER; CENTER OF ROADWAY.....	69
FIG. 37: MULTILANE DIVIDED ROADWAY; RIGHT LANE.....	70
FIG. 38: MULTILANE DIVIDED ROADWAY; LEFT LANE.....	71
FIG. 39: MULTILANE UNDIVIDED ROADWAY; LEFT LANE.....	72
FIG. 40: MULTILANE DIVIDED ROADWAY; MIDDLE LANE; APPROACH FROM LEFT.....	73
FIG. 41: MULTILANE DIVIDED ROADWAY; MIDDLE LANE; APPROACH FROM RIGHT.....	74
 <u>TRAFFIC SIGNAL REPAIR WORK AT INTERSECTION</u>	
FIG. 42: MULTILANE UNDIVIDED ROADWAY; LEFTMOST OR LEFT TURN LANE.....	75
FIG. 43: TWO LANE UNDIVIDED ROADWAY; ONE LEG OF INTERSECTION.....	76
FIG. 44: MULTILANE UNDIVIDED ROADWAY; CENTER OF INTERSECTION.....	77
 <u>PEDESTRIAN DETAILS</u>	
FIG. 45: PEDESTRIAN BYPASS.....	78
FIG. 46: TEMPORARY SIDEWALK CLOSURE.....	79
 <u>BIKE LANE DETAILS</u>	
FIG. 47: BIKE LANE CLOSURE.....	80-81

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.

PAGE 2

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.

PAGE 4

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 (≤ 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 (≥ 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 (≤ 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 (≥ 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 handing 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.

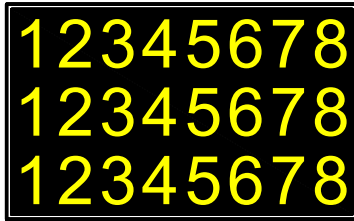
USE OF THIS GUIDE

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:

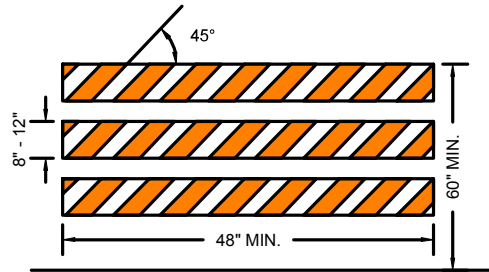
- 1) Turn to the Index. Consider the type of operations and the type of roadway upon which work will occur.
- 2) Select the figure that most closely matches the conditions where you plan to work. Remember that all diagrams represent minimum standards.
- 3) Read the title of the illustration to ensure 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.



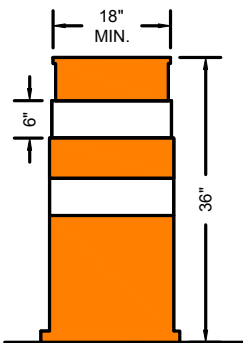
SIGN



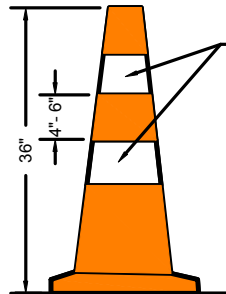
PORTABLE CHANGEABLE MESSAGE SIGN (PCMS)



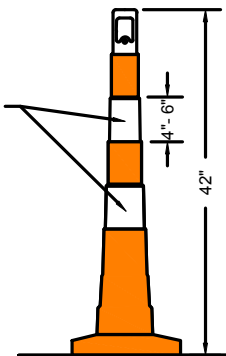
TYPE III BARRICADE



DRUM

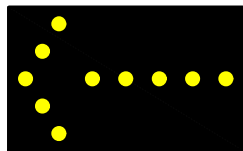


RETROFLECTIVE BANDS

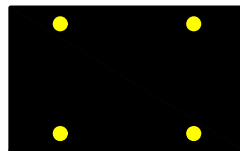


CONES

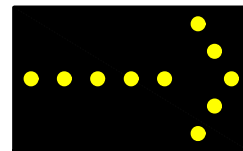
Cones may be used for all daytime operations. For night work, drums should be used to form the taper(s) and cones can be used along the tangent section of the work setup.



LEFT

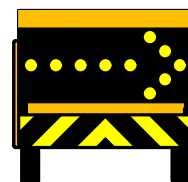


CAUTION



RIGHT

ARROW BOARD (WITH MODE)



TRUCK MOUNTED ATTENUATORS

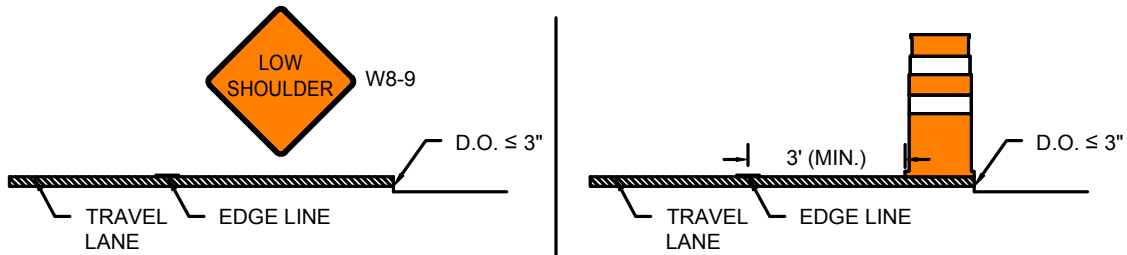
Truck Mounted Attenuators (TMA) shall be positioned between the start of the work area and the end of the designated buffer zone. The TMAs are to be positioned in each temporarily closed lane. This includes shoulders (≥ 8 feet) whether combined with a travel lane closure or being closed alone. These 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

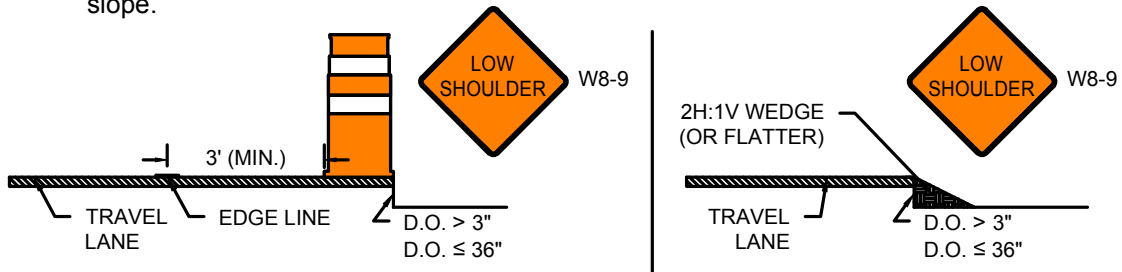
Note that this guidance is adopted from the Roadside Design Guide, 4th Edition.

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.

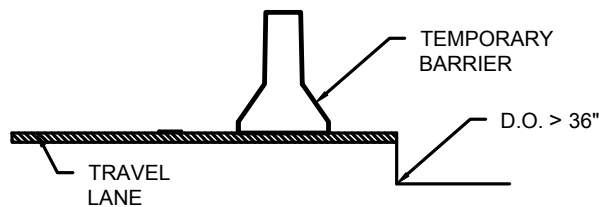
- Shoulder drop-offs 3" or less adjacent to a shoulder or active travel lane should be mitigated by:
 - ✓ A W8-9 (LOW SHOULDER) sign in advance of and at regular intervals throughout the treatment; or
 - ✓ The placement of drums on the traffic side of the drop-off.



- 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

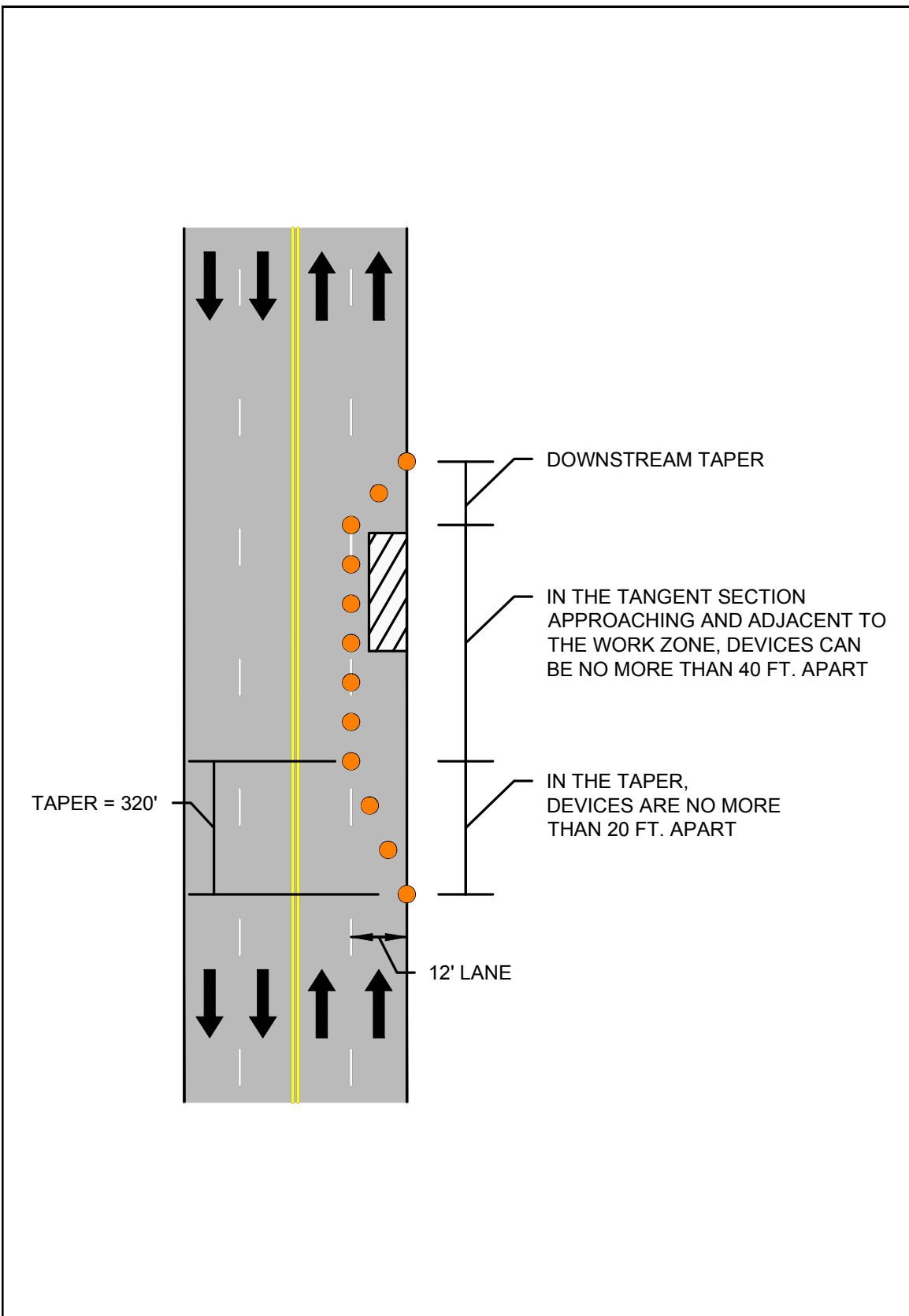
NOTES


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>
--	---	--------------------------

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.

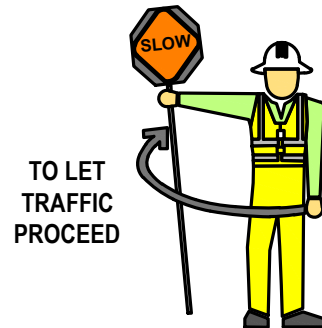


Properly Trained Flaggers

- 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.

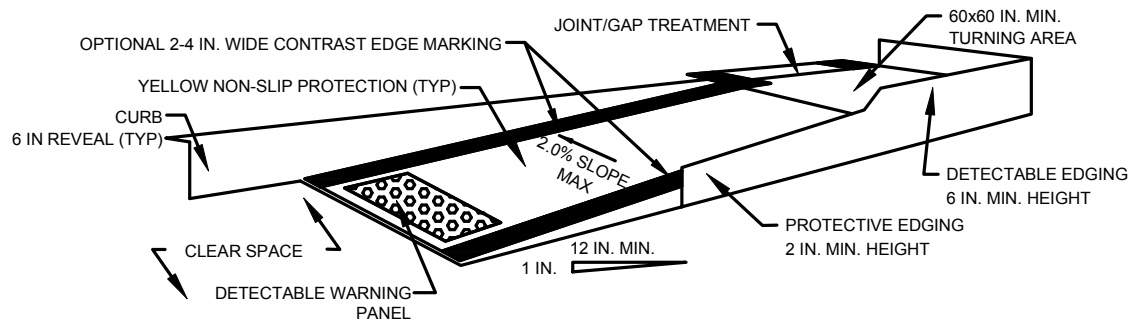


Proper Advance Warning Signs

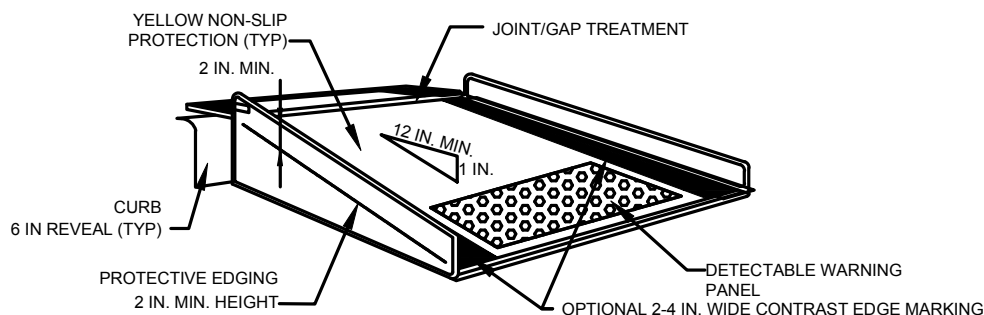
- Always use warning signs.
- Allow for reaction distance from signs.
- Remove signs if no longer necessary or not flagging.
- Use free hand in up-and-down motion to help slow traffic.



FIGURE 4
TYPICAL PEDESTRIAN DEVICES
(1 OF 2)
NOT TO SCALE



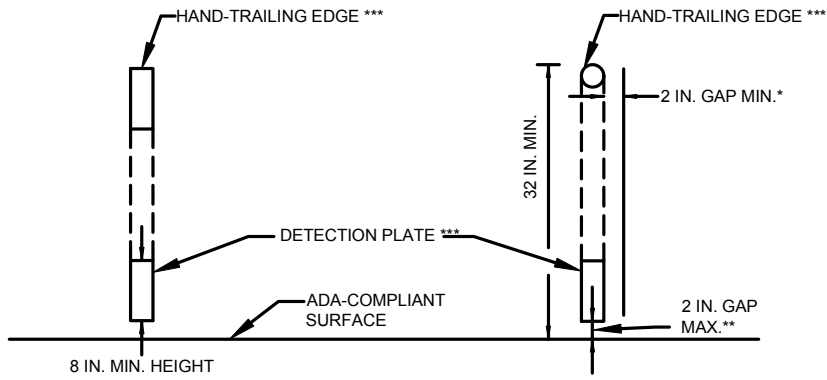
TEMPORARY CURB RAMP-PARALLEL TO CURB



TEMPORARY CURB RAMP-PERPENDICULAR TO CURB

NOTES:

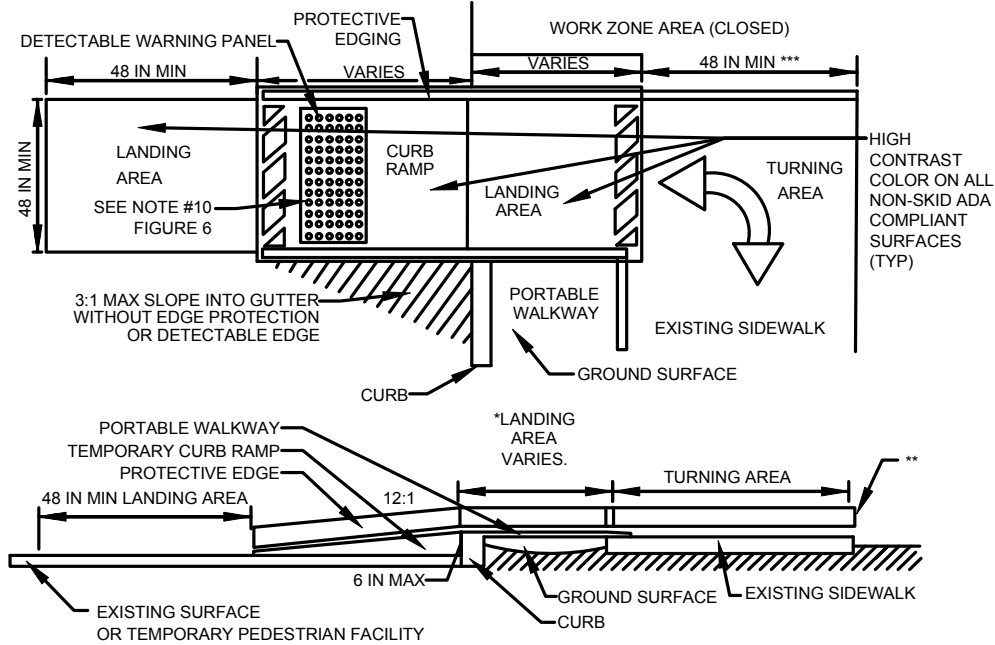
1. CURB RAMPS SHALL BE 60 IN. MINIMUM WIDTH WITH A FIRM, STABLE, AND NON-SLIP SURFACE.
2. PROTECTIVE EDGING WITH A 2 IN. MINIMUM HEIGHT SHALL BE INSTALLED WHEN THE CURB RAMP OR LANDING PLATFORM HAS A VERTICAL DROP OF 6 IN. OR GREATER OR HAS A SIDE APRON SLOPE STEEPER THAN 1:3 (33%). PROTECTIVE EDGING 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.

 <p>Massachusetts Department of Transportation Highway Division</p>	<p>Work Zone Safety Standard Details and Drawings</p>	<p>FIGURE 5 TYPICAL PEDESTRIAN DEVICES (2 OF 2) NOT TO SCALE</p>
<p>PAGE 17</p>		



PAGE 18

Work Zone Safety
Standard Details
and Drawings

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.

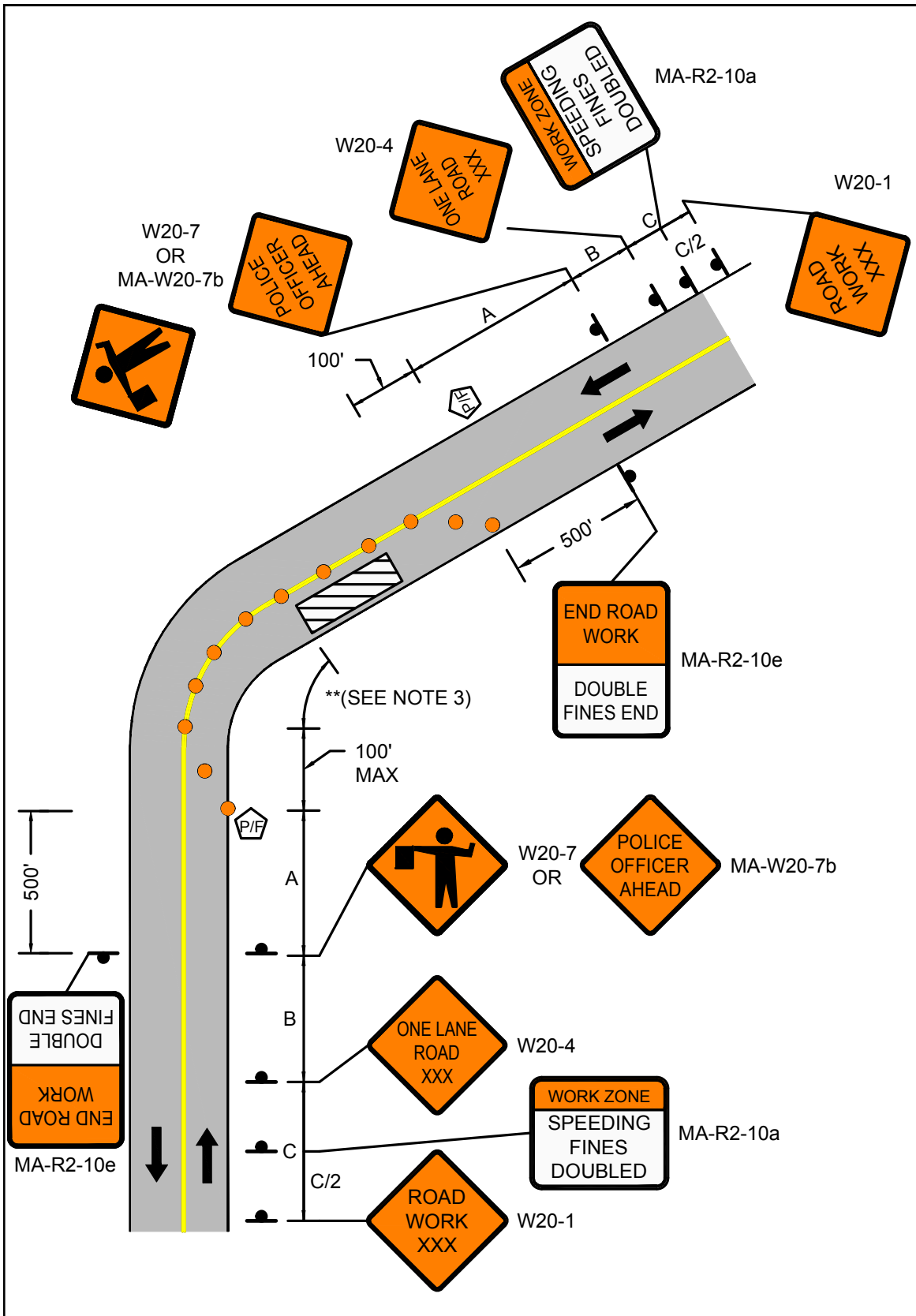
NOTES


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>Massachusetts Department of Transportation Highway Division</p> <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>
---	---	---



PAGE 20

Work Zone Safety
Standard Details
and Drawings

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

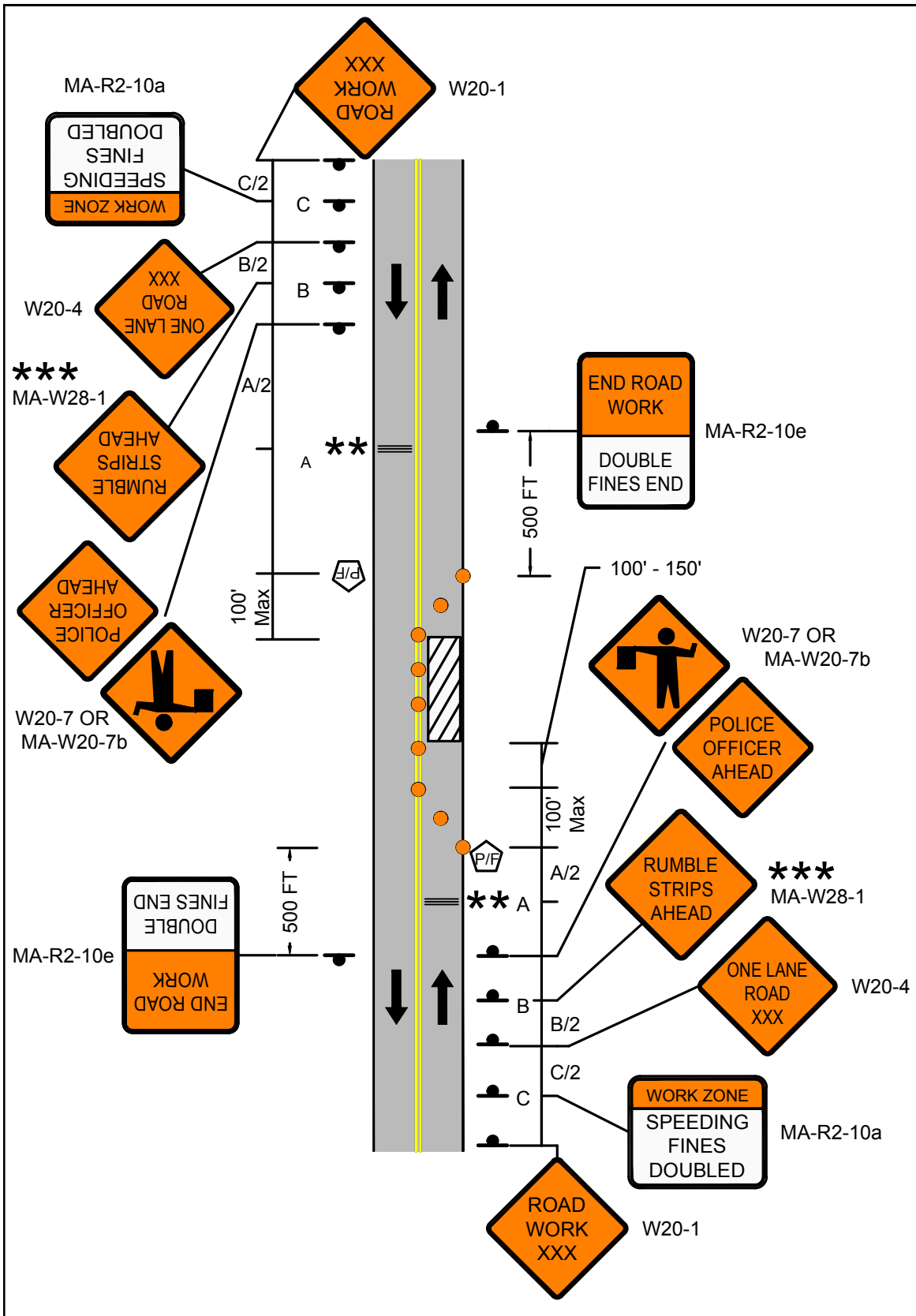
NOTES


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>Massachusetts Department of Transportation Highway Division</p> <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>
---	---	---



PAGE 22

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.

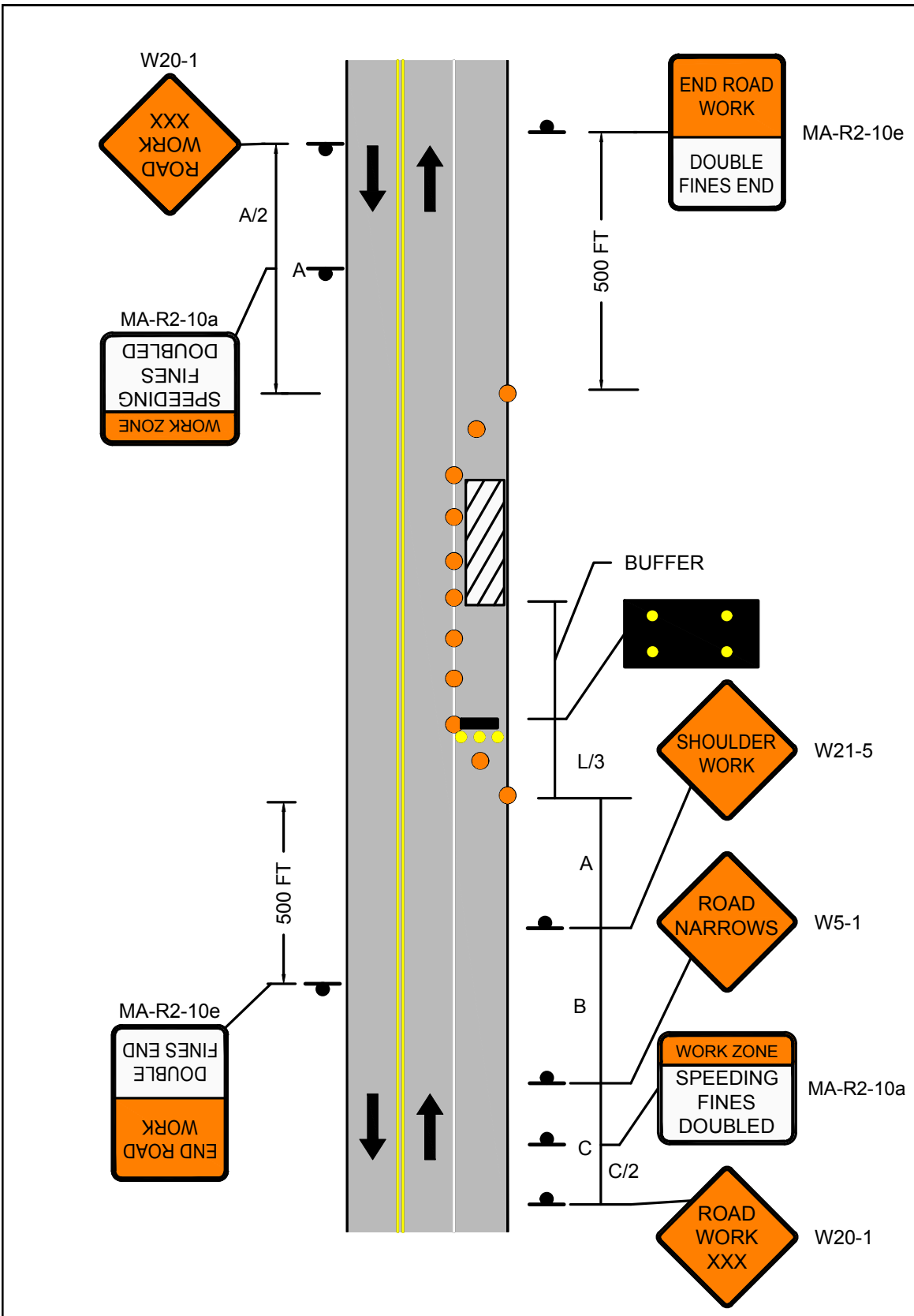
NOTES


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>Massachusetts Department of Transportation Highway Division</p> <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>
---	---	--



PAGE 24

Work Zone Safety
Standard Details
and Drawings

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

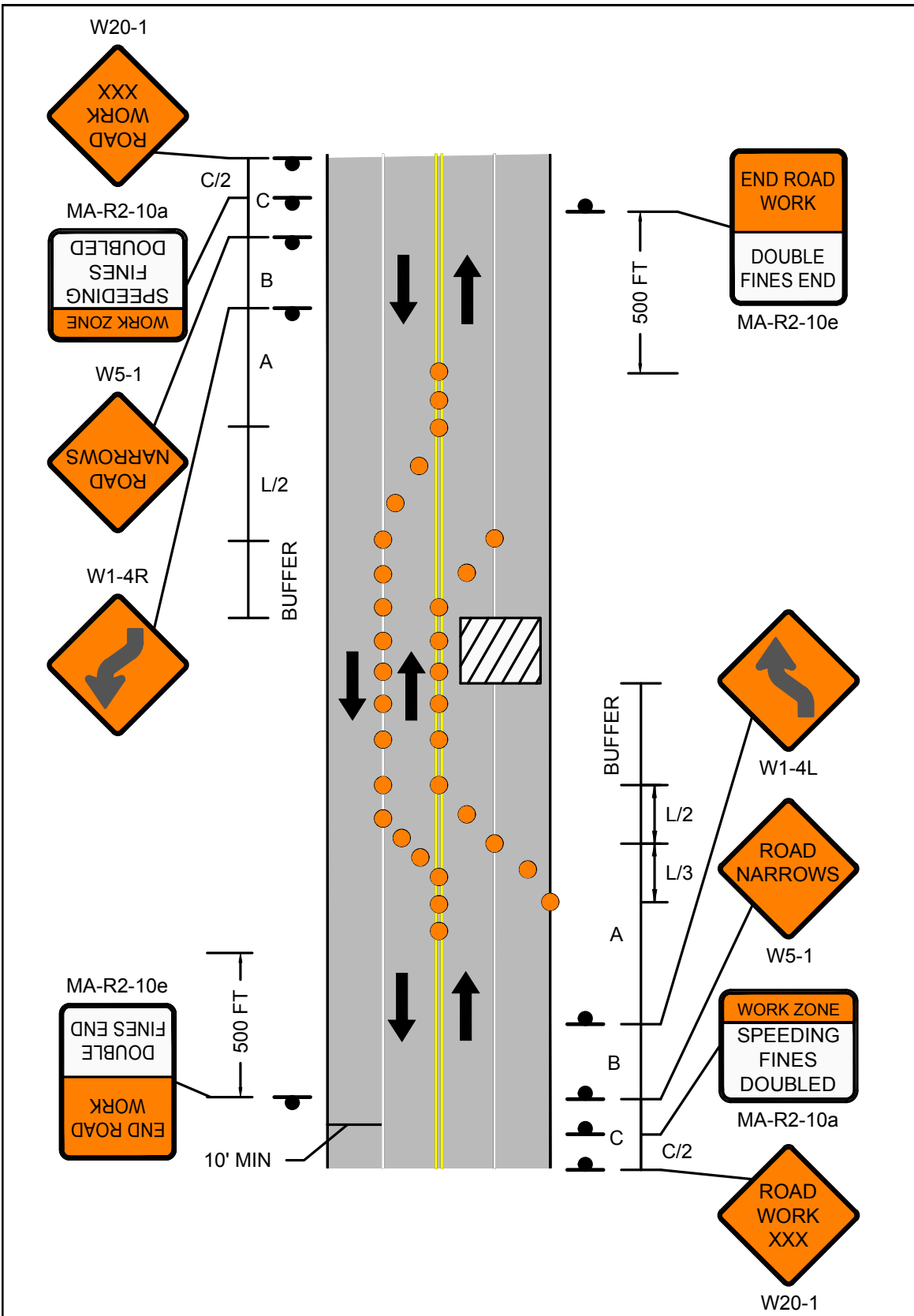


FIGURE 9
 STATIONARY OPERATIONS
 TWO LANE UNDIVIDED ROADWAY
 WITH TRAVERSABLE SHOULDER
 HALF OF ROADWAY CLOSED
 MAINTAIN TWO-WAY TRAFFIC





PAGE 26

Work Zone Safety
Standard Details
and Drawings

STATIONARY OPERATIONS
FOUR LANE UNDIVIDED ROADWAY
RIGHT LANE CLOSED

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

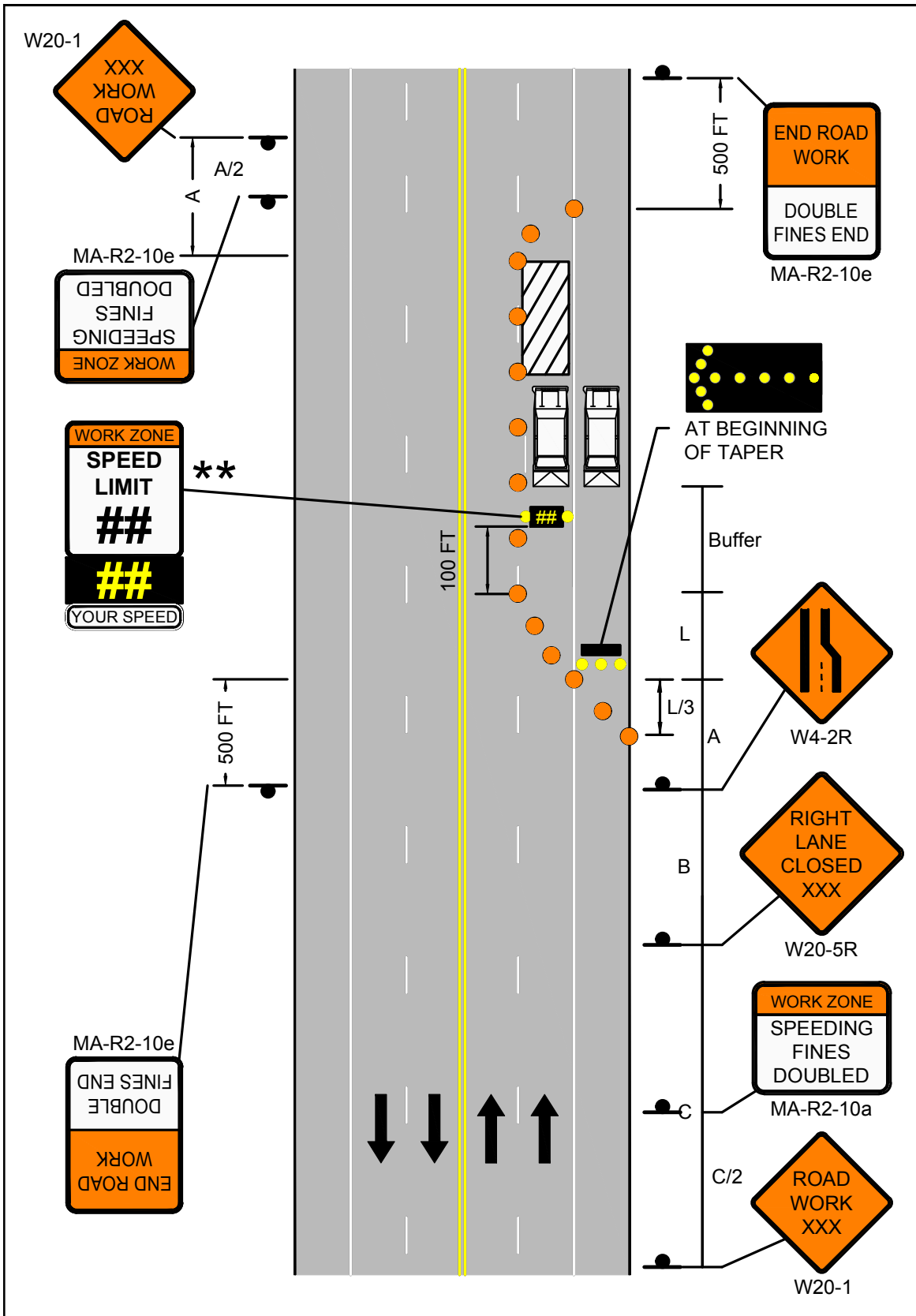
NOTES


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>
--	---	--



PAGE 28

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.

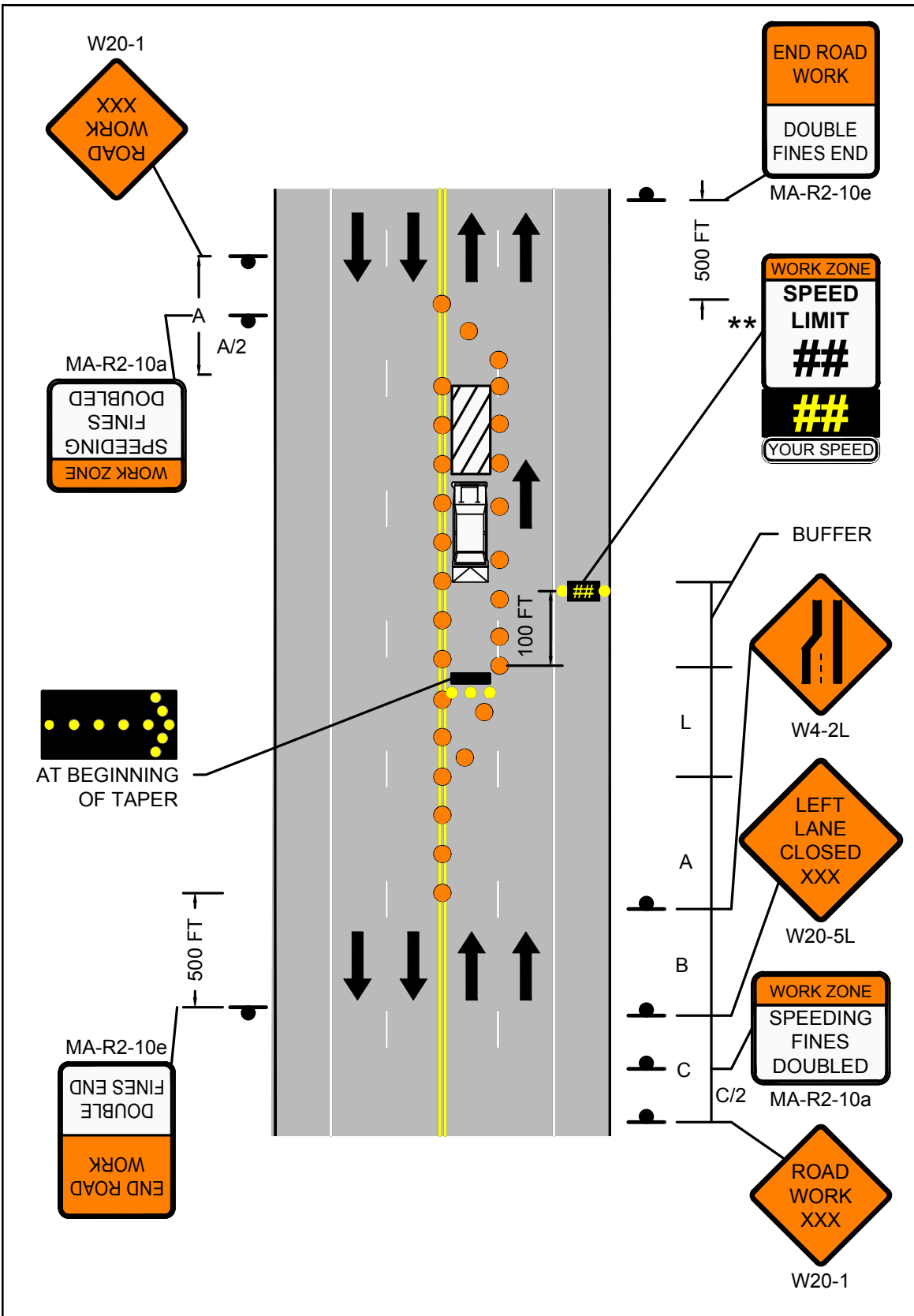
NOTES


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>
--	---	---



PAGE 30

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

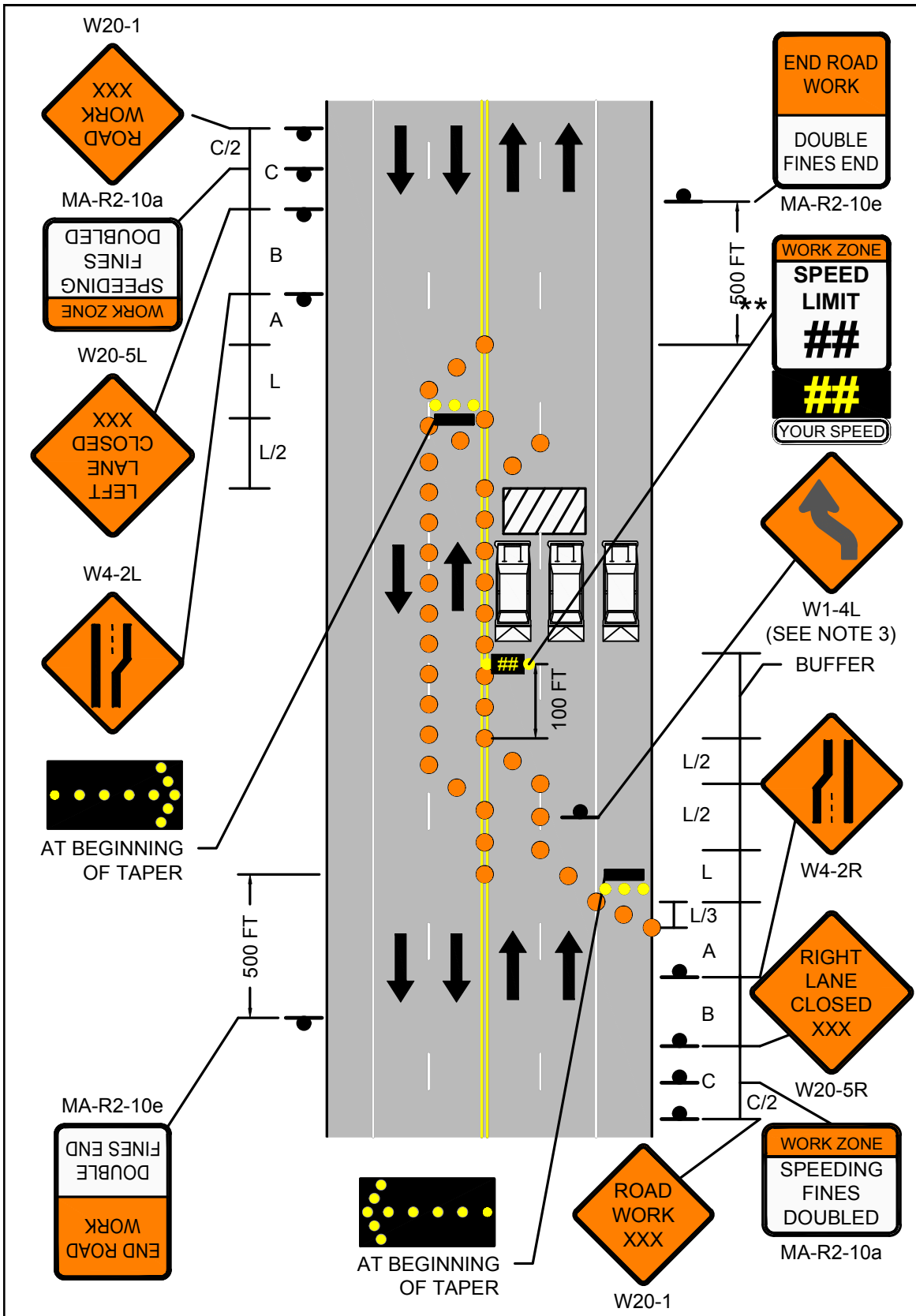


FIGURE 12
STATIONARY OPERATIONS
FOUR LANE UNDIVIDED ROADWAY
HALF OF ROADWAY CLOSED





PAGE 32

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

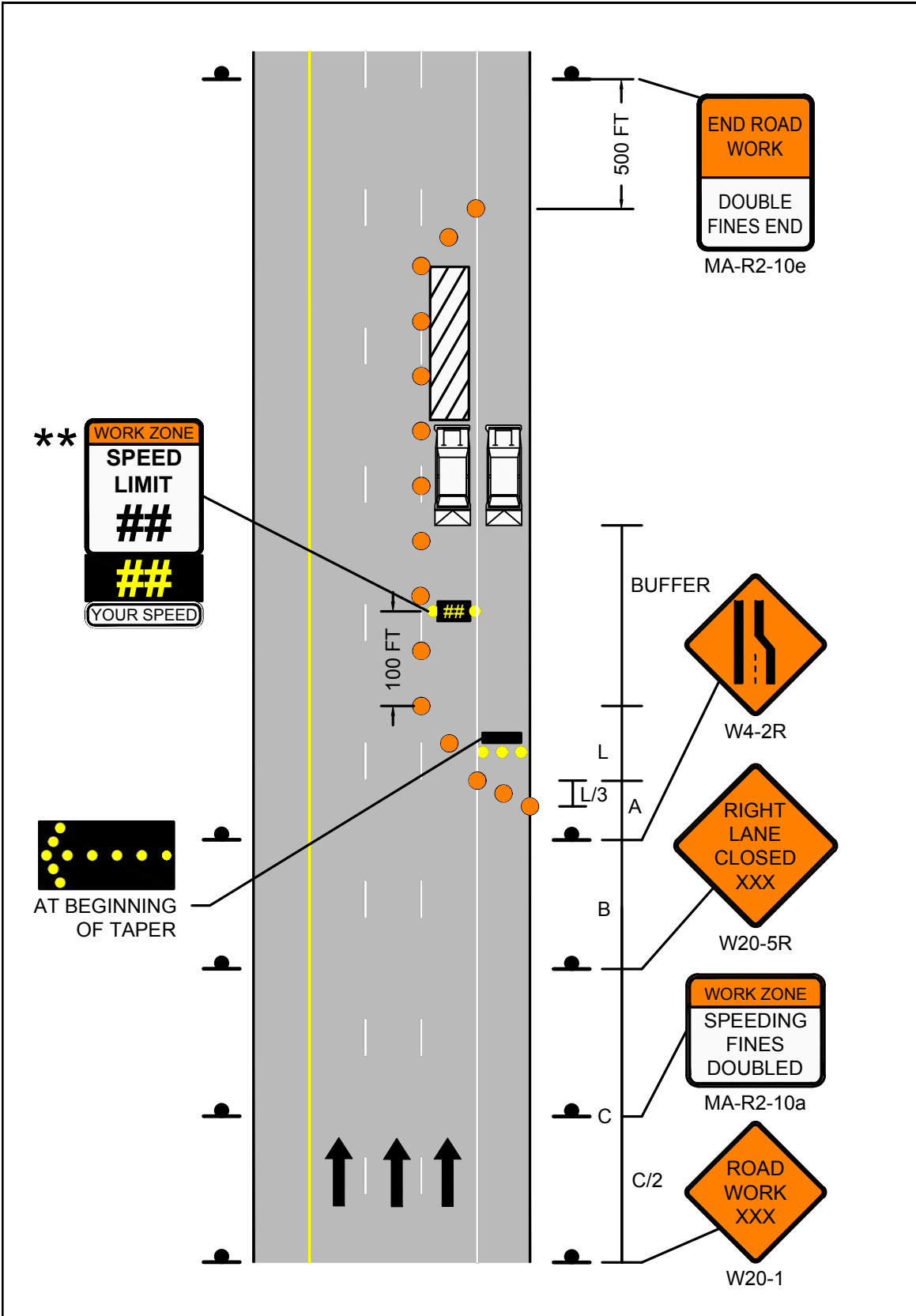
NOTES

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





PAGE 34

Work Zone Safety
Standard Details
and Drawings

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

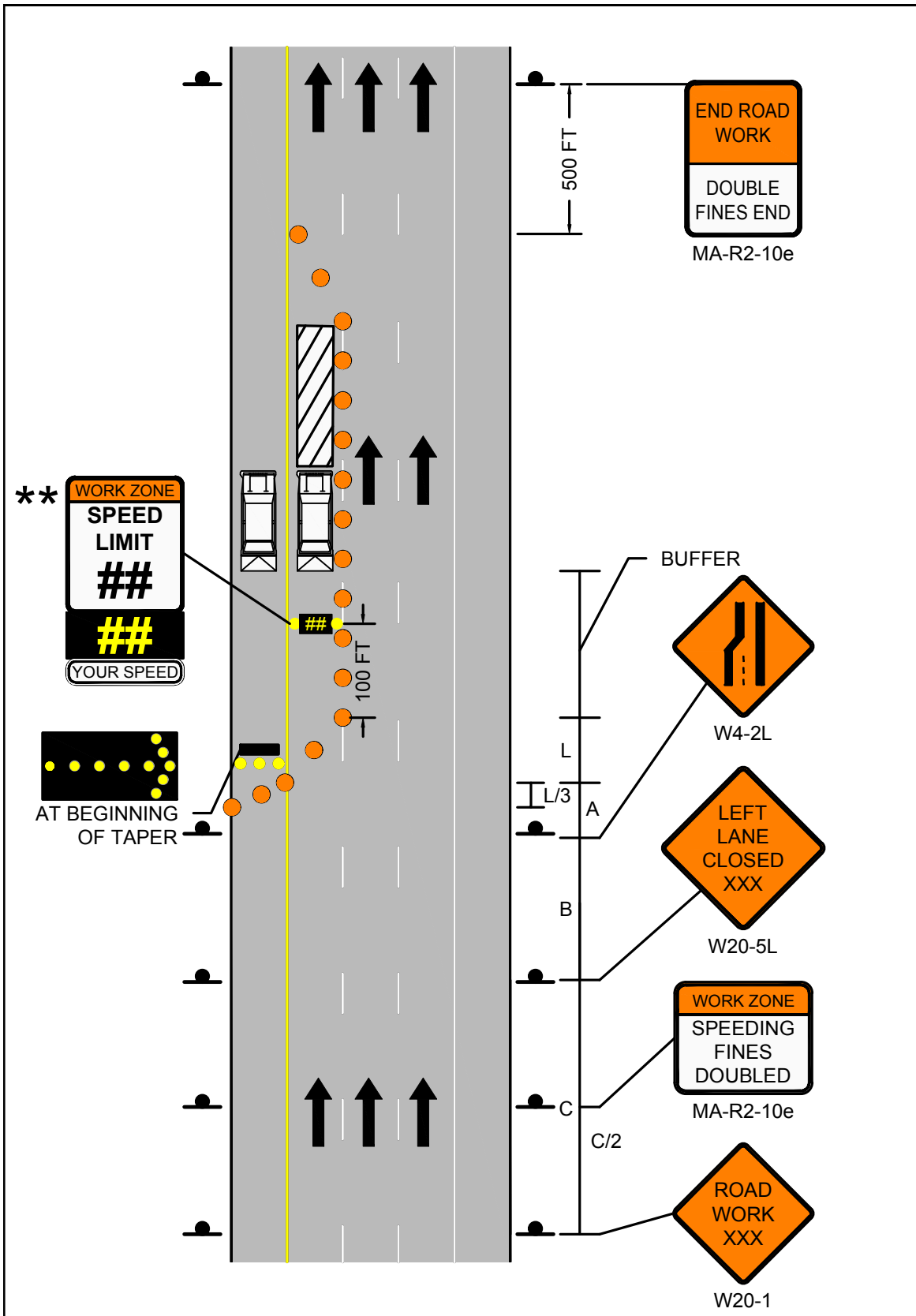
NOTES


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>	Work Zone Safety Standard Details and Drawings	STATIONARY OPERATIONS MULTILANE DIVIDED ROADWAY CENTER LANE OR RIGHT/CENTER LANES CLOSED
---	--	---

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

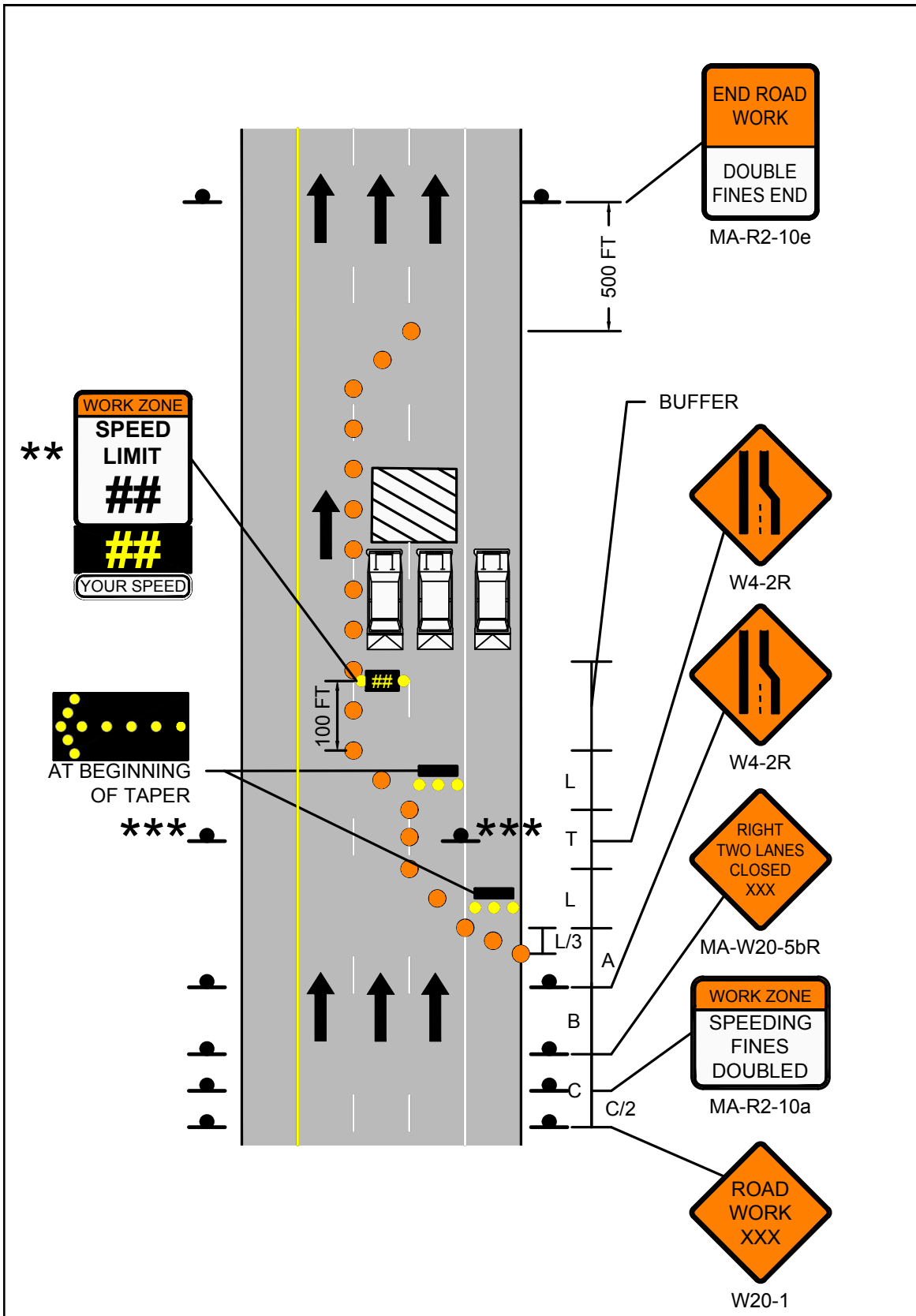



FIGURE 15
STATIONARY OPERATIONS
MULTILANE DIVIDED ROADWAY
CENTER LANE OR RIGHT/CENTER
LANES CLOSED

 PAGE 38	Work Zone Safety Standard Details and Drawings	STATIONARY OPERATIONS MULTILANE DIVIDED ROADWAY CENTER LANE OR LEFT/CENTER LANES CLOSED
--	--	--

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

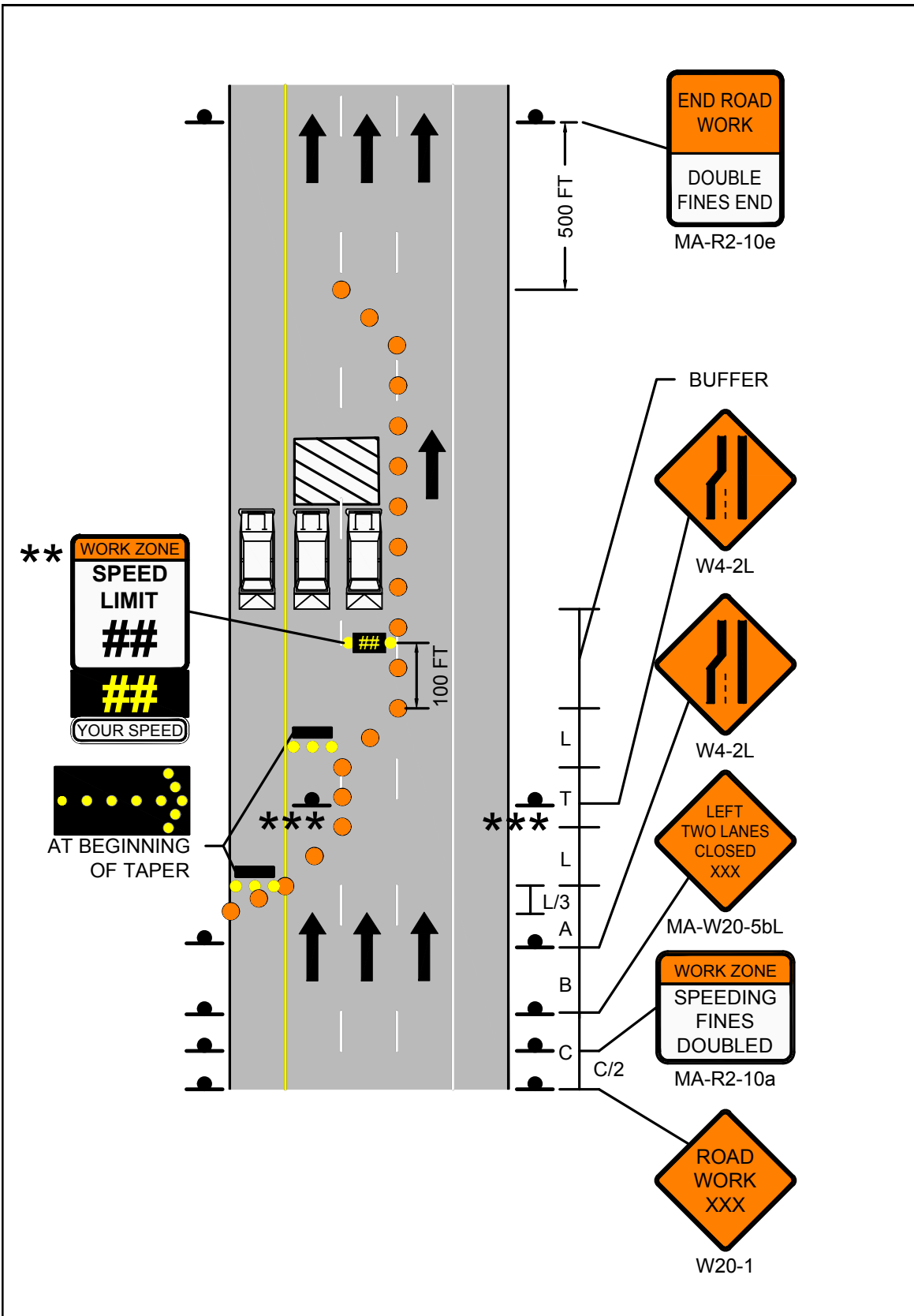
NOTES


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>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>
--	---	--



PAGE 40

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.

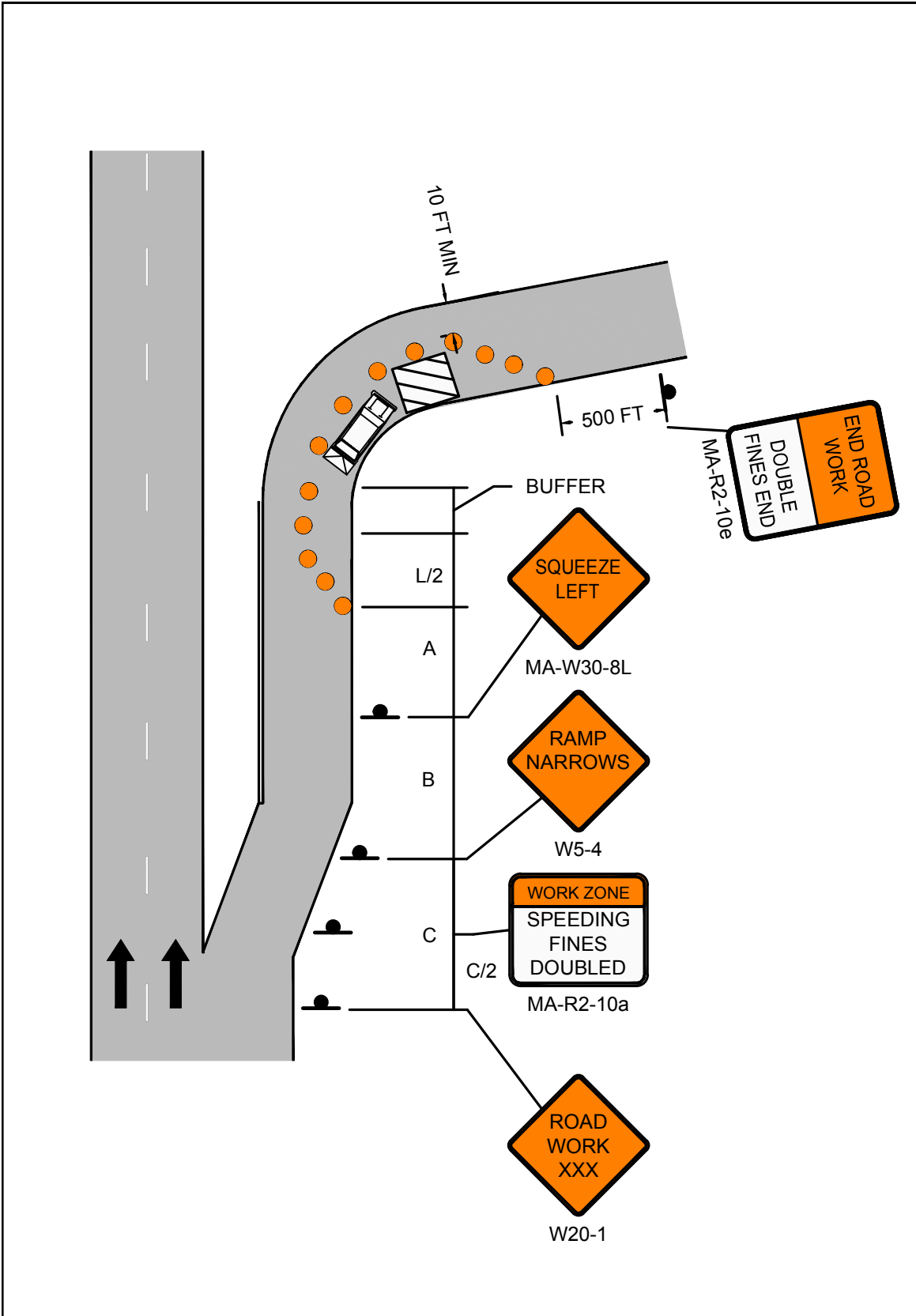
NOTES


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>Massachusetts Department of Transportation Highway Division</p> <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>
---	---	--



PAGE 42

Work Zone Safety
Standard Details
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.

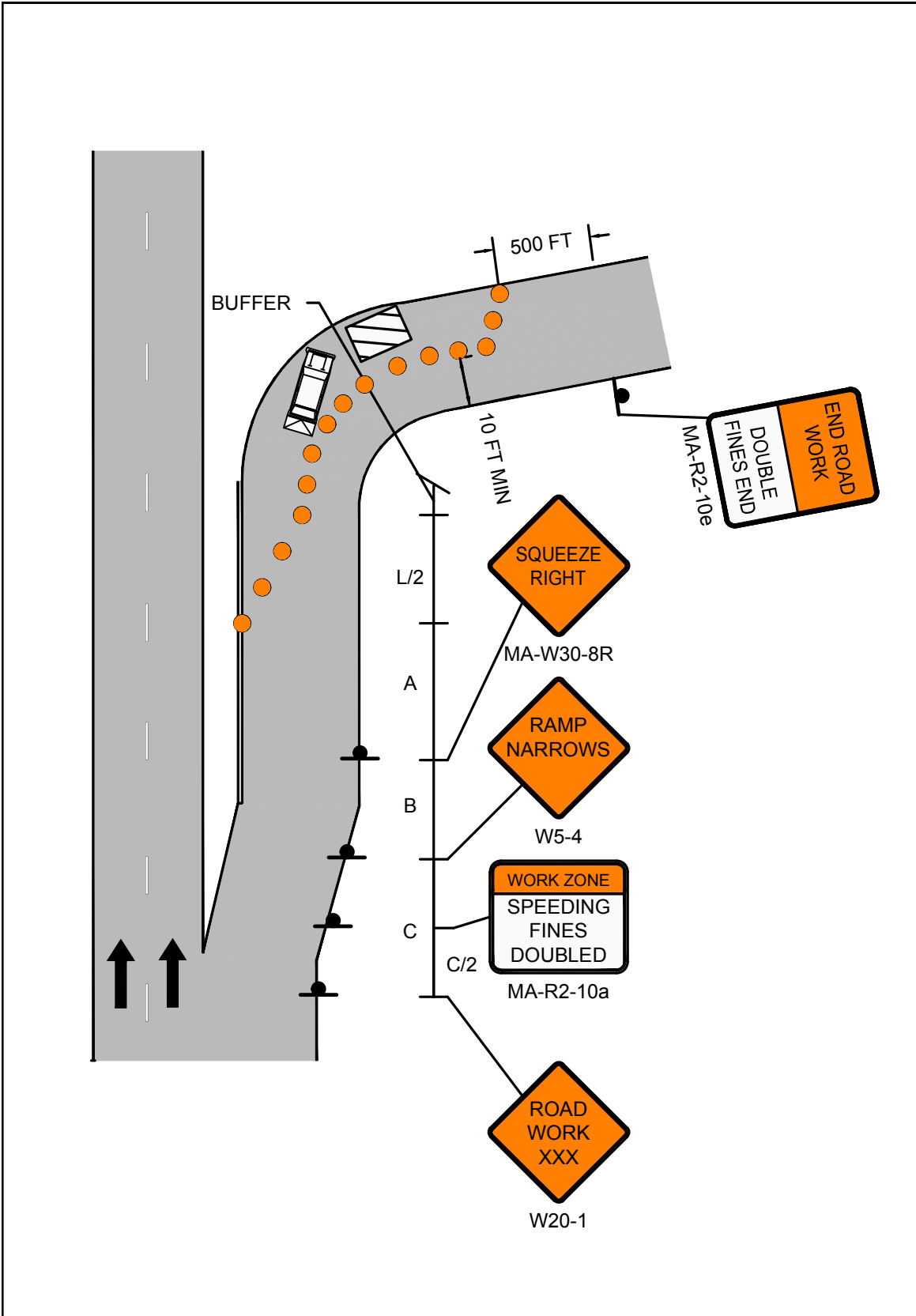
NOTES

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>
--	---	---



PAGE 44

Work Zone Safety
Standard Details
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

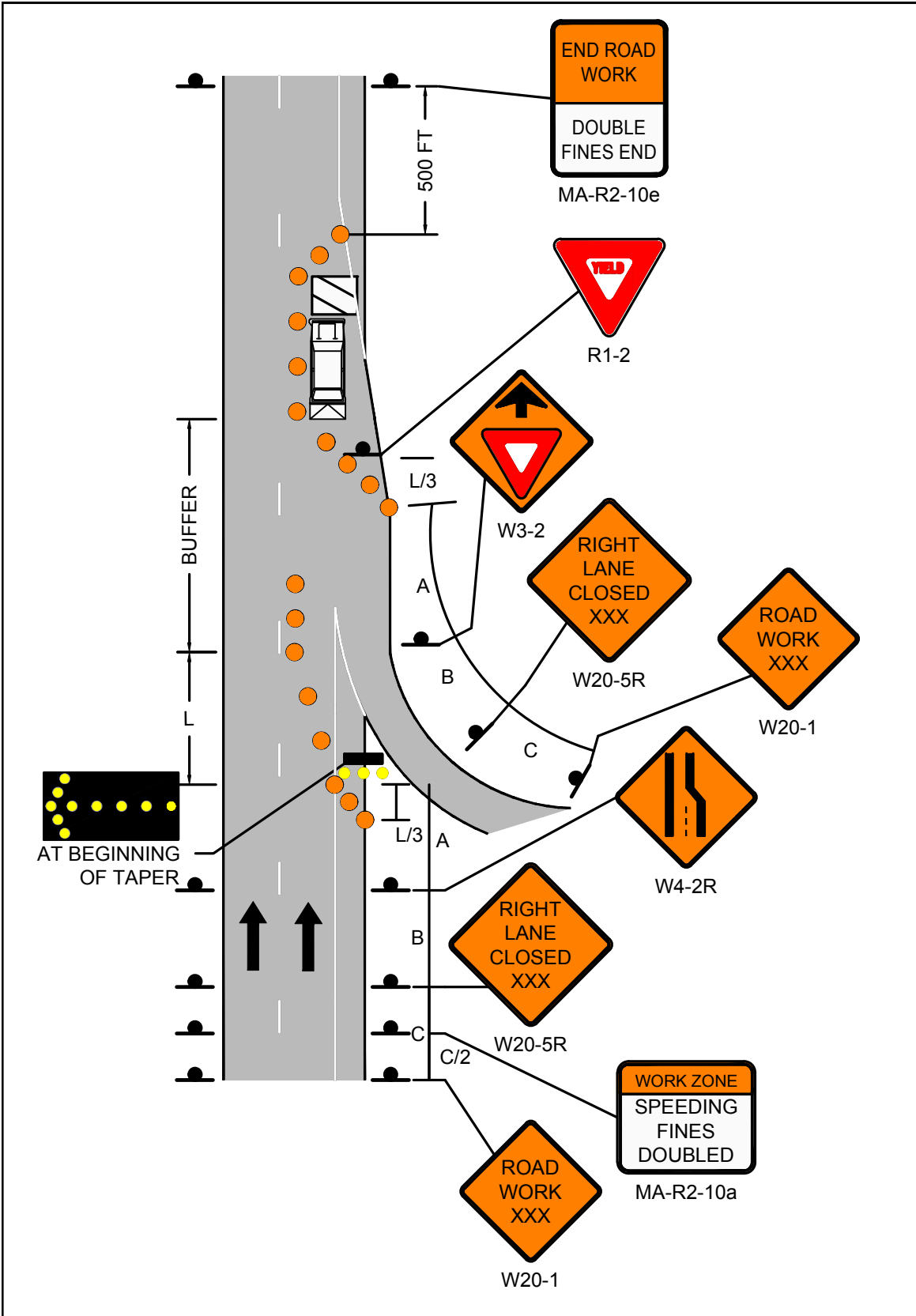
NOTES


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>
--	---	--



PAGE 46

Work Zone Safety
Standard Details
and Drawings

STATIONARY OPERATIONS
MULTILANE DIVIDED ROADWAY
ROADWORK BEYOND OFF RAMP

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

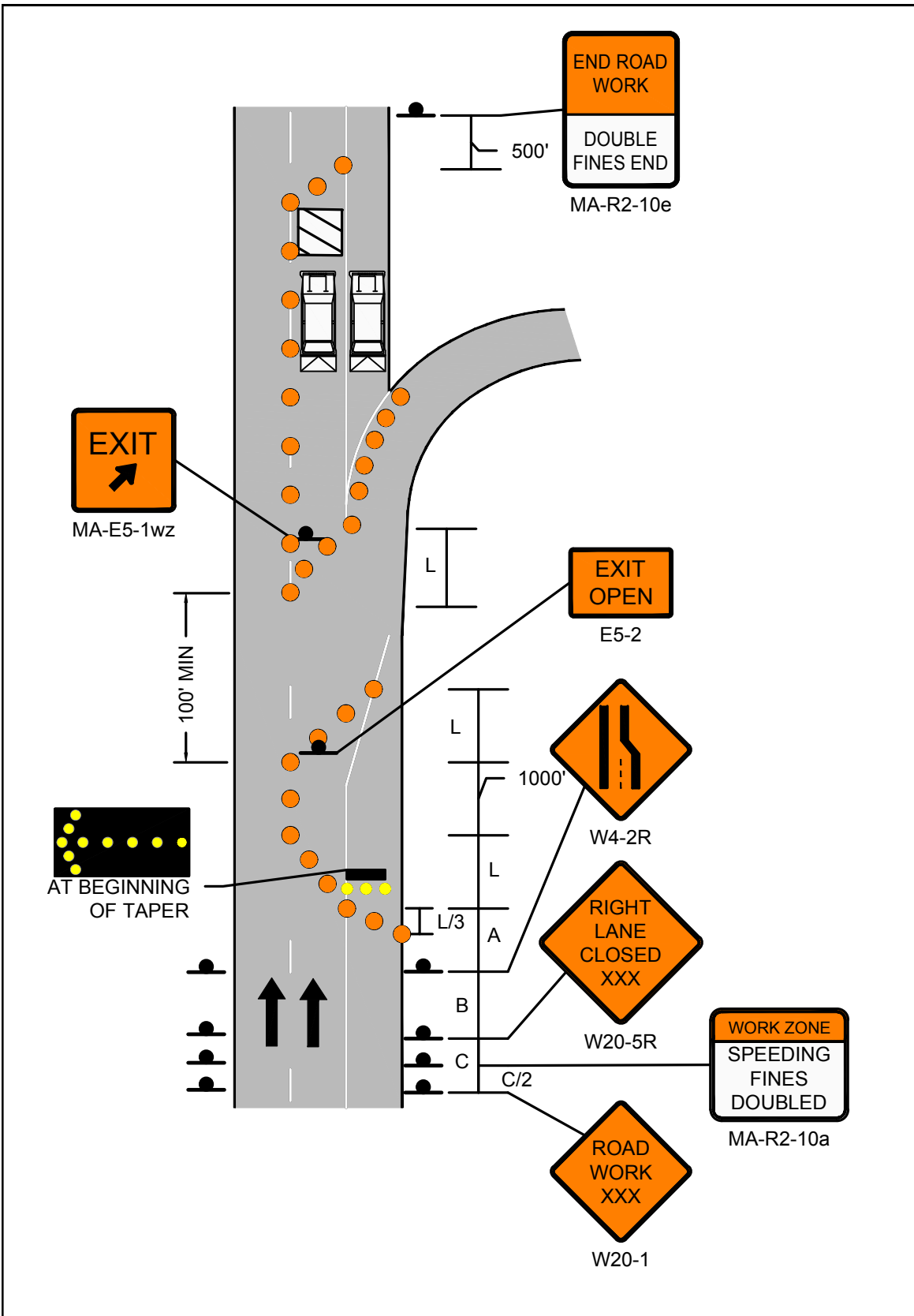
NOTES

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





PAGE 48

Work Zone Safety
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

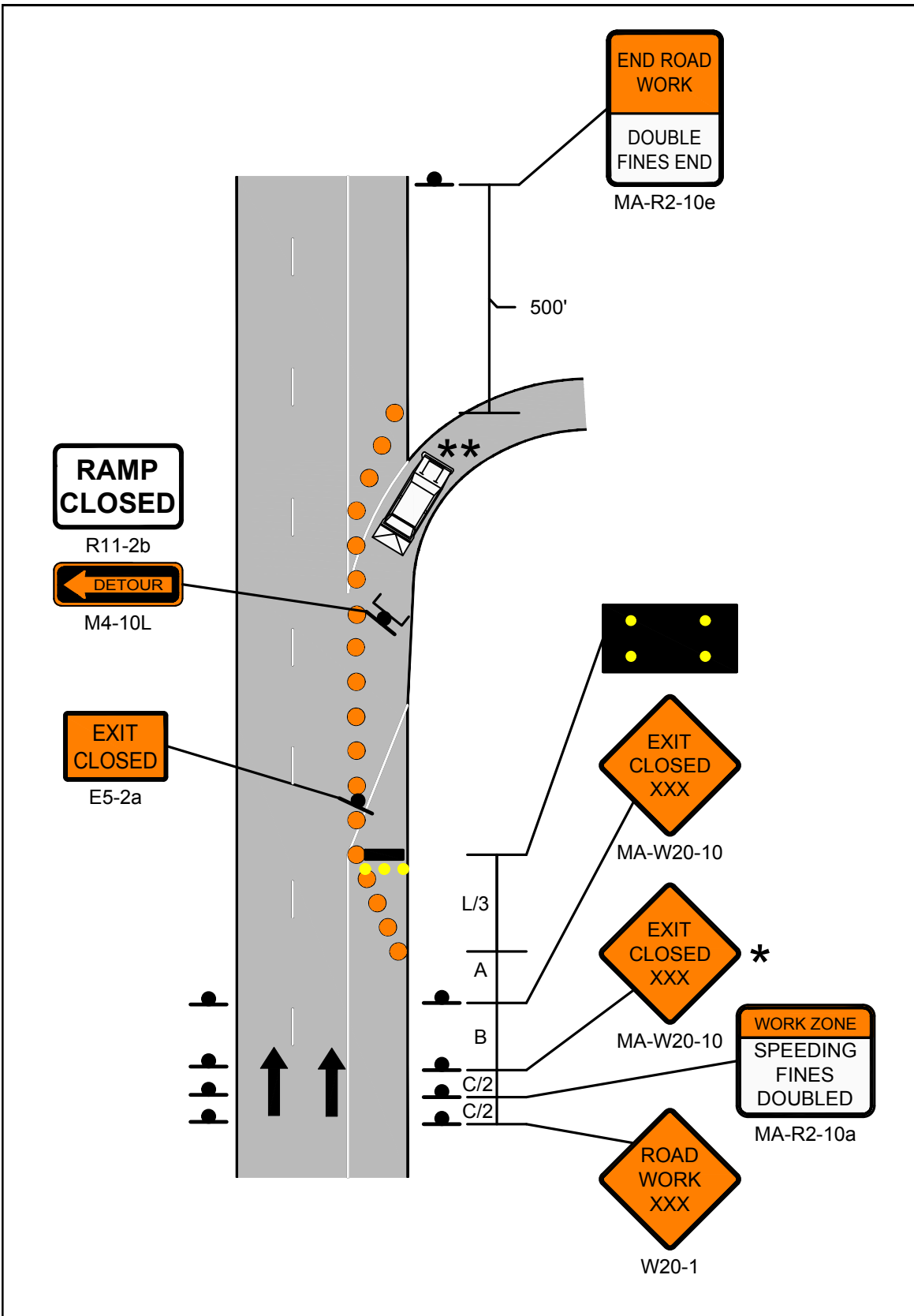
NOTES

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





PAGE 50

Work Zone Safety
Standard Details
and Drawings










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

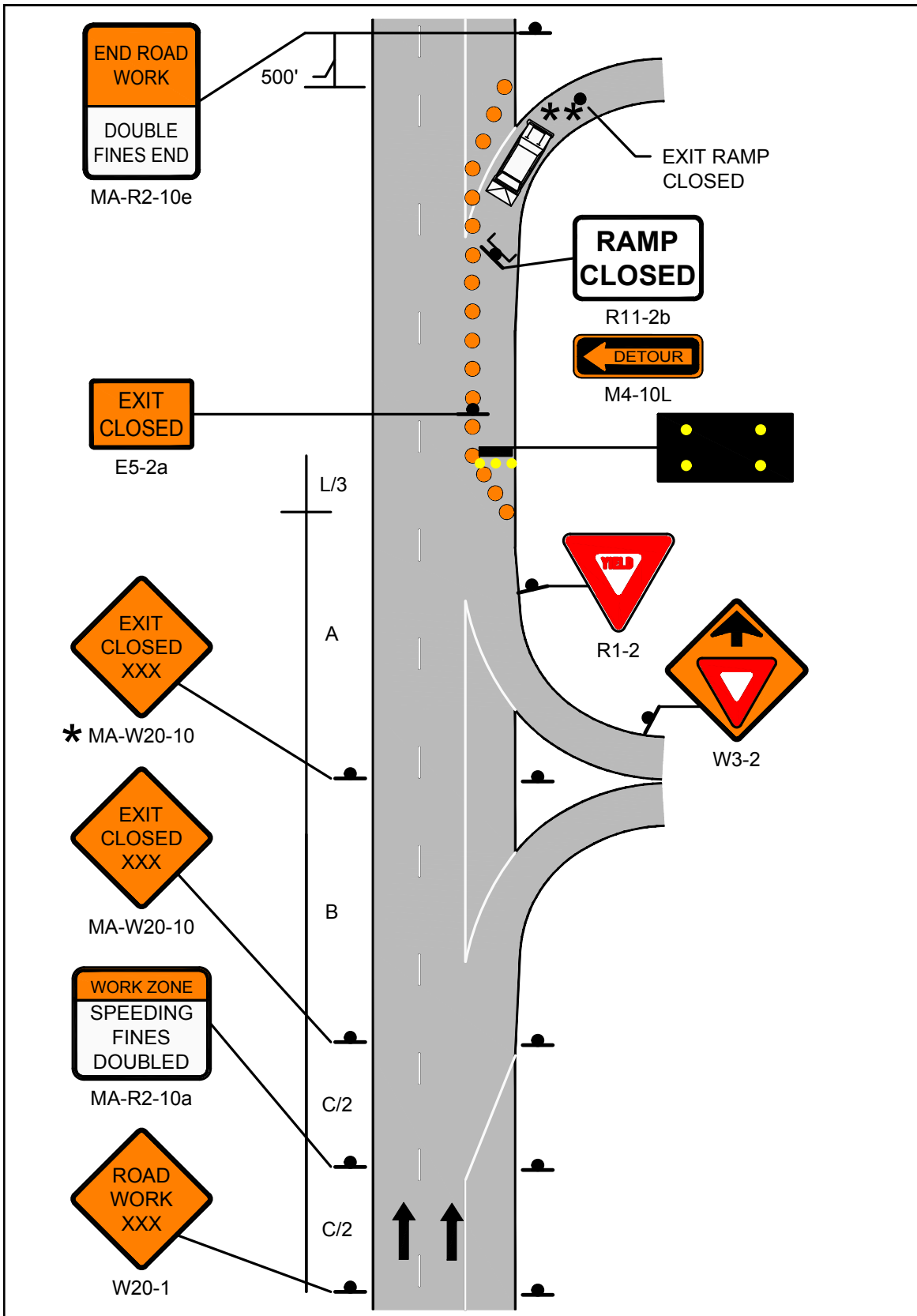
NOTES


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>
--	---	--

 <p>PAGE 52</p>	<p>Work Zone Safety Standard Details and Drawings</p>	<p>MULTILANE DIVIDED ROADWAY TYPICAL RAMP CLOSURE ADVANCE SIGNING</p>
--	---	---

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

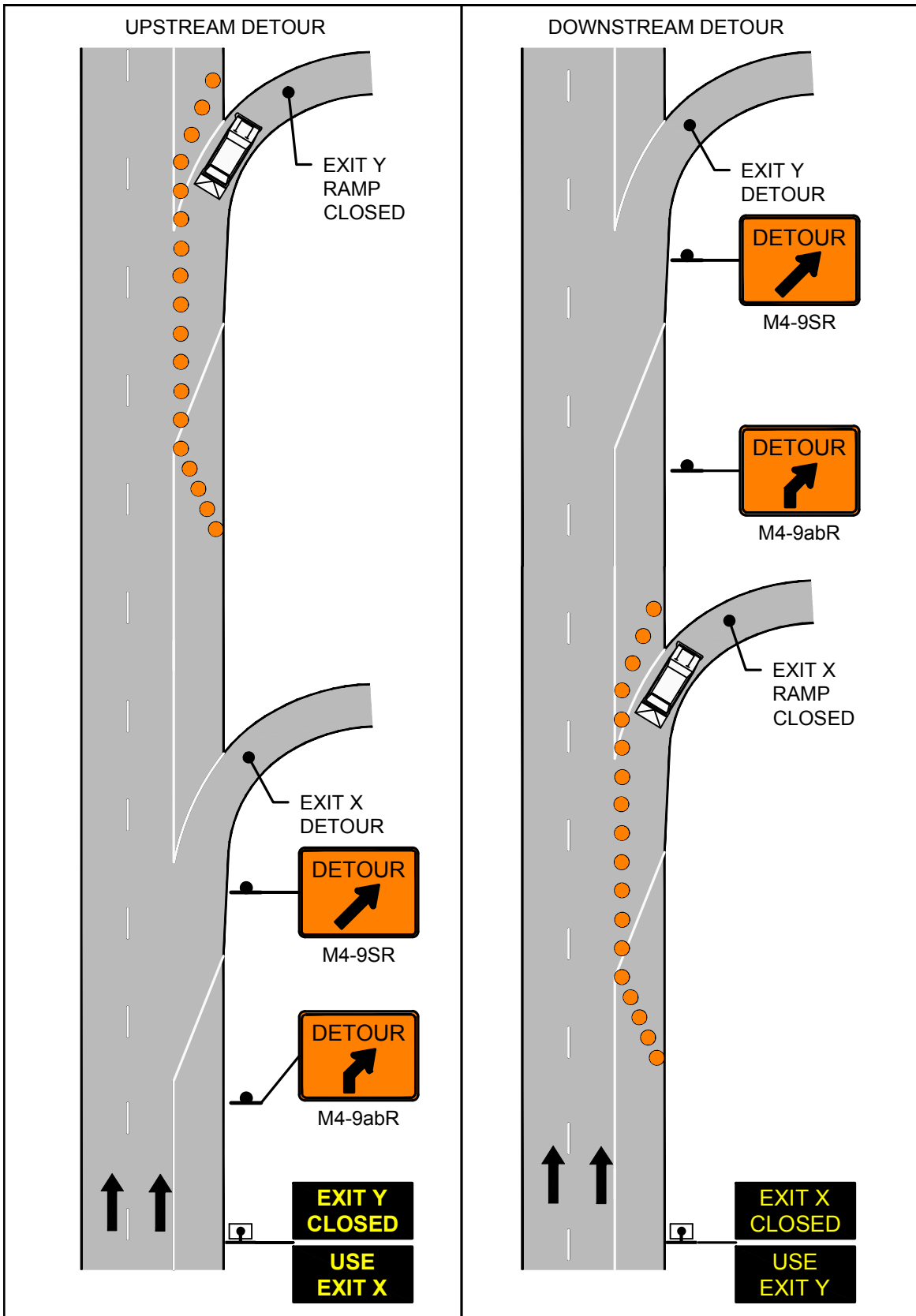


FIGURE 23
MULTILANE DIVIDED ROADWAY
TYPICAL RAMP CLOSURE
ADVANCE SIGNING



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

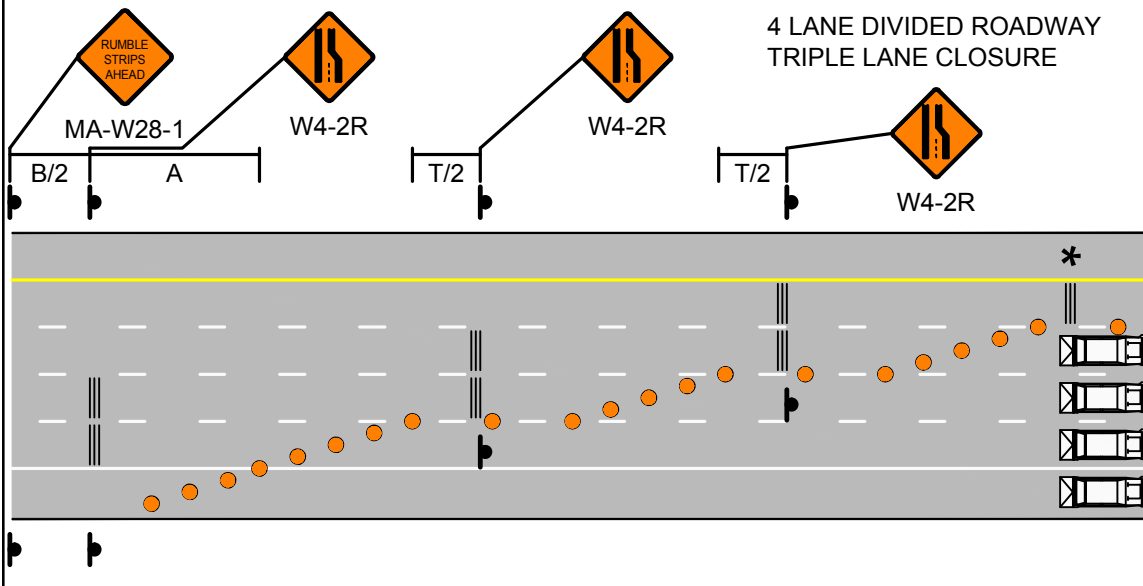
NOTES

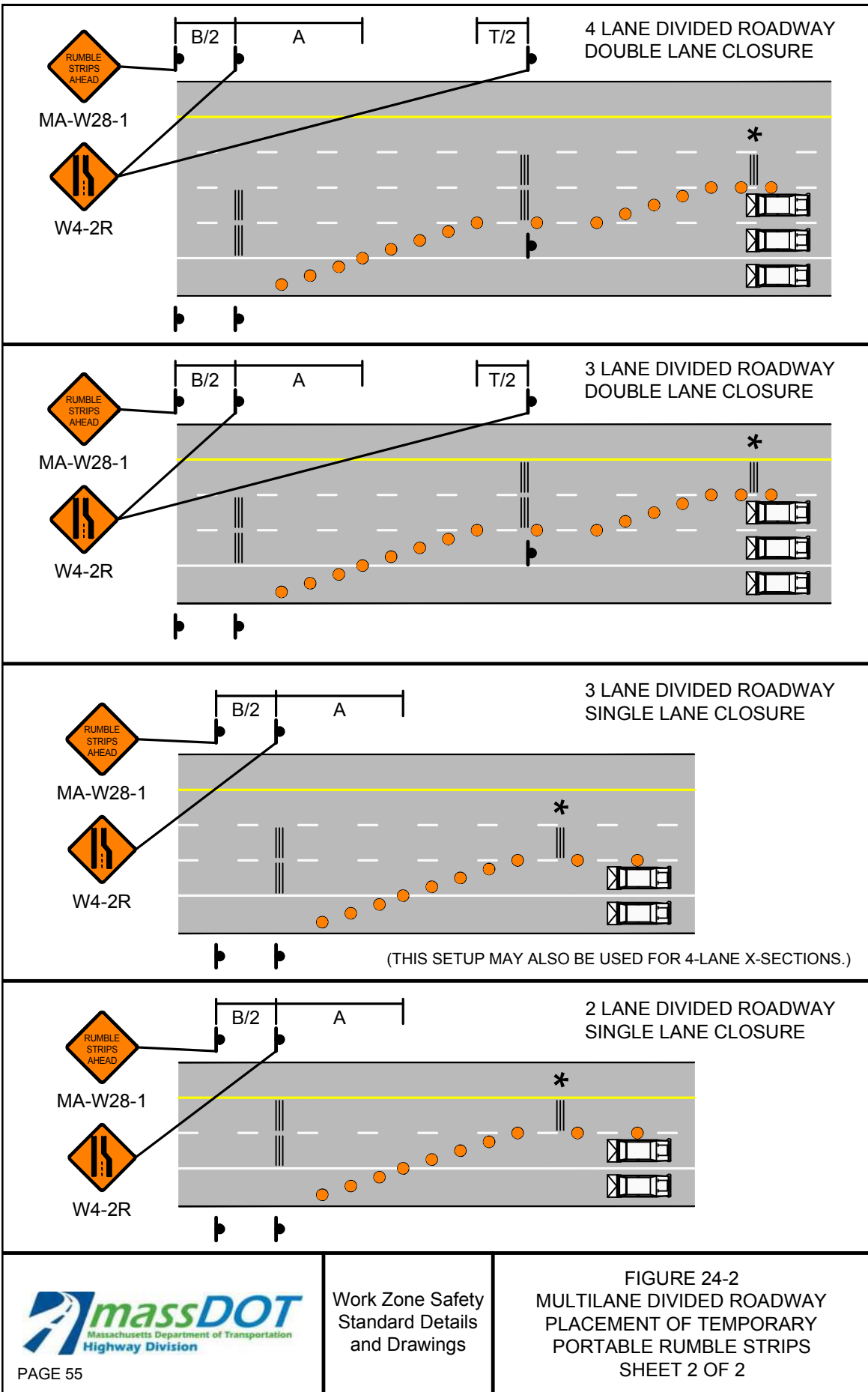
1. THE INTENTION OF THESE DETAILS IS ONLY TO DEPICT THE PLACEMENT OF TEMPORARY PORTABLE RUMBLE STRIPS (TPRS) IN RELATIONSHIP TO THE TAPER AND THE BUFFER OF A SINGLE- OR MULTI-LANE CLOSURE. THE DEPICTION OF THE NUMBER AND SPACING OF ALL OTHER TRAFFIC CONTROL DEVICES IS NOT TO SCALE. REFER TO OTHER DETAILS 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

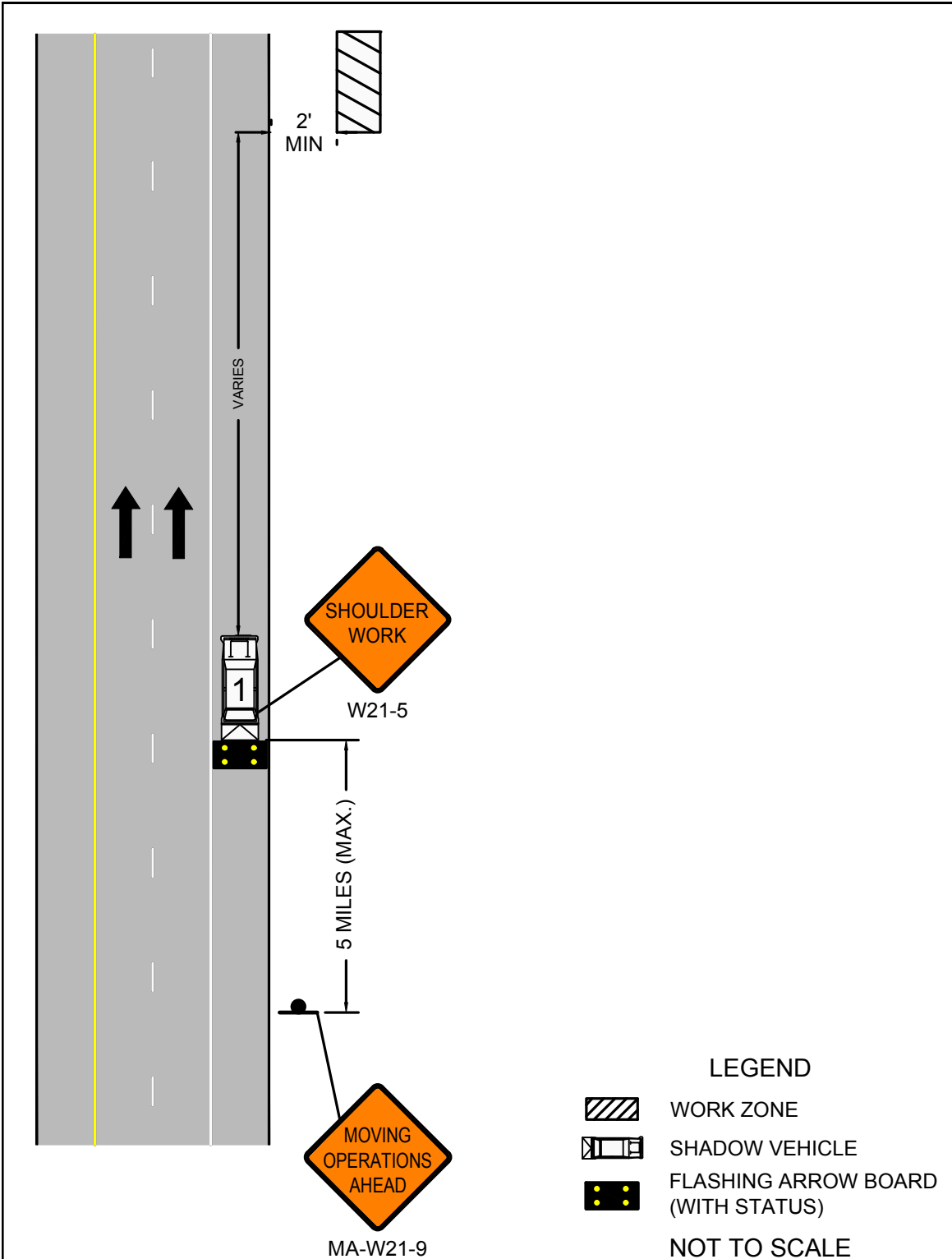







 <p>PAGE 56</p>	<p>Work Zone Safety Standard Details and Drawings</p>	<p>NOTES FOR MOBILE OPERATIONS</p>
--	---	------------------------------------

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.



LEGEND

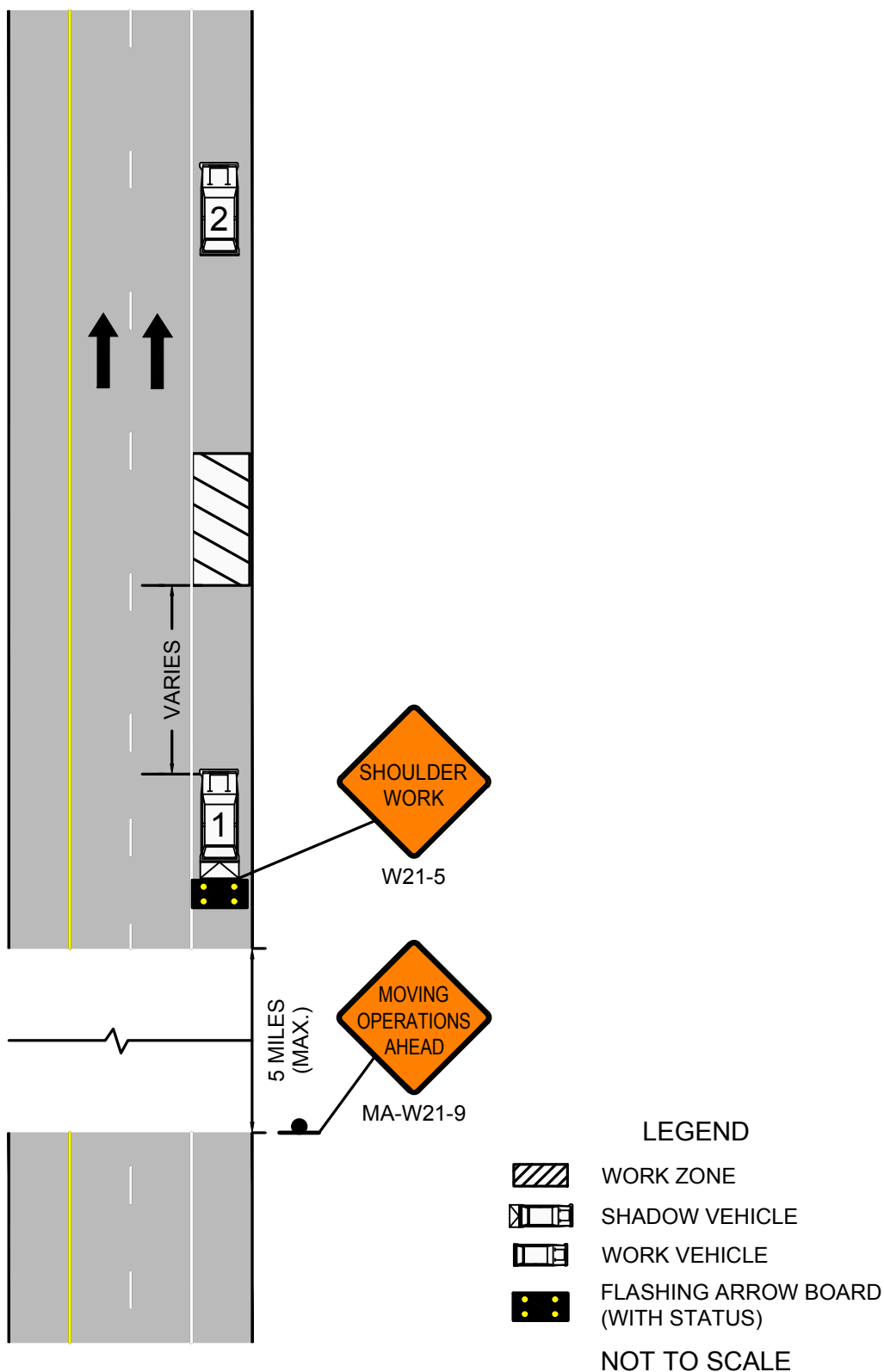
-  WORK ZONE
-  SHADOW VEHICLE
-  FLASHING ARROW BOARD (WITH STATUS)

NOT TO SCALE

NOTES

1. IF THE WORK AREA IS SUFFICIENTLY AWAY FROM THE EDGE OF ROADWAY (20' MINIMUM) THEN SIGNS AND VEHICLES MAY NOT BE REQUIRED.





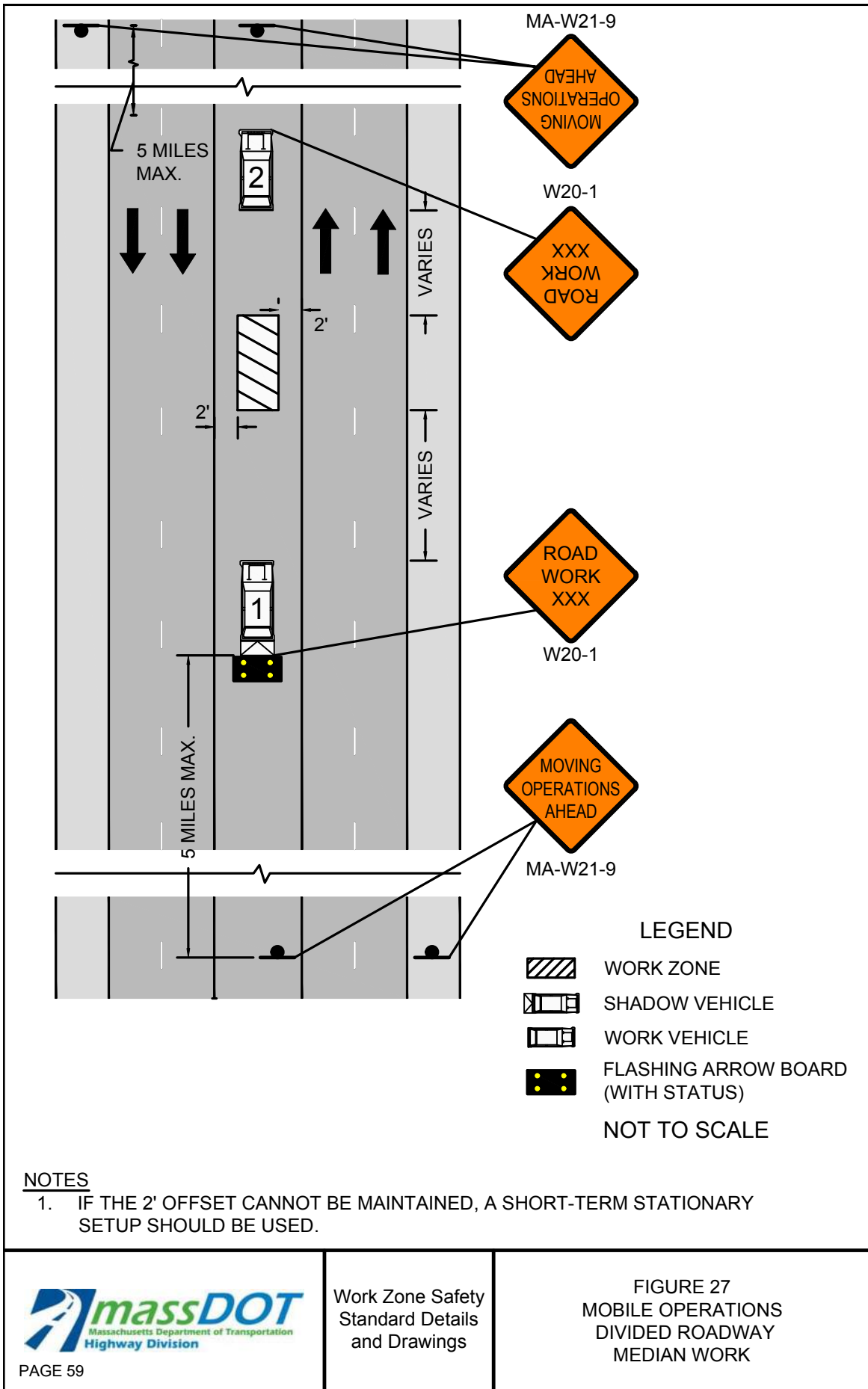
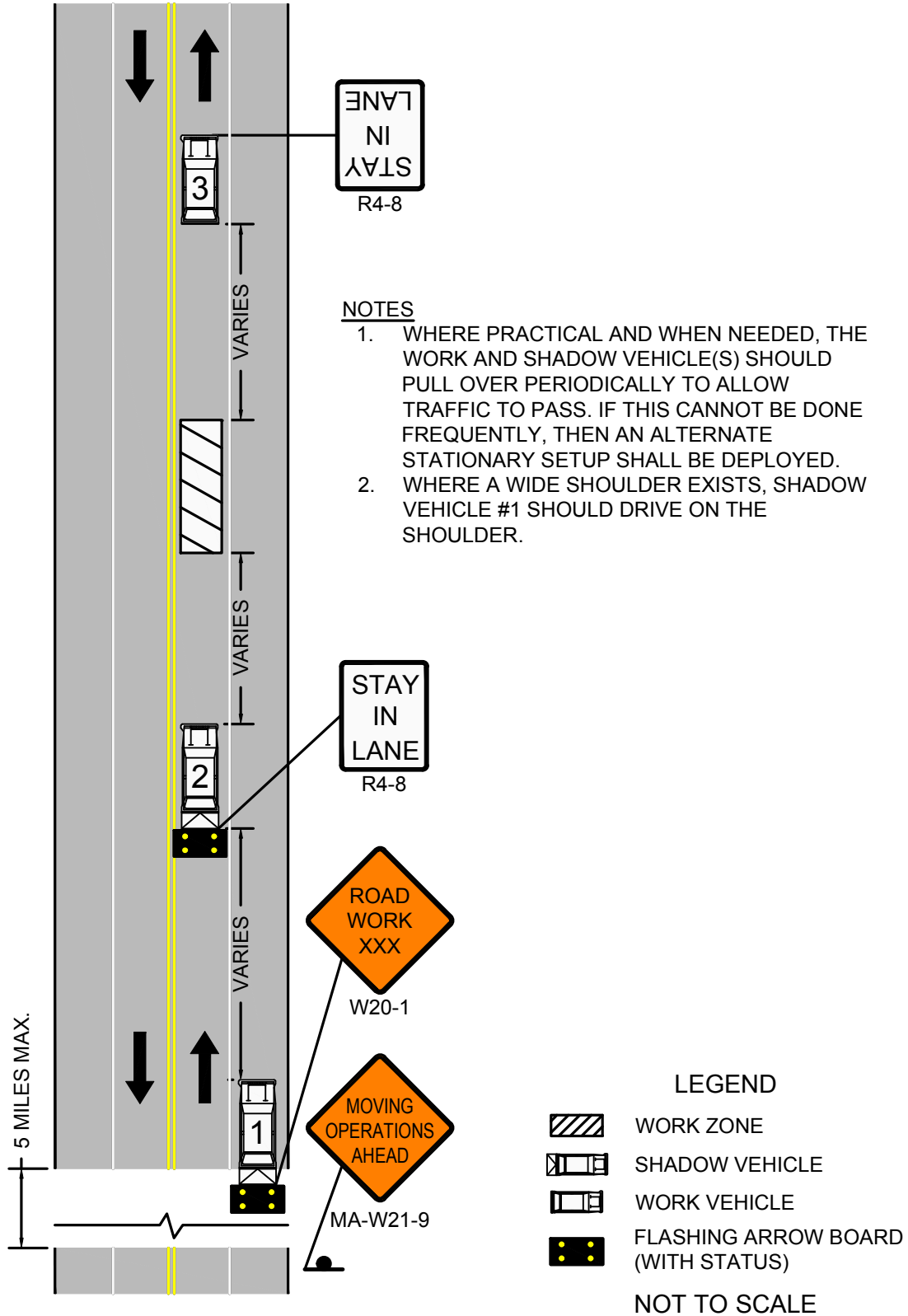




FIGURE 28
MOBILE OPERATIONS
UNDIVIDED TWO LANE ROADWAY
HALF OF ROADWAY CLOSED



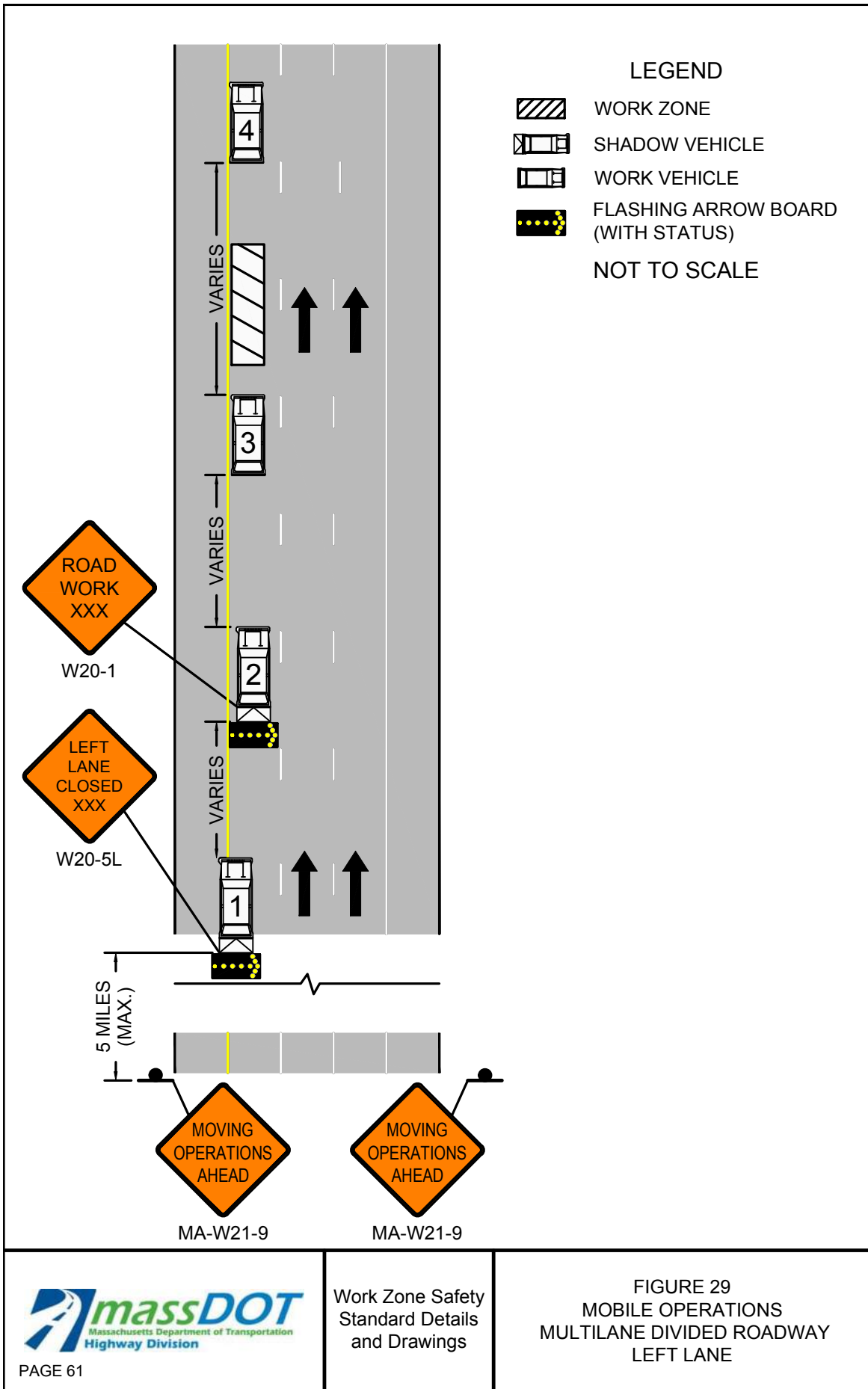
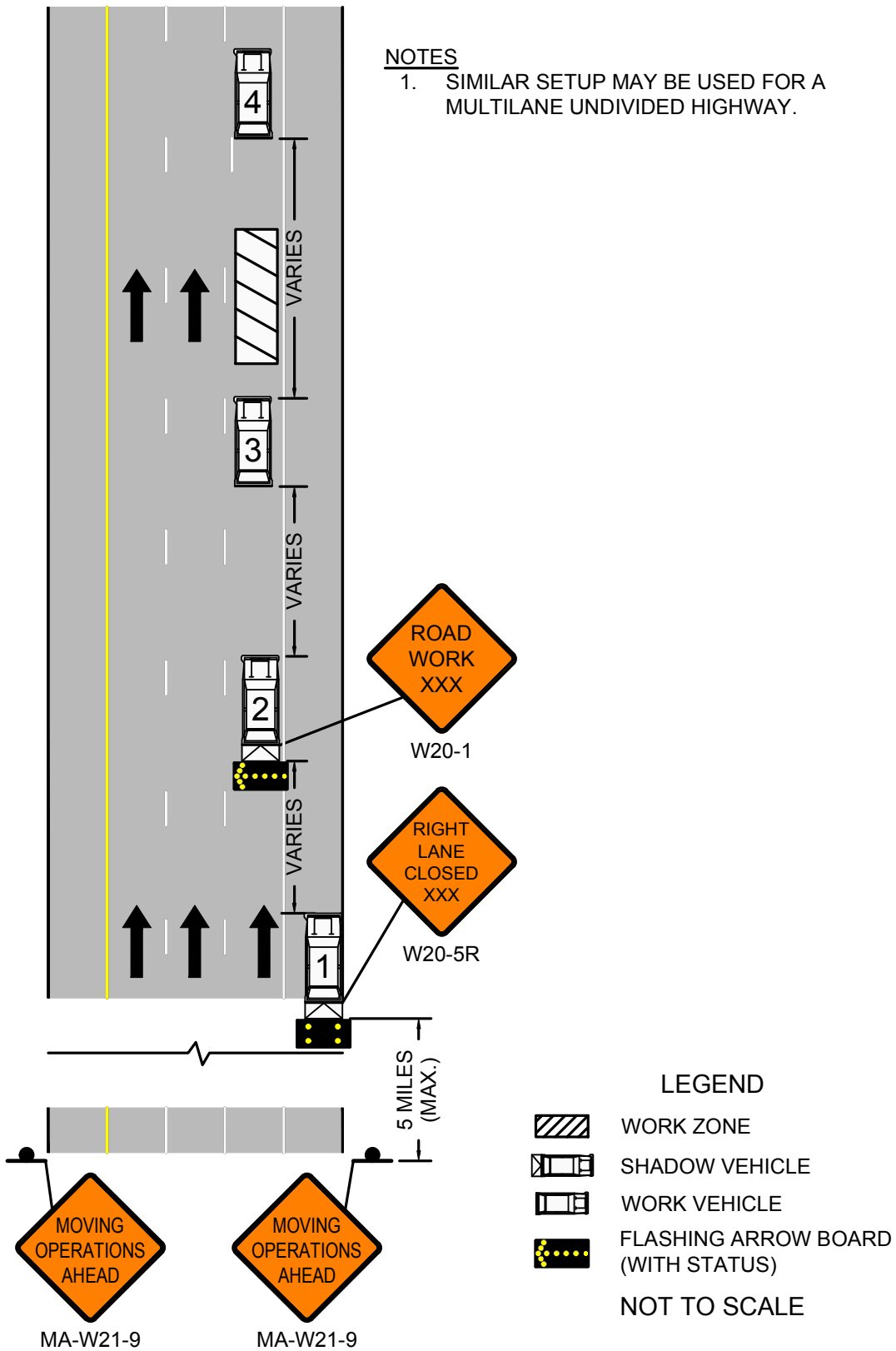
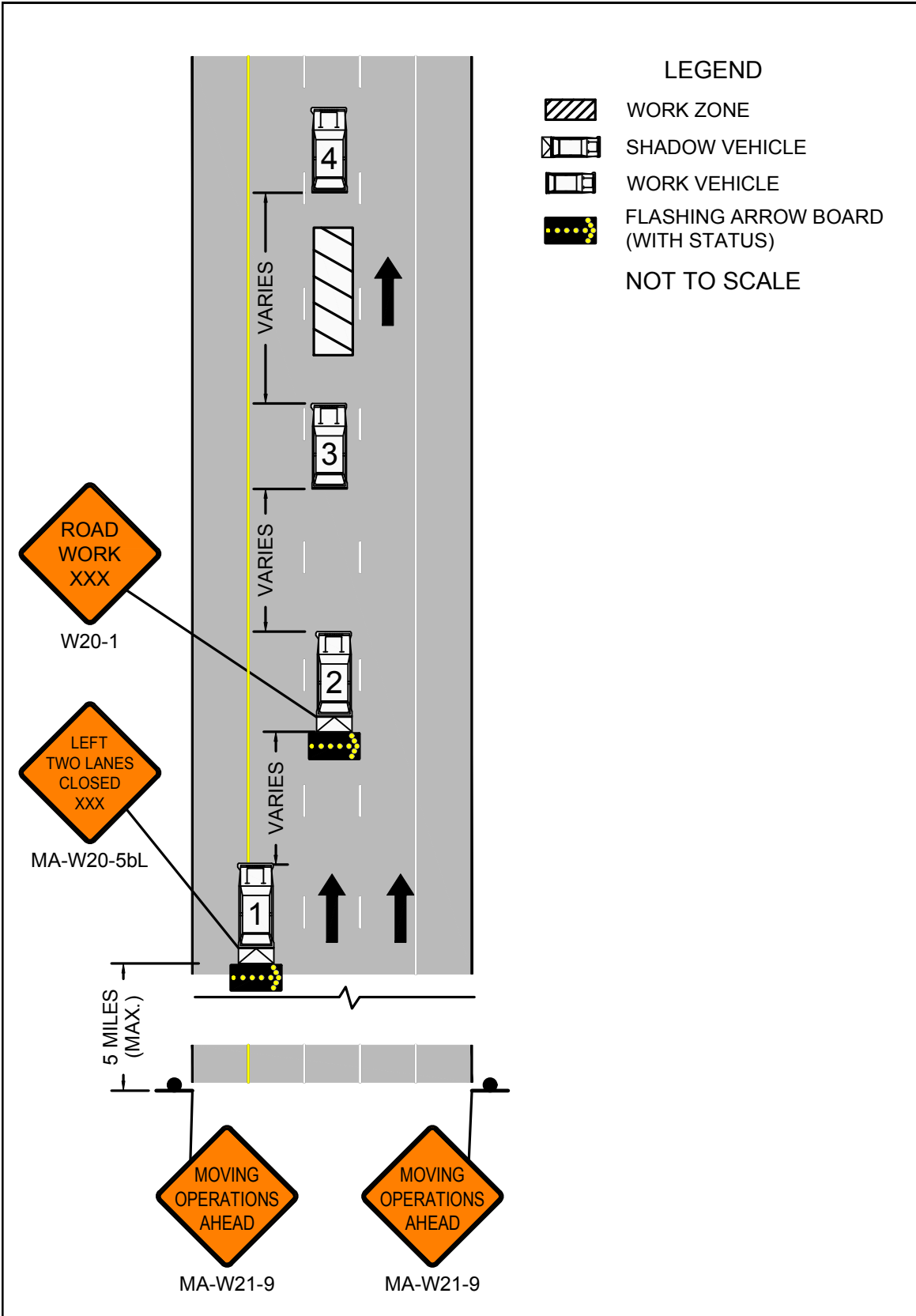



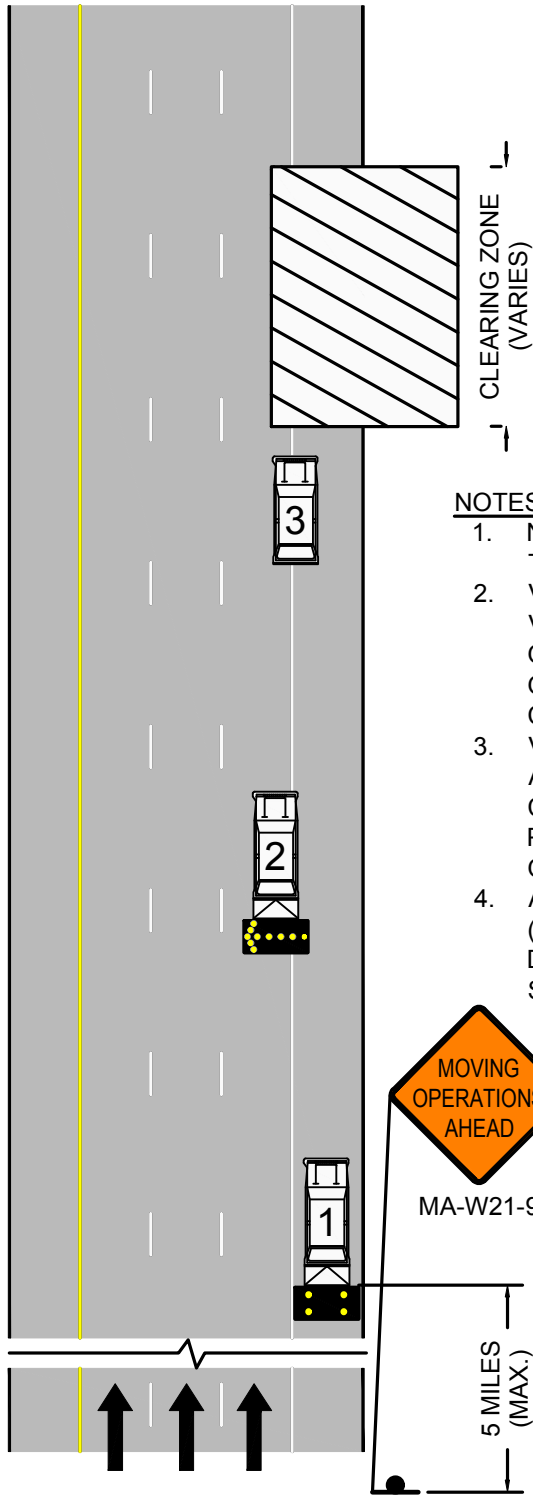


FIGURE 30
MOBILE OPERATIONS
MULTILANE DIVIDED ROADWAY
RIGHT LANE









 <p>Massachusetts Department of Transportation Highway Division</p>	<p>Work Zone Safety Standard Details and Drawings</p>	<p>FIGURE 31 MOBILE OPERATIONS MULTILANE DIVIDED ROADWAY CENTER LANE</p>
<p>PAGE 63</p>		



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

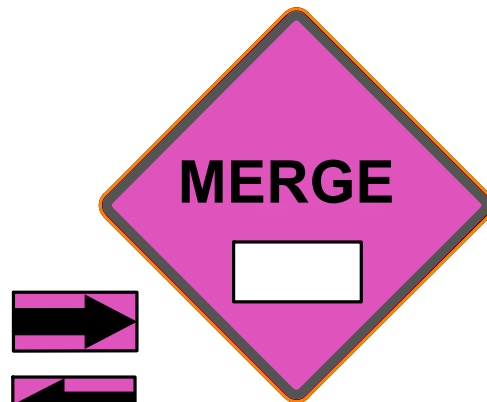
Notes for Traffic Emergency or Incident Operations

- 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





 <p>PAGE 65</p>	<p>Work Zone Safety Standard Details and Drawings</p>	<p>NOTES FOR TRAFFIC EMERGENCY/ INCIDENT OPERATIONS</p>
--	---	---

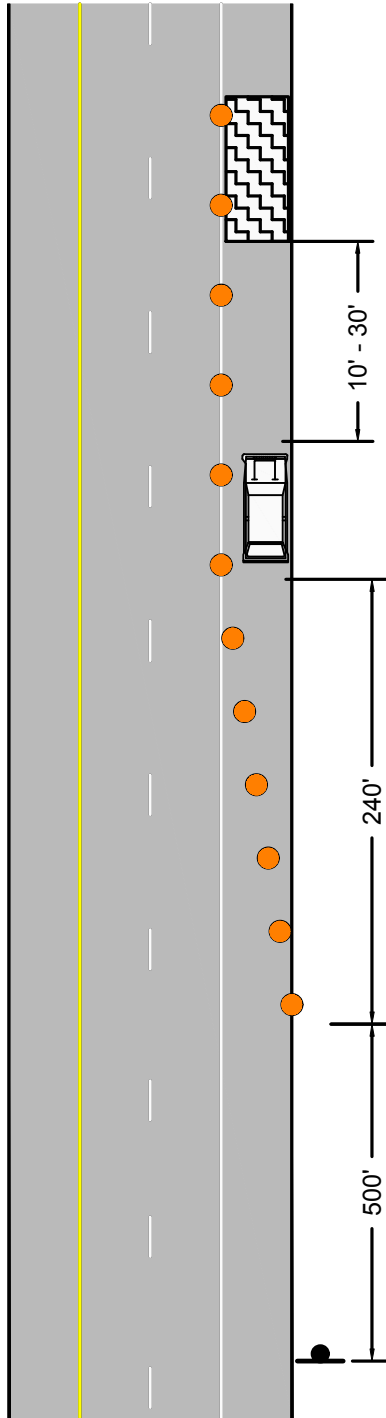


FIGURE 33
EMERGENCY RESPONSE
ANY ROADWAY
SHOULDER ENCROACHMENT

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

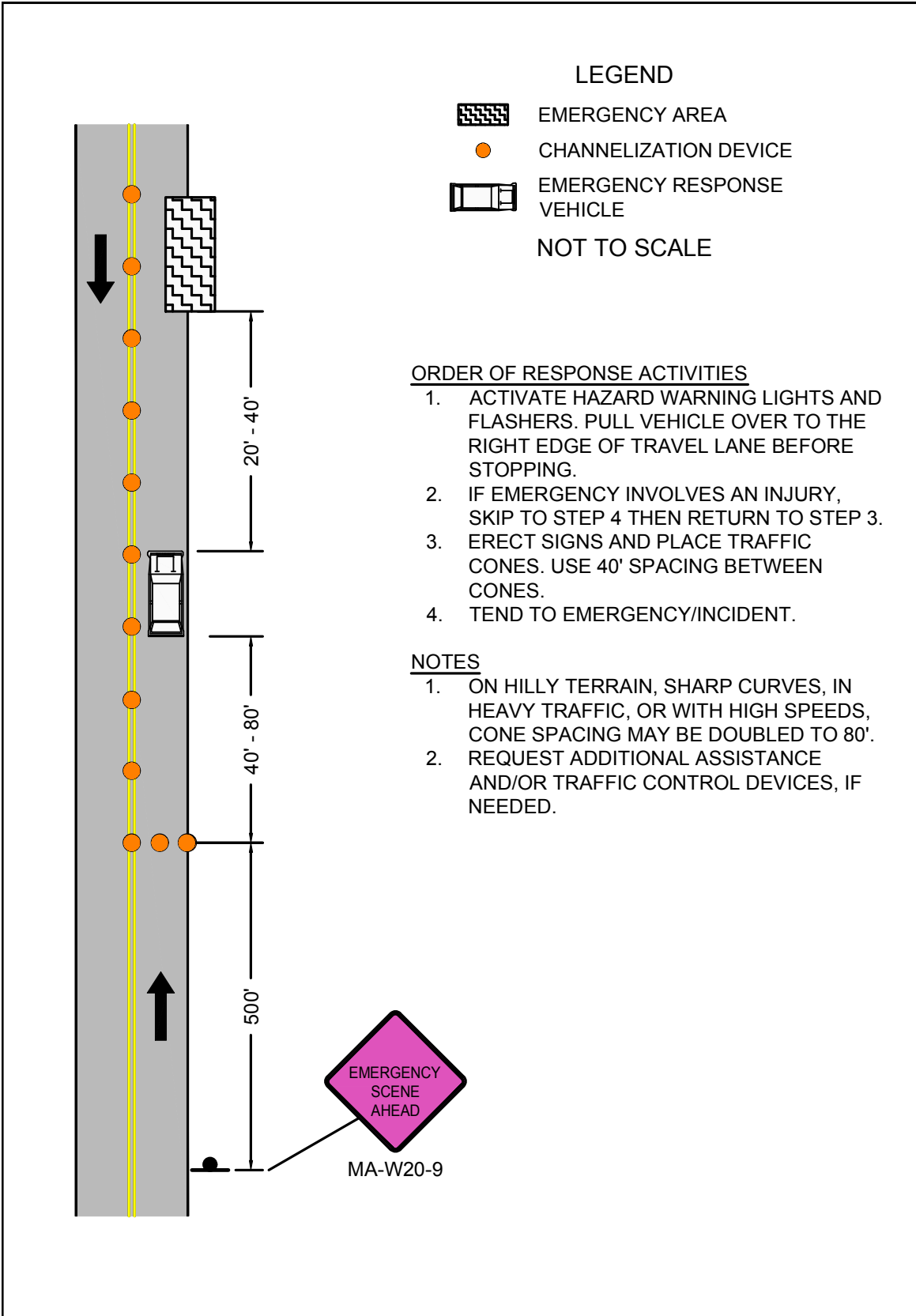





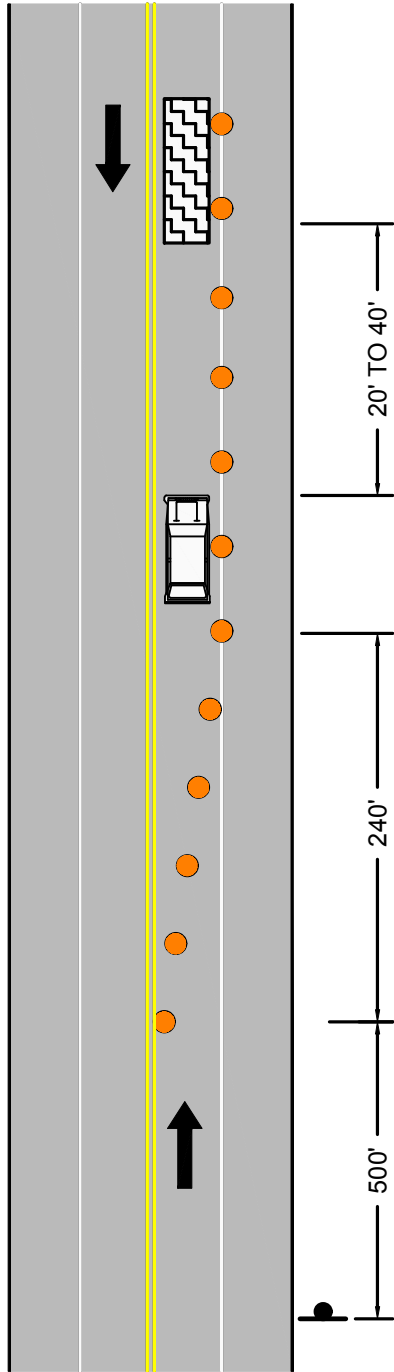


FIGURE 35
EMERGENCY RESPONSE
TWO LANE ROADWAY
TRAVERSABLE SHOULDER
SINGLE LANE ENCROACHMENT

LEGEND

-  EMERGENCY AREA
-  CHANNELIZATION DEVICE
-  EMERGENCY RESPONSE VEHICLE

NOT TO SCALE

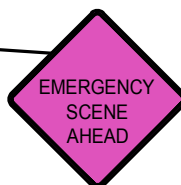


ORDER OF RESPONSE ACTIVITIES

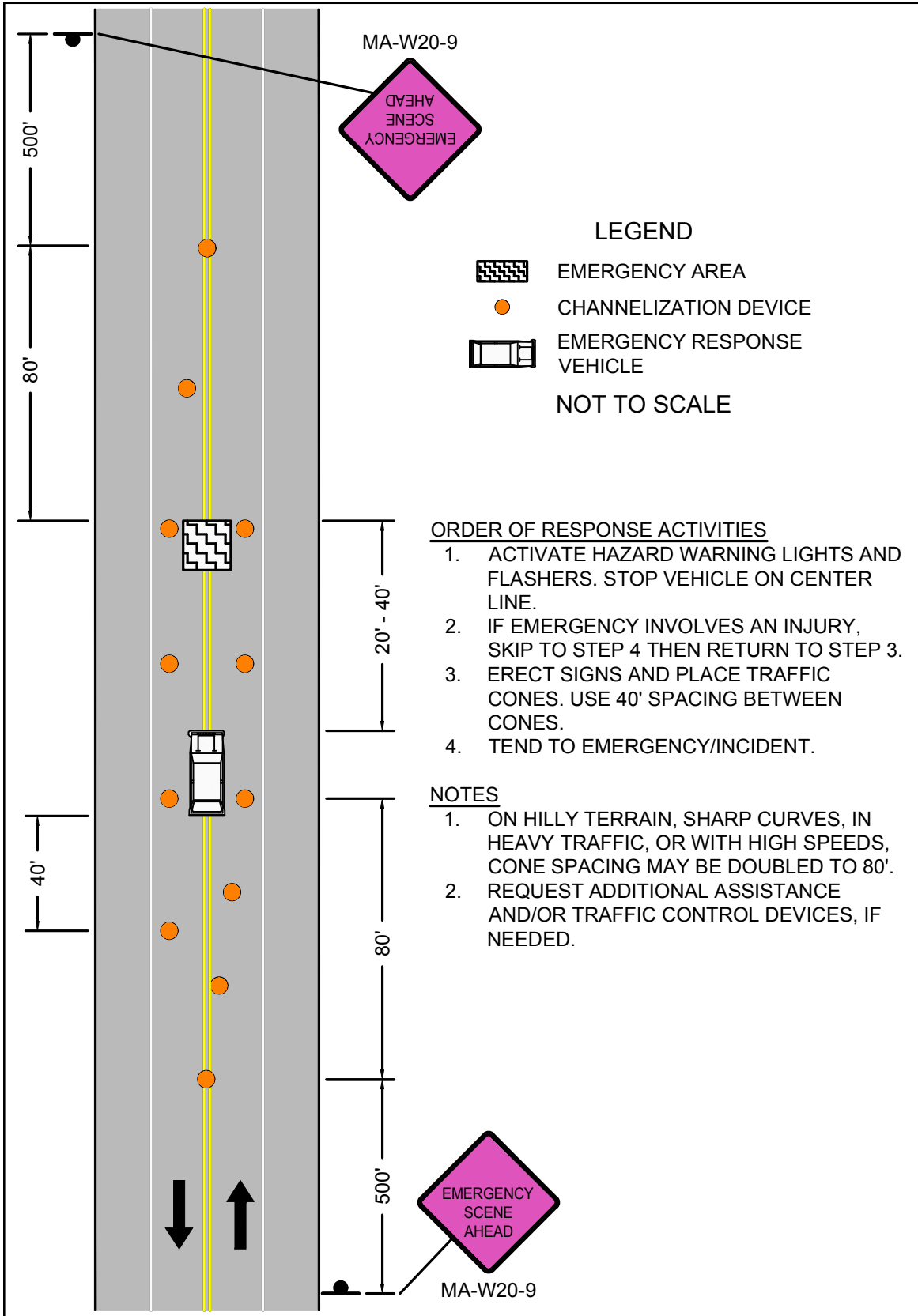
1. ACTIVATE HAZARD WARNING LIGHTS AND FLASHERS. PULL VEHICLE OVER TO THE LEFT EDGE OF TRAVEL LANE BEFORE STOPPING.
2. IF EMERGENCY INVOLVES AN INJURY, SKIP TO STEP 4 THEN RETURN TO STEP 3.
3. ERECT SIGNS AND PLACE TRAFFIC CONES. USE 40' SPACING BETWEEN CONES.
4. TEND TO EMERGENCY/INCIDENT.

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




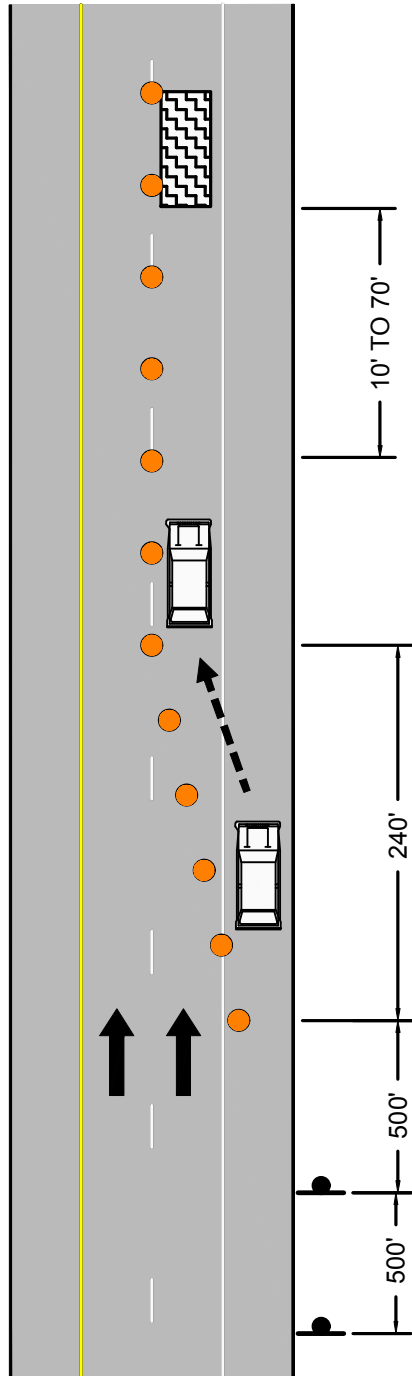




 <p>Massachusetts Department of Transportation Highway Division</p> <p>PAGE 69</p>	<p>Work Zone Safety Standard Details and Drawings</p>	<p>FIGURE 36 EMERGENCY RESPONSE TWO LANE ROADWAY TRAVERSABLE SHOULDER CENTER OF ROADWAY</p>
---	---	---



FIGURE 37
EMERGENCY RESPONSE
MULTILANE DIVIDED ROADWAY
RIGHT LANE



LEGEND

-  EMERGENCY AREA
-  CHANNELIZATION DEVICE
-  EMERGENCY RESPONSE VEHICLE
-  RESPONSE VEHICLE MOVEMENT

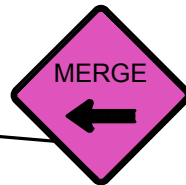
NOT TO SCALE

ORDER OF RESPONSE ACTIVITIES

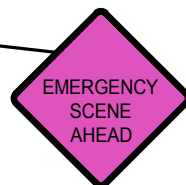
1. ACTIVATE HAZARD WARNING LIGHTS AND FLASHERS. STOP VEHICLE IN BREAKDOWN LANE.
2. IF EMERGENCY INVOLVES AN INJURY, SKIP TO STEP 6 THEN RETURN TO STEP 3.
3. ERECT SIGNS AND PLACE TRAFFIC CONES. USE 40' SPACING BETWEEN CONES.
4. MOVE RESPONSE VEHICLE BEHIND EMERGENCY.
5. PLACE ADDITIONAL CONES.
6. TEND 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.



MA-W4-2aL



MA-W20-9

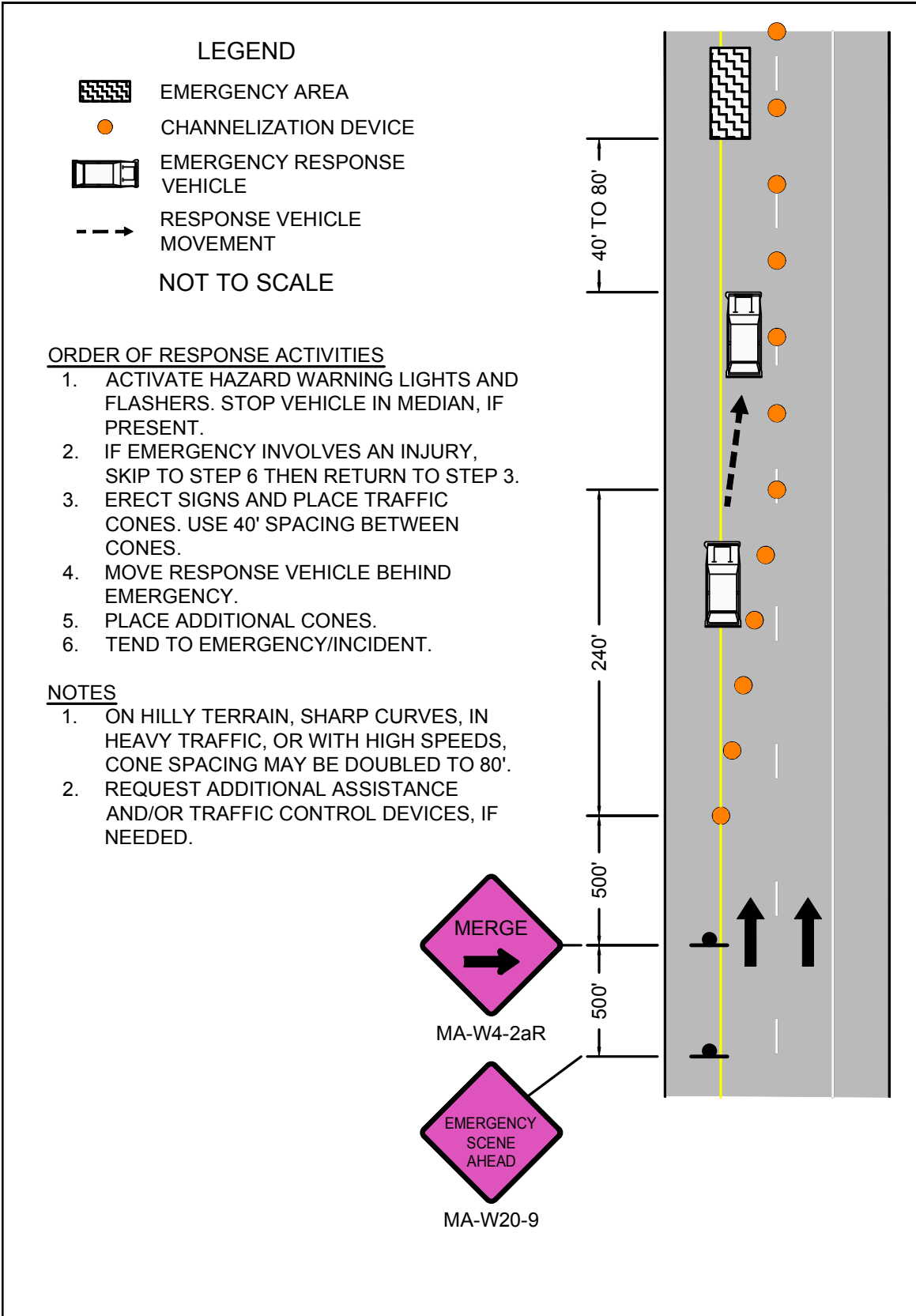
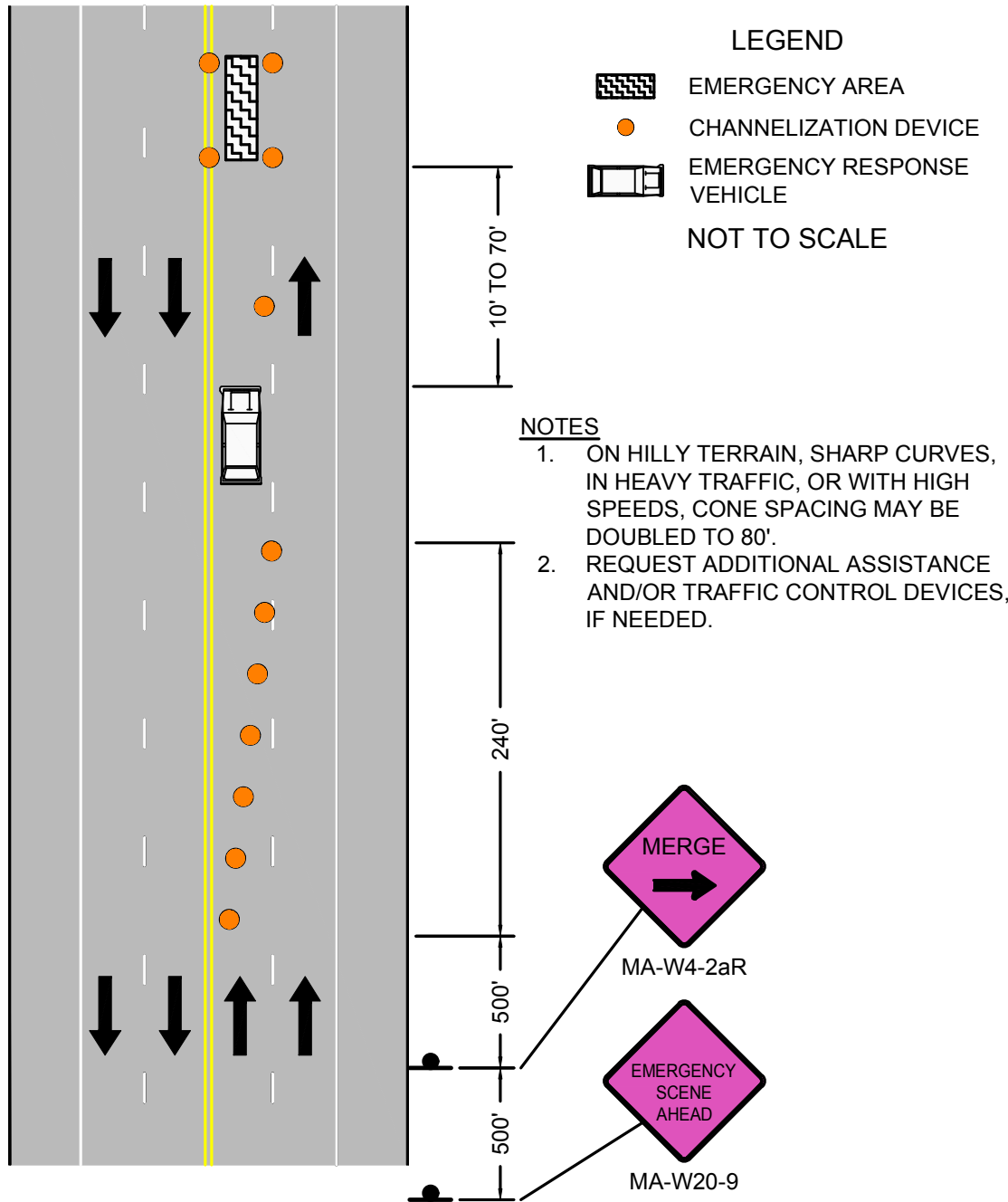


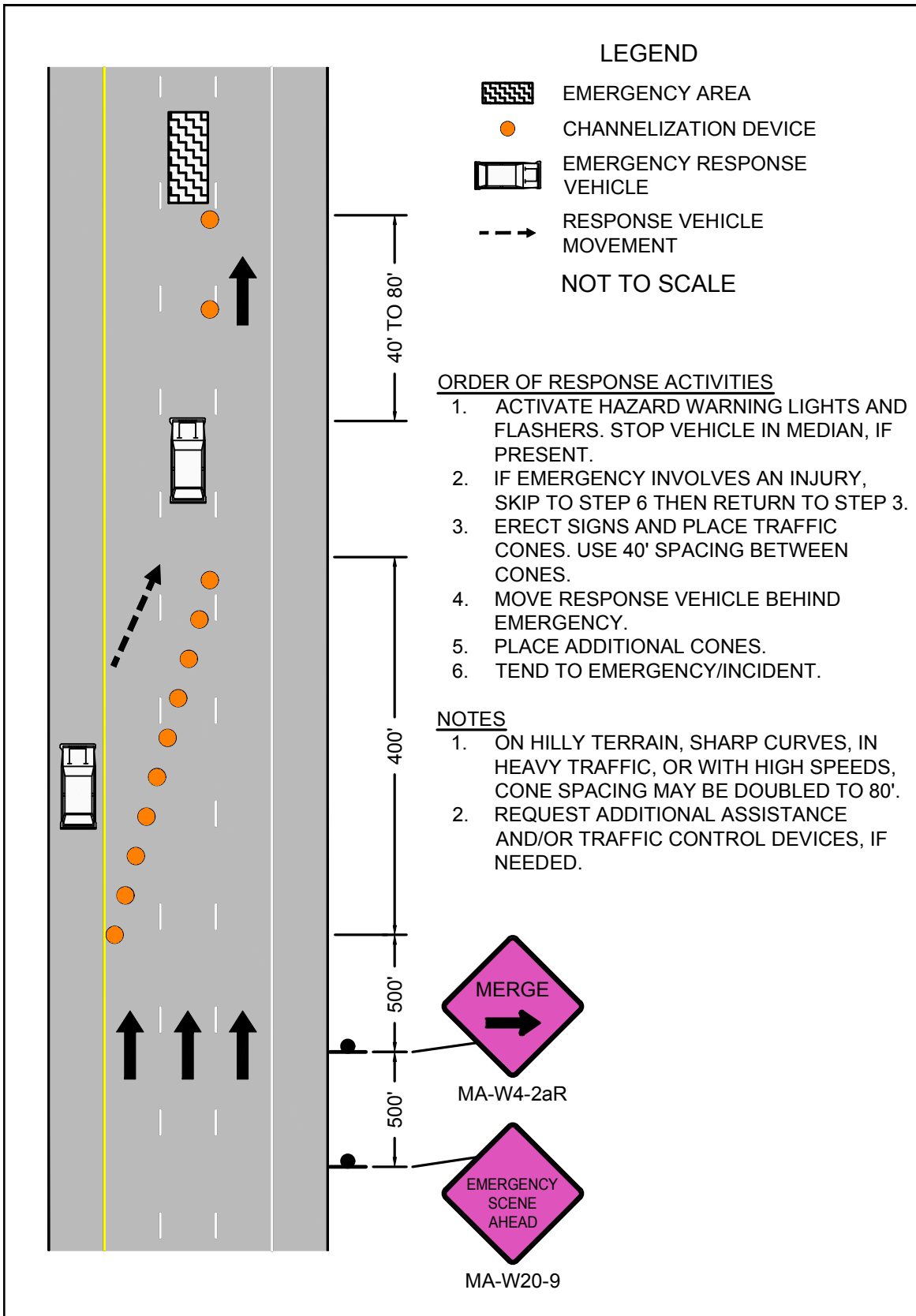


FIGURE 39
EMERGENCY RESPONSE
MULTILANE UNDIVIDED
ROADWAY
LEFT LANE



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.




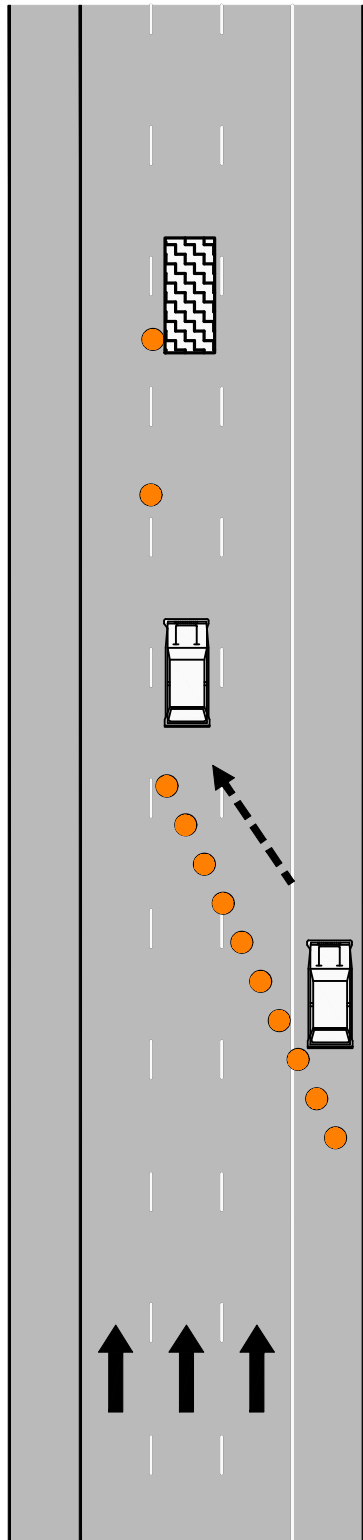




 <p>Massachusetts Department of Transportation Highway Division</p>	<p>Work Zone Safety Standard Details and Drawings</p>	<p>FIGURE 40 EMERGENCY RESPONSE MULTILANE DIVIDED ROADWAY MIDDLE LANE APPROACH FROM LEFT</p>
--	---	---



FIGURE 41
EMERGENCY RESPONSE
MULTILANE DIVIDED ROADWAY
MIDDLE LANE
APPROACH FROM RIGHT



LEGEND

-  EMERGENCY AREA
-  CHANNELIZATION DEVICE
-  EMERGENCY RESPONSE VEHICLE
-  RESPONSE VEHICLE MOVEMENT

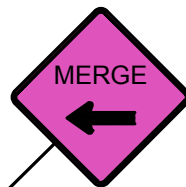
NOT TO SCALE

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

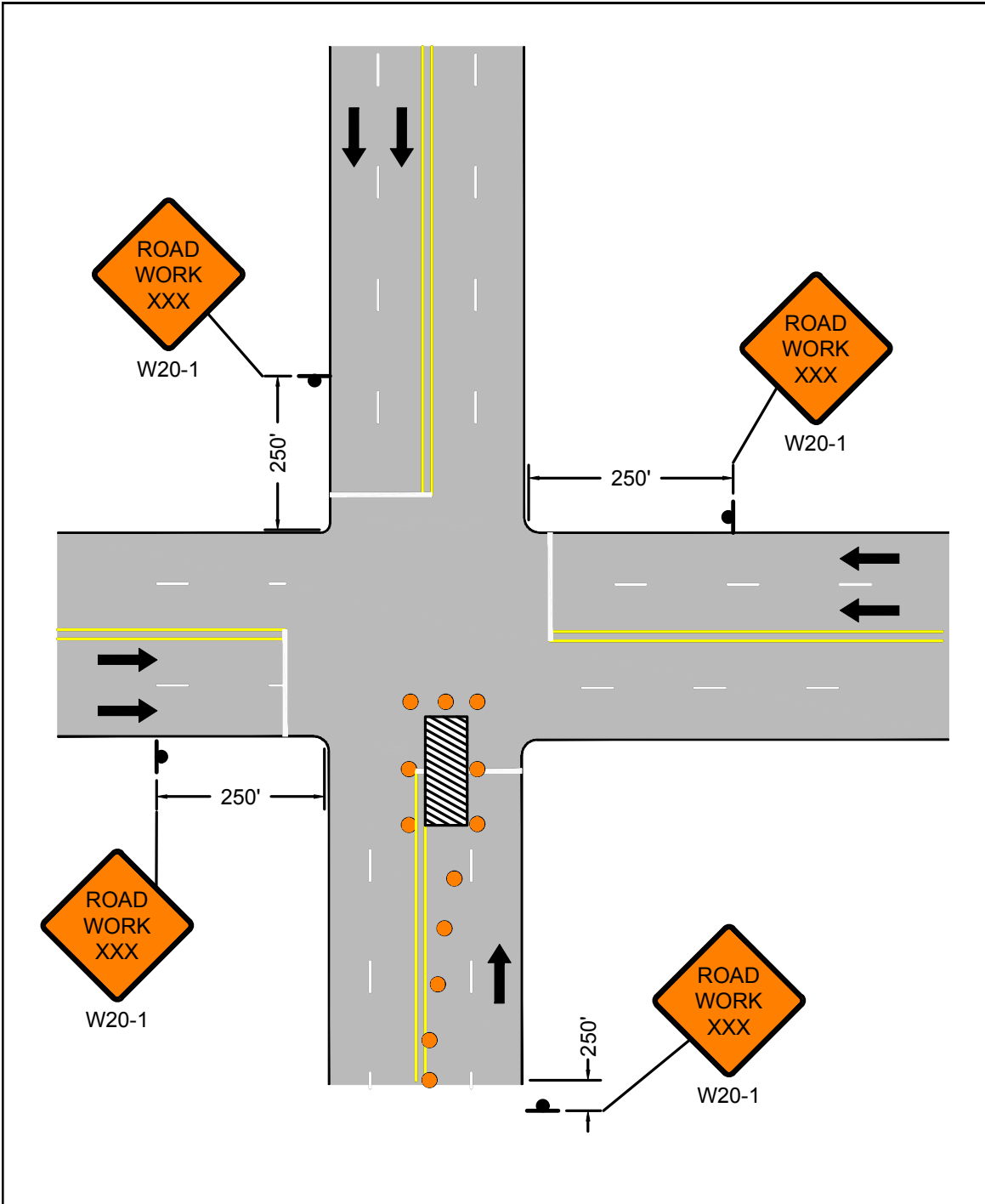
1. ON HILLY TERRAIN, SHARP CURVES, IN HEAVY TRAFFIC, OR WITH HIGH SPEEDS, CONE SPACING MAY BE DOUBLED TO 80'.
2. REQUEST ADDITIONAL ASSISTANCE AND/OR TRAFFIC CONTROL DEVICES, IF NEEDED.





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.

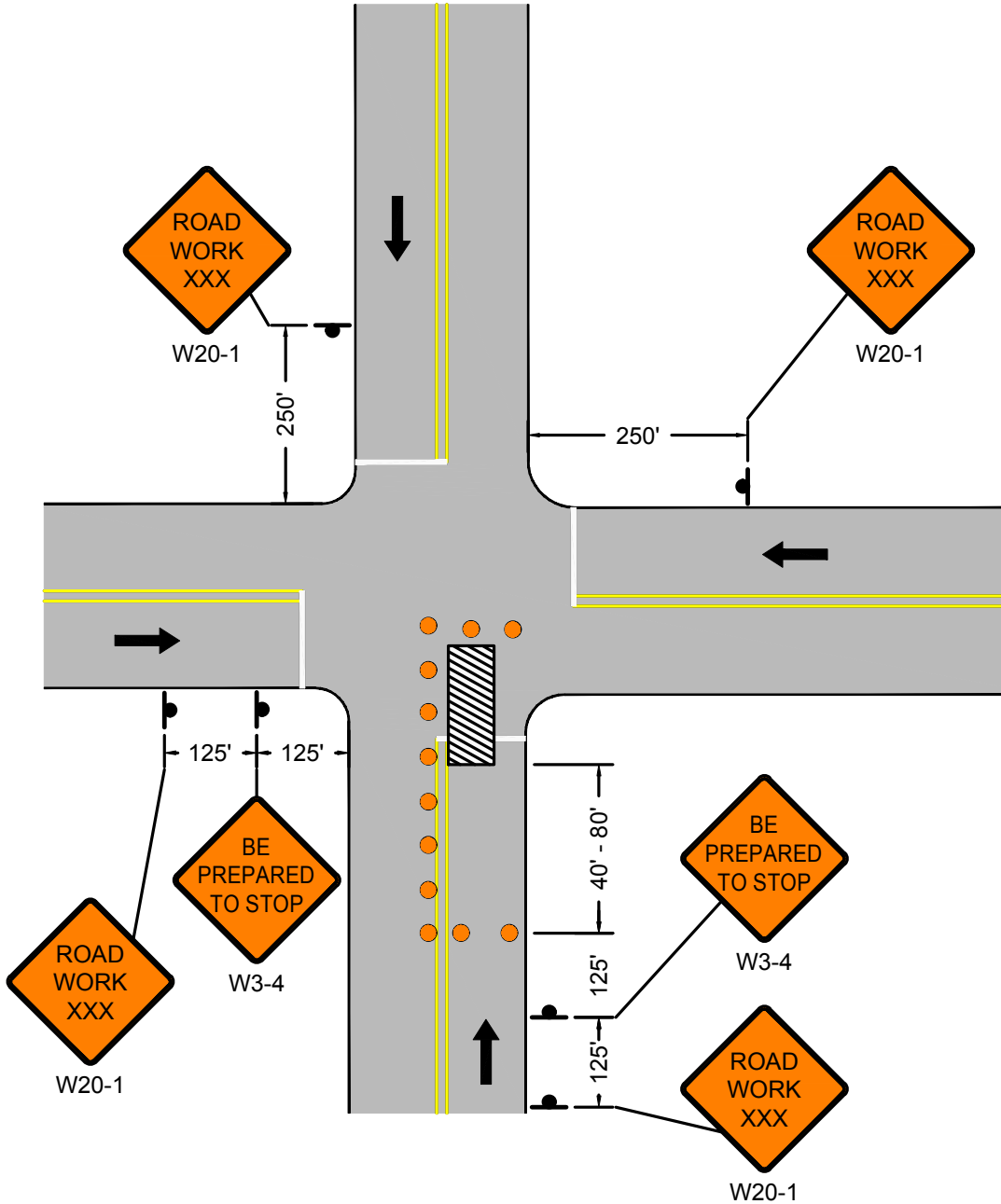






PAGE 76

Work Zone Safety
Standard Details
and Drawings

FIGURE 43
TRAFFIC SIGNAL REPAIR WORK
TWO LANE UNDIVIDED ROADWAY
ONE LEG OF INTERSECTION

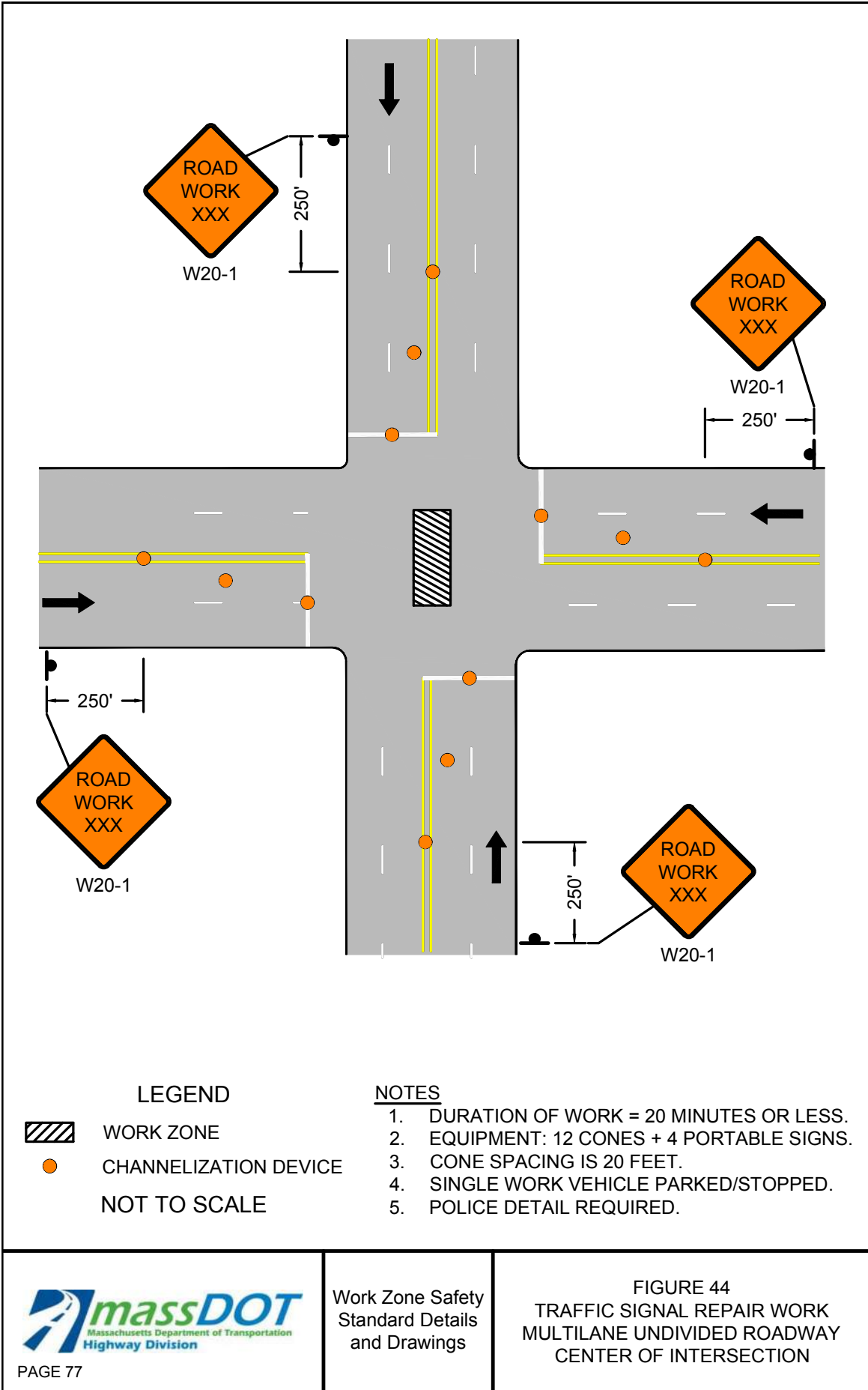


LEGEND

-  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.

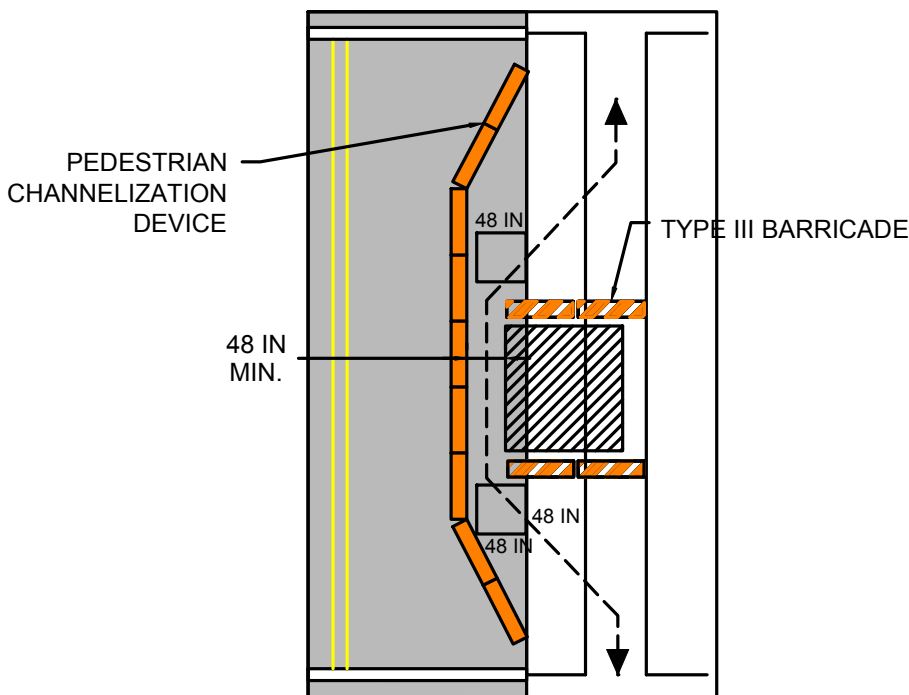




PAGE 78

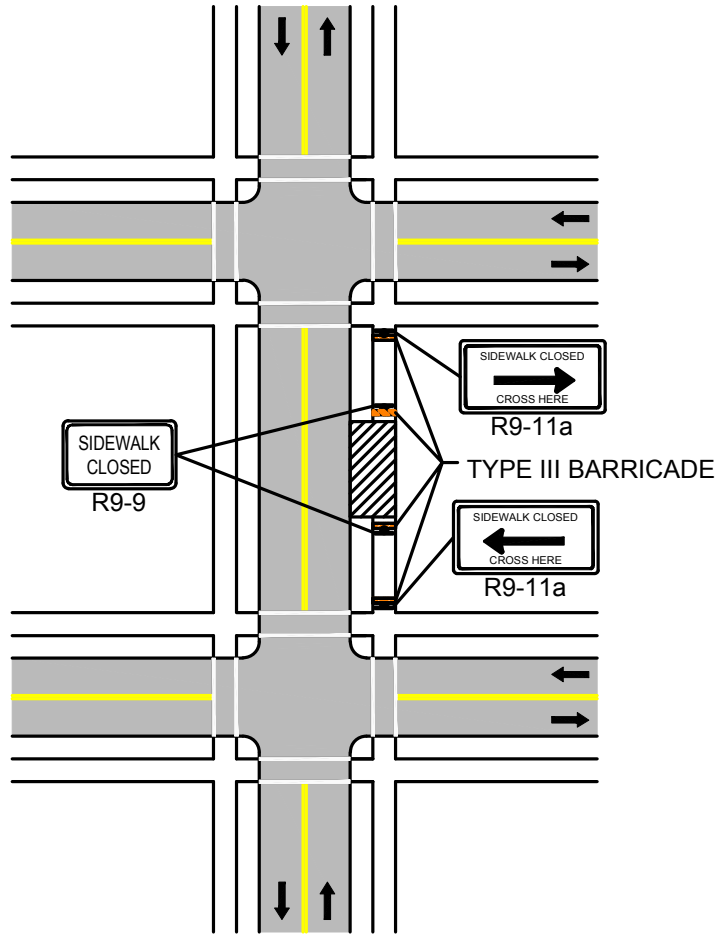
Work Zone Safety
Standard Details
and Drawings

FIGURE 45
PEDESTRIAN BYPASS



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.





PAGE 80

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.

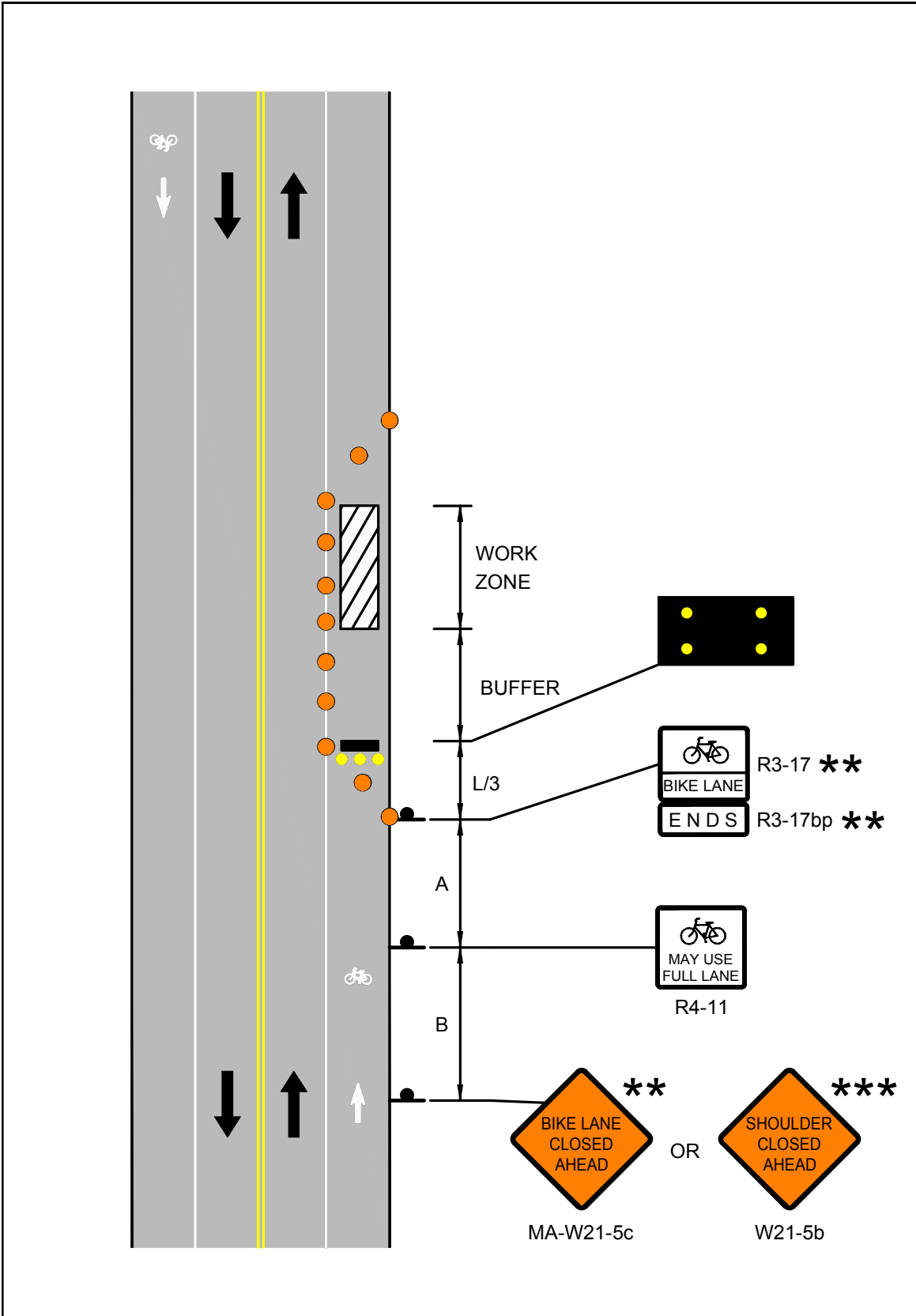
NOTES


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>
---	---	--



Safety is everyone's business

Rev. June, 2017